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# PARTNERS

IN RESEARCH FOR DEVELOPMENT

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LANDCARE SPREADS TO NEW AREAS

The influence of the community-based movement is growing in the Philippines

VOLUNTEERS LEARN FROM THEIR EXPERIENCE

When Australians work in developing countries, the benefits are shared

PRESERVING GENETIC SEED RESOURCES

Seeds of ancient lineage may hold a key to the future of grain growing

## Increasing productivity in the Philippines

Over the past 20 years ACIAR has supported more than 100 projects in the Philippines. These projects have resulted in the development of valuable technologies with the potential to increase Filipino farmers' production and income. The broad aim has always been to support improvements in agricultural productivity to increase market access for poorer farmers.

Farmers and researchers in ACIAR-supported projects are working together to increase sustainable farming practices in Mindanao, the Visayas and beyond these areas.

The first Philippines–Australia Landcare project, for example, resulted in the formation of more than 400 Landcare groups and adoption of conservation technologies by thousands of farmers. Plans for expansion of Landcare in the Philippines are outlined in Jenni Metcalfe's report on page 4.

On the island of Bohol, researchers and farmers are also focusing on sustainability issues, trying to improve management of steep agricultural lands.

Several other Philippine projects are reported in this issue – improving timber quality on the island of Leyte will benefit both smallholder tree farmers and local sawmillers, and bamboo is being investigated as a renewable, alternative timber for use in construction and processed timber products.

Over the years a number of ACIAR projects have benefited from the involvement on the ground of Australian volunteers. Roger Beckmann provides an illuminating account of the experiences of three of these volunteers.

A special report on collaborative work between ACIAR and ICARDA is also covered in this issue, and Dr Ken Street explains his germplasm projects in the Caucasus and Central Asia that are aimed at preserving potentially vital genetic resources for world agriculture.

## PARTNERS IN RESEARCH FOR DEVELOPMENT

Partners in Research for Development presents articles that summarise results from ACIAR-sponsored research projects, and puts ACIAR research initiatives 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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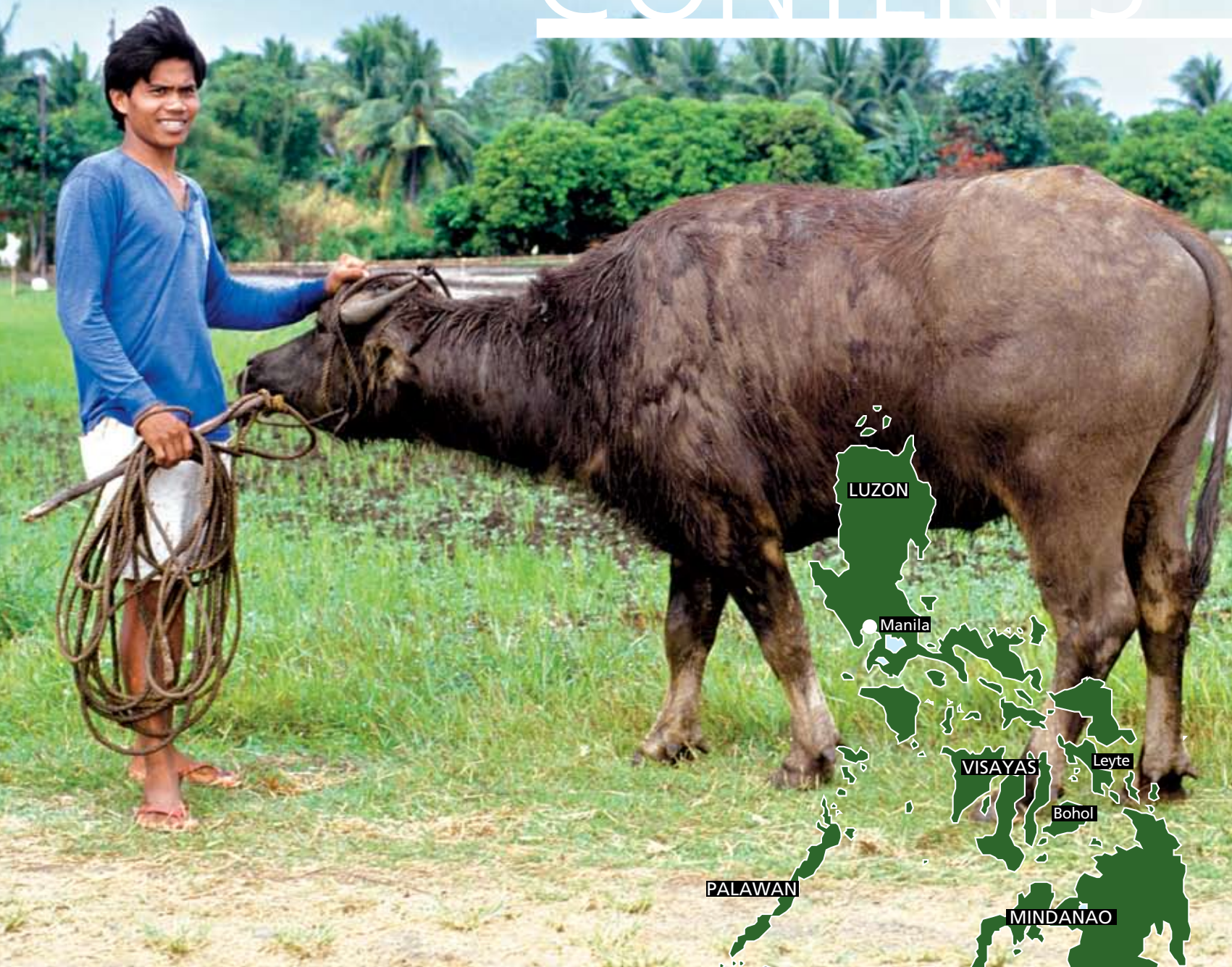
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PHILIPPINES



# LANDCARE TAK



Farmer Basilio Decano is a Landcare advocate: "With Landcare, I was able to dream."



Landcare is helping poor Filipino farmers to conserve their soil while maintaining and enhancing their livelihoods.

## Jenni Metcalfe looks at moves to widen the influence in the Philippines of the community-based Landcare movement

After more than 15 years, Landcare is a widely recognised movement in Australia. People generally understand Landcare to be an organisation of local people who try to work together on each others' land and public property for both production and conservation outcomes.

Landcare in Australia has gained widespread public support and also attracted significant government funding. It is this sort of institutional support that Landcare in the Philippines is also striving for, as it looks to spread from three core areas in the southern island of Mindanao to other parts of the country.

Landcare formally started in the Philippines in March 1996, when the Claveria Landcare Association was formed in northern Mindanao. The first president of the Association, Marcelino Patindol, says they did not know about the existence of Australian Landcare when they called their own group 'Landcare'. It was not until a couple of years later, when asked by the World Agroforestry Centre's Dr Dennis Garrity about how Philippine Landcare fitted in with Australian Landcare, that they realised they were not alone. "We didn't even know about Landcare in Australia and asked if we could find out more. Since that time, many people have come here from Australia to look at what we're doing, and we have visited Australia to see what they are doing," Marcelino says.

Landcare is helping poor Filipino farmers to conserve their soil while still maintaining and enhancing their livelihoods. As the population increases, the demand for the steep, easily-eroded land also increases. Landcare is built on a simple technology accidentally discov-

ered after researchers from the International Rice Research Institute tried to encourage contour farming, and provided farmers with planting sticks to indicate contours. The farmers could not afford to buy the seeds and other materials to grow hedgerows on their contours and left the planting sticks in the ground and ploughed around them. Within a year, the grass left around the sticks formed natural contour barriers. Researchers studied the grassy strips and found they were stopping soil erosion. The grassy strips became known as Natural Vegetative Strips and their use has been expanded to agroforestry and mixed cropping operations.

The first ACIAR-funded Philippines–Australia Landcare project concluded last year with publication of *Landcare in the Philippines – Stories of people and places*. The book contains the personal stories of more than 50 people involved in Philippine Landcare, including farmers, government workers, researchers, community and church representatives and people from private industry. It reflects the spread of Landcare across Mindanao, from the northern municipality of Claveria to the central municipality of Lantapan and to Ned, a remote barangay (local government area) in southern Mindanao.

The book highlights some of the achievements of the first Landcare project, including the formation of more than 400 Landcare groups, adoption of conservation technologies by 35 to 65 per cent of farmers at the three sites, overall protection of 15 to 25 per cent of the total farm area across the three sites (including a larger proportion of the steeper and cultivated farmland), and improved livelihoods through access to fruit and timber trees, high-value vegetable crops and collective marketing and purchasing schemes.

These outcomes have provided a good platform for a new joint ACIAR–AusAID project, which aims to strengthen and sustain existing Landcare activities and support the spread of Landcare to other parts of the Philippines.

# ES ROOT

**PARTNER COUNTRY:** Philippines  
**PROJECT:** Landcare in the Philippines and Australia (ASEM 1998/052)  
**DESCRIPTION:** Community and industry-led groups working with scientists to adopt simple conservation practices  
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## SHARED STRENGTHS

The expansion of the new Landcare project to the island province of Bohol in the Visayas provides an excellent opportunity for collaboration with another ACIAR project which is looking at sustainable management of the Inabanga watershed in central Bohol (see page 6). The fact that both projects are pursuing improved resource management practices means they can build on shared strengths in delivering outcomes to Bohol farming communities. To this end, the two project teams met in November 2005 in Bohol to plan future collaborative activities, such as the establishment of a demonstration farm and monitoring and evaluation of social, environmental and economic outcomes at the farm level.



Farmer Pearla Binahon is involved in Landcare training. Her husband Henry is president of the Landcare Foundation of the Philippines.

“This will mean seeking increased support from existing natural resource management institutions within government, civil society and business,” says Australian project leader Noel Vock. “After a year of operation, our network of Landcare facilitators has already made some terrific connections with community and government leaders. This sort of support is needed for Landcare to go further and build on the grassroots enthusiasm of individuals, villages and communities.”

Basilio Decano is a poor upland farmer in Lantapan who is championing the cause of Landcare in his village. “Before Landcare, we were fairly contented with the way we did our farming. We ate a little, sold a little and that’s about it. But with Landcare, I was able to dream. I opened my eyes to a future that could be better and more stable. I know now that I have a legacy to leave my children that will not be stolen or burnt down.”

Basilio came to Landcare reluctantly, afraid of another government program that would limit his farming options. But after being persuaded to visit farmers in Claveria practising Landcare, he became a convert to the cause. “I changed completely once I realised that Landcare was something that I could simply ‘do’, which didn’t require any expense and was beneficial to me, my family and my community,” he says.

Basilio now harvests 1600 kilograms of shelled corn from his farm, up from the 224kg produced before Landcare, using the same seed, fertiliser and other inputs. He plants taro along the contours of his farm and has put in an agroforestry system, which is already delivering benefits after only four years.

Supporting farmers to visit other farmers who have successfully adopted Landcare techniques such as natural vegetative strips continues to be a cornerstone of Philippine Landcare. “We are trying to focus the main effort on building and enhancing the effective Landcare capacity of local government units and the provincial government,” Noel Vock

says. “We are also keeping a watching brief on potential Landcare sites in neighbouring provinces.”

The newly formed Landcare Foundation of the Philippines Inc is being led by previous Claveria Landcare facilitator Ma. Aurora Laotoco. Henry Binahon is a farmer and trainer in the Lantapan region of Central Mindanao and is the Landcare Foundation’s current president. He and his wife, Pearla, are involved in Landcare training activities. “These are unique, because they are about sharing information between farmers about their experiences with Landcare and conservation, and also about the exchange of information between farmers and researchers,” he says.

The new ACIAR-AusAID project includes the previous partner agencies of the Queensland Department of Primary Industries and Fisheries, the University of Queensland, the World Agroforestry Centre and SEAMEO Regional Center for Graduate Study and Research in Agriculture. An important new partner is the Catholic Relief Service, which is testing Landcare as part of its community development program in the Agusan del Sur province of eastern Mindanao.

Landcare facilitators are using and adapting the criteria developed by Dr Delia Cacatucan’s PhD research (under an ACIAR John Allwright Fellowship) to determine the best sites for promoting Landcare. The criteria have been used by the project to identify sites for further promoting Landcare in Misamis Oriental, Bukidnon and South Cotabato in Mindanao. They have also been used to identify suitable locations in the two project sites of Agusan del Sur and Bohol.

The Australian component of the new project is looking at how the Landcare model may help in understanding and improving the viability of horticultural farmers working in the peri-urban Sunshine Coast area of south-eastern Queensland. “This will help ensure that ideas continue to be shared between the Philippines and Australia in the years to come,” says Noel Vock. ◀

# OVERCOMING THE SLIPPERY SLOPE

Modern technologies help traditional landholders ensure a sustainable future, writes Whitney Macdonald



IAN WILLETT

**T**he steep slopes of Bohol, the Philippines' 10th largest island, may provide residents with an aesthetically pleasing landscape, but they do little to provide the necessary terrain to sustain the island's primary livelihood – agriculture.

At the agricultural heart of Bohol island is the Inabanga watershed, supplying the Inabanga-Wahig River with water for the island's agricultural, domestic and industrial needs. However, due to the steep slope of the land and inappropriate farming practices, the watershed's sustainability has been under threat.

By assessing the management of the land and water resources within the Inabanga watershed, ACIAR-supported researchers from Australia and the Philippines aim to establish better agricultural practices and management strategies to help secure the island's primary industry.

Farming practices expected to have a positive impact on the Bohol watershed include agroforestry – that is, interspersing crops with forestry to decrease the overall drain of nutrients by an individual crop – and mixed crops. The research has also identified soil-protecting practices such as contour cultivation, building steps into the steeply sloping land and cultivating less frequently.

Leading the project are Professor John Bavor, from the Centre for

Water and Environmental Technology at the University of Western Sydney, and Dr Rogelio Concepcion of the Bureau of Soils and Water Management. Also involved is the Forest Management Bureau of the Department of Environment and Natural Resources.

Professor Bavor says data demonstrates that traditional crops of irrigated and rainfed rice are not the most economically viable crop selections, based on the soil type and land traits. "Farmers are essentially going economically backwards by growing traditional crops of irrigated and rainfed rice because it is costing them more money to grow these than their peso returns," he says.

Now in the final stages of the project, the emphasis is on implementing identified strategies beyond the research field into the everyday practices of the farmers. In order to ensure a smooth transition of knowledge to the farmers, the research team is establishing five community learning centres made up of agricultural experts, provincial government officials and members from the individual barangays (local government areas).

Almost half of the 411,700-hectare island is designated as agricultural land, supporting the farming practices of 80 per cent of the island's population; yet 60 per cent of that land has a slope of greater than 18 per cent and receives more than two metres of rainfall a year.



JOHN BAVOR

Left: weeding rice growing on terraces in the upper Inabanga watershed. Above: local farm families who rely on water for farming and domestic use often complain that the sediment-laden water is difficult to wash in, but do not link the problem to loss of soil in their fields. Right: the region relies heavily on rainfed rice, but farmers are learning that cultivating less frequently can have a positive impact on sustainability in the watershed.



High levels of soil erosion and runoff make it very difficult to sustain conventional cropping practices.

Using land satellite imagery and analysis by Geographic Information System (GIS), researchers were able to correlate land and water characteristics like slope, soil characteristics, soil erosion and runoff to agricultural practices such as crop selection and land management.

The maps generated by GIS looked at the land-use within the watershed, with a focus on agricultural crops and forestry/grasslands. The analysis included the six most prominent crops – irrigated rice, rainfed rice, corn, cassava, coconut and oil palm.

While corn, cassava and vegetables are currently minor crops in the watershed, Professor Bavor says that exploiting them more would be advantageous. “Farmers would economically benefit much more by growing corn, cassava and vegetables.

“Unfortunately, these crops typically increase soil erosion in sensitive landscapes. What we are proposing, though, is that by progressively adopting the good farming practices that are suitable for these crops on this landscape, they will be able to minimise soil and nutrient losses and produce an economically and environmentally viable crop.”

The maps gave comprehensive data about the watershed resources by illustrating a series of land classifications – that is, categorising the soil depth into three groups, the slope into six classes, and the general erosion into five categories. As well, data was gathered from seven experimental soil erosion sites that demonstrated the effects on soil of a broad spectrum of environmental conditions that crops were likely to experience during the year. Nitrogen and phosphorus losses were also measured.

The data generated from these maps was incorporated into a GIS database for future use in a variety of agricultural management decisions, such as selection of more sustainable and productive crops, as well as more effective cropping practices to minimise erosion. The

**PARTNER COUNTRY:** Philippines

**PROJECT:** Integrated management of the Inabanga watershed (LWR/2001/003)

**DESCRIPTION:** Protecting water resources affected by soil erosion and runoff from agricultural lands on the island of Bohol

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accuracy afforded by the GIS maps, compared to traditional manual survey methods, enabled researchers to identify areas of extreme sensitivity and model more suitable agricultural practices for the future.

The decline in agricultural productivity in Bohol, due to unsustainable farming practices, has been exacerbated by the pressure placed on farmers to increase farm income to offset poverty and meet the demands of a fast-growing population (about three per cent a year).

In addition to integrating Bohol farmers and a large group of stakeholders into the research, the team used a range of information technology to gather and analyse the agricultural data.

“Having the data doesn’t do any good unless you can get it into a form that the farmers and stakeholders can use,” Professor Bavor says.

Despite a tendency to resist farming changes, the Bohol farmers have been very receptive to the proposed changes in farming practices, says Imelida Genson, a student member of the research team. The daughter of a Bohol farmer, Ms Genson came to Australia from Bohol to participate in this research as part of a master’s degree.

“I saw first-hand growing up how the poor farming practices and environmental factors only served to maintain the poverty and hardships in the farming industry” she says. “I wanted to do something to help improve the situation of the farmers and the environment of the watershed.”

The dedication and hard work of the members of the ACIAR research team could see the Inabanga watershed flourish. “If we can improve soil and water retention just a little bit, we can significantly improve the livelihood of Bohol,” Professor Bavor says. ◀

# QUALITY LIFT TO OPEN TIMBER MARKETS

Not what the mills want: logs of *Gmelina arborea*, commonly grown by smallholders.



JACK BAYNES

Producing timber of the quality sawmills demand could give smallholder tree farmers more chance of a sustainable income, writes David Adams

Unable to access markets and producing timber not up to the standard required by sawmills, smallholder tree farmers on the island of Leyte in the Philippines have faced uncertainty over their livelihoods.

Under an ACIAR-supported project, however, a joint Australian–Philippine team is now working to address these issues to help the long-term sustainability of smallholder tree farms.

Launched in Leyte Province – based on an island in the Visayas group – in January 2005, the \$700,000 project follows an earlier four-year initiative which identified the constraints and impediments facing smallholder farmers in the region.

Dr John Herbohn, a senior lecturer in tropical forestry at the University of Queensland and Australian project leader, says it became obvious during the previous project that smallholders who had planted trees eight to 10 years ago were facing problems finding markets.

“Whenever we would visit a community we would be asked: where can we sell our trees?” he says. Even the smallholders who did manage to sell their timber found they were not receiving the price they expected.

Paradoxically, sawmillers also reported that they could not obtain the timber they wanted.

In response, ACIAR decided to fund a new three-year project to look at ways of improving financial returns to smallholders for their existing timber, and to examine ways in which future returns to smallholders who are planting now could also be improved. The collaborative project involves representatives from the University of Queensland, the Philippine Department of Environment and Natural Resources (DENR) and Leyte State University.

While smallholders producing timber on Leyte Island work on farms ranging in size from just a couple of trees up to 400 hectares or more, Dr Herbohn says the project is focusing on those with farms up



to three or four hectares in size, which are by far the most common.

Usually family-run, these farms largely produce timber from the fast-growing species *Gmelina arborea*, along with mahogany and some acacias and eucalypts. Many smallholders are also showing interest in planting native species, including the narra (the national tree), but few have been planted.

With the bottom-line aim of increasing returns to smallholder tree farmers, the latest project centres on two main prongs – one aimed at addressing government policy constraints that hinder smallholders accessing markets, the other at looking at how the smallholders can produce timber better able to meet market requirements.

In addressing the first of the two, Dr Herbohn says members of the ACIAR team, who are based at Leyte State University, are working directly with officers from DENR to examine the tree registration process. “At the moment there’s some major problems with the way that the tree registration process is being implemented,” he says. “So part of the project has been to look at why people are having problems registering trees, and to get information to people about the registration process.”

To that end, earlier this year a series of workshops were held involving the ACIAR team, representatives of DENR, smallholders and other stakeholders at which they developed a primer on tree registration for smallholders. Not only does the primer – which has been translated into local dialects – show how to register trees, it also debunks some of the myths about the process.

As well as looking at issues surrounding the implementation of the policies, Dr Herbohn says the project is feeding back information to the Philippine authorities through the project’s advisory committee on whether existing policies need to be changed or amended.

The second main prong of the project – helping smallholders to better meet market requirements – emerged after it was found that one of the reasons why farmers had trouble finding a market was that they did not supply the timber in a form that the mills wanted.

“For instance, one of the mills that we talked to only wanted fitches, basically rectangular blocks of timber sawn with a circular saw, whereas all the timber being produced by smallholders is cut using chainsaws, so they’re much rougher and they’re just not what the mills want,” Dr Herbohn says.

To counter these difficulties, the project is seeking ways to provide better communication between tree farmers and the mills, and is trialling a number of pilot projects. These include creating a database of timber merchants for smallholders and another database for the merchants detailing what timber smallholders are producing. Other initiatives are also being investigated – a possible radio segment to provide information about potential markets, how to grow trees and how to get all the required permits.

To address the difficulties smallholders face in finding markets, a manual is being developed to explain important aspects of tree farming. This complements a manual for tree nursery techniques developed as part of the previous project.

The ACIAR project team has also trialled bus tours of smallholders to demonstration sites as a cost-effective means of providing information about how to better grow and manage their trees. Up to 20 smallholders are taken on a tour of four or five tree-farming sites.

“There’s a lot of really bad timber being grown,” says Dr Herbohn. “So there’s a desperate need for better silviculture and better management of these tree farms. At the moment, there’s just a total lack of knowledge about how to grow good trees.”

Part of the broader aim of the project is to develop better smallholder tree-farm systems that provide economic, social and environmental benefits.

“Tree farms often form part of a broader livelihood strategy of smallholders and it is important that we consider them as part of this

bigger picture,” Dr Herbohn says. “An important part of the project is to identify the social and economic factors that make livelihood systems incorporating tree farms successful, and to use these to design better farming systems for smallholders.

“Part of the project is also looking at how tree farms can be used to help restore the rich biodiversity of Leyte, that has been eroded due to the loss of native forests.”

While the project is already having an impact on Leyte, Dr Herbohn says the team is always conscious of considering how its initiatives could be used on a broader scale across the Philippines.

“It’s something that is beyond the scope of our current project, but it could be something that an organisation like AusAID might be interested in,” he says. “We’re running these pilot projects to see if they are effective. If we can identify some winners, then we hope to be able to work with one of the international aid organisations to roll them out on a broader scale.”

**PARTNER COUNTRY:** Philippines

**PROJECT:** redevelopment of a timber industry following extensive land clearing (ASEM/2000/088)

**DESCRIPTION:** addresses the problem of slow uptake of farm and community forestry in the Philippines and north Queensland

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SAMUEL BERNALDEZ



Team members measure trees on smallholder farms to provide information on likely timber yields.



At this small bandsaw mill on Leyte, *Gmelina* logs from smallholders are used to make furniture.

JOHN HERBOHN

# BAMBOO

## SUPPORT FOR A NEW BUILDING BUSINESS

Adrienne Jones looks at the prospects of a remarkable grass that offers commercial potential as a renewable building material – and food



**PARTNER COUNTRY:** Philippines

**PROJECT:** Improving and maintaining productivity of bamboo (FST/2000/127)

**DESCRIPTION:** Managing bamboo for timber and edible shoot production

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Dr Nimfa Torreta, [ntorreta@yahoo.com](mailto:ntorreta@yahoo.com)

It is delicate to look at, bends in the wind and is botanically classified as a perennial grass. It is better known as bamboo, the preferred building material in the Philippines and most of the rest of South-east Asia. Commonly used in low-cost housing, as construction scaffolding on building sites, frameworks for fish pens and poultry farms and stakes and props in fruit and vegetable markets, it is largely taken for granted where it grows.

But plant scientists, commercial bamboo producers and entrepreneurial government agencies in the Philippines and Australia joined forces a few years ago to harness the unrealised potential of bamboo, and make this modest, homegrown perennial better understood in its own backyard.

Under the auspices of a \$550,000 ACIAR partnership led by the Primary Industries Research Centre at Central Queensland University (CQU), scientists in both countries are trialling and monitoring the intensive cultivation of bamboo as a hometown crop with global credentials – its dual-purpose potential as an agricultural crop, and its under-invested capacity to help redress social, economic and environmental problems.

CQU and its collaborating partners in the Philippines – the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development, the Forest Product Research and Development Institute, the Ilocos Agricultural and Resources Research and Development Consortium at Mariano Marcos State University (MMSU), and the government agencies Ecosystems Research and Development Bureau, and the Department of Environment and Natural Resources – are investing in improving bamboo cultivation techniques developed in both countries for cooperative benefit.

They believe this fast-growing, underrated commodity has the potential to counter, to some extent, the destructive deforestation of the Philippines' native hardwood forests – and the consequent decrease in its wood products industry – by providing a renewable, alternative timber for use in construction and processed timber products.

Once a major exporter of wood products, the Philippines now imports what it used to export. The ACIAR partners believe that rejuvenating the country's rapidly depleting cultivated bamboo resources, and developing objective management practices to sustain increasing demand for bamboo products, could make a positive impact on this situation.

Properly-managed bamboo, according to the scientists, could sustain profitable domestic and export industries in Australia and the Philippines as a dual-purpose agricultural crop. It offers not only a renewable substitute for timber but also a valuable vegetable source in harvested bamboo shoots during the lean typhoon season in the Philippines. While it is commonly believed that attempting to harvest two different crops from one bamboo plant compromises culm (mature stem) production, Australian and Philippine research scientists hope to demonstrate through trials in both countries that most species can easily support both uses.

The trials provide reciprocal benefits for both countries, as research plantations in northern Australia currently grow bamboo primarily for its edible shoots, but have not yet succeeded in marketing it outside Australia, and Philippine growers are prohibited from harvesting the shoots for food, to protect the culms from sudden depletion.

CQU project leader Professor David Midmore says this is a crucial component of the collaboration. "The Philippines has a long history in the traditional uses of bamboo, and Australia has research experience in the production requirements of shoot production, so the idea is to swap and build on each other's advantages," he says.

In the Philippines, where vegetable consumption is still less than half the recommended World Health Organisation levels, the food crop proposition alone offers huge potential benefits – in new rural

employment and income-generating opportunities and better nutrition, apart from more ambitious export prospects.

In strategic plantings in Mindanao, using materials derived from an experimental plantation, bamboo is also demonstrating that it has another value – as a low-cost, home-grown solution to environmental degradation on slopes and riverbanks, another commonly acknowledged problem in the Philippines and beyond.

The primary emphasis of the ACIAR project, however, is in optimising cultivation and management strategies to produce more shoots and higher-quality poles, and to encourage more innovative approaches to value-adding uses of bamboo. The project scientists have spent the past four years working with local bamboo farmers rejuvenating old and abandoned Philippine plantations, and trialling an extensive range of growing, production and management techniques aimed at optimising maintenance and productivity.

In collaboration with the Cadagmayan Norte Bamboocraft Producers' Cooperative and other farmers' cooperatives, they are still trialling 12 irrigation, fertilisation and management strategies across a range of commonly cultivated bamboos, including *Bambusa blumeana* (locally known as kawayaan tinik) and *Dendrocalamus asper* (known as giant bamboo) on five experimental plantations in Mindanao, Luzon and Iloilo. The scientists are simultaneously monitoring equivalent trials on two commercially-grown bamboo species in Australia (*Dendrocalamus latiflorus* and *Bambusa oldhamii*), on two plantation sites, one near Darwin in the Northern Territory and the other at Eumundi, in Queensland.

The Philippine plantations include two institutional sites, the MMSU site in Luzon and the Panay State Polytechnical College

## BAMBOO OFFERS NOT ONLY A RENEWABLE SUBSTITUTE FOR TIMBER BUT ALSO A VALUABLE VEGETABLE SOURCE

Dumarao site in Iloilo, which will increasingly be used as demonstration and training sites for communicating management strategies to students and farmers.

Although ACIAR has recently extended the experiments to the end of 2006, and plantation treatments cannot be fully evaluated before then, results so far indicate that under the right conditions the yield and quality of bamboo culms and shoot harvests can be significantly improved. Project leaders say the trials will serve the common interests of both partner countries, but will also help define and promote optimum production systems for the wider South-east Asian region.

MMSU project leader Professor Stanley C. Malab says the project has also facilitated an income-generating business out of bamboo at the university, which is now selling its prototype bamboo tile-making machine and two new bamboo driers to a local furniture manufacturer, and exploring export markets for the tiles.

Professor Midmore says that four years on, the project has already realised many of its objectives, not least an explosion of bamboo networking events and innovative new uses for bamboo, especially in the Philippines – including a bamboo house and bamboo-floored condominiums, and even, in 'Villa Navarro' in the Province of La Union, a recently-opened all-bamboo tourist resort.

"We've raised awareness all the way from community level to government, state and national, and we've got bamboo on the R&D agenda in this country," he says. ◀

# MUSTARD CUTS THE



Spectacular results of experiments to control soil disease in tobacco, and the predicament of vegetable growers in Southeast Asia seeking a defence against bacterial wilt, led to an ACIAR project which has delivered promising results in some unexpected ways, writes Robin Taylor

In 1999 former CSIRO Entomology chief Max Whitten was running the Food and Agriculture Organization (FAO) vegetable integrated pest management (IPM) program in Asia. During training exercises for farmer field schools, many of the field trials which had been set up to investigate insect pests were being devastated by bacterial wilt – a soilborne disease that is a major problem for vegetable growers throughout the tropics.

Dr Whitten approached a CSIRO colleague, John Kirkegaard, who for many years had been studying the use of brassica green-manure crops such as canola and mustard to control soilborne diseases, to see if they could have the same effect on bacterial wilt.

A few years earlier, Dr Steve Akiew, a researcher with the Queensland Department of Primary Industries and Fisheries (QDPI&F), working on tobacco in Mareeba, northern Queensland, read about the ability of brassicas to suppress disease and wondered if they could be used against bacterial wilt.

He decided to conduct his own experiment, grew some mustard and mixed it into soil infested with bacterial wilt. The results were spectacular. In the treatment with mustard leaves added to the soil, the bacterial wilt completely disappeared. In field trials there was a 77 per cent reduction in the disease.

With the demise of the tobacco industry in the area, the work stopped, but Dr Kirkegaard did not forget the results. “The effect of brassica tissues on bacterial wilt was the most spectacular impact I’d seen on any organism,” he says. “We’d seen suppression in other organisms but Steve’s work on tobacco, where he put it in the soil and then could not isolate the bacteria – I’ve never seen anything like that. When I realised that the bacterial wilt causing problems in the Asian vegetables was the same organism that Steve had worked on, we showed Max Whitten the results and he became convinced that we should investigate it as a treatment for vegetable crops in the Philippines.

“Farmers there were getting desperate, they were buying bleach and cement and applying them to the soil in an attempt to control bacterial wilt. They just seemed to have no practical options for control.”

In fact, bacterial wilt worldwide is the most serious soilborne disease of tropical solanaceous vegetables (plants such as tomatoes, eggplant and potatoes). It is a problem shared by the Philippines and northern Australia.

So began the ACIAR project, which aimed to evaluate the most promising brassica species in the field and to develop best management practices for using them. Researchers from CSIRO

# BACTERIAL WILT



**PARTNER COUNTRY:**

Philippines

**PROJECT:** Biofumigation for soilborne diseases in tropical vegetable production (SMCN/2000/114)

**DESCRIPTION:** Biofumigation has potential as an environmentally friendly and economical method for controlling bacterial wilt in vegetable crops in the tropics

**CONTACT:** Dr John Kirkegaard, john.kirkegaard@csiro.au; Ms Valeriana Justo, ncpctvsu@laguna.net



The Philippine team inspects experimental plots at the QDPI&F Southedge research farm, near Mareeba in north Queensland. Dr John Kirkegaard (kneeling front left) and Dr Steve Akiew (standing right) demonstrate the approaches used in Australian cropping systems.



Senior plant pathologist Dr Rizaldo Bayot and research associate Mr Jaynor Dangan compare wilted and healthy tomato plants in a glasshouse experiment conducted at NCPC laboratories, Los Banos, in the Philippines. The tomatoes were grown in soil taken from different brassica treatments and used as a bioassay to determine impacts on bacterial wilt.

Plant Industry and QDPI&F are working with the National Crop Protection Center at Los Banos in the Philippines to identify suitable brassicas for tropical environments and to evaluate them in the field, initially on experimental farms and more recently on commercial farms and in smallholder farmers' fields.

The process where naturally occurring chemicals known as isothiocyanates (ITCs), released from brassica crops, suppress soilborne organisms when the plants decompose, has been termed 'biofumigation'.

The field work is being carried out at Mareeba and in the Philippines, while laboratory work on the chemistry behind the idea of biofumigation – that is, how to get the active chemicals out of the brassica green manures and into the soil – is being done in Canberra.

In Australia, horticultural industries are interested in biofumigation because of the worldwide withdrawal of soil fumigants such as methyl bromide and concern about reliance on highly toxic synthetic soil fumigants for pest control.

"Part of the project was to find out which of these chemicals might be more effective against bacterial wilt so we could select the right kind of brassica plant to use as green manure," explains Dr Kirkegaard. "Many people have tried this in the past with variable results. We tried

to take a structured approach, testing different brassicas."

There are many different brassicas – cabbage, mustard and canola are some of the more common ones in Australia, and there are many varieties of these crops. The different varieties vary enormously in the level of disease-suppressing chemicals they produce.

How do you get the chemicals out of the tissues of the plants and into the soil? The answer, says Dr Kirkegaard, is that you have to disrupt the cells. "In the same way that you have to chew a mustard seed to get the flavour, you need the cellular disruption to get the release of the ITC." The researchers have demonstrated this by freezing plant tissue. "If you freeze leaves and stems then thaw them you get complete cellular disruption – and 100 times more ITC is released from frozen plants than fresh."

This was a significant finding, as until this research was done all the studies had been carried out by chopping up the green manure with a rotary hoe, which leaves big pieces of plant material intact. But in the Philippines, suitable equipment is not available and chopping up the plants by hand takes so long that a lot of the chemicals are lost.

However, the project has also discovered that any organic matter added to the soil can provide some level of suppression, whether or

## WASTE NOT, WANT NOT – SOURCING THE GREEN MANURE

In June, the project team ran a workshop in Benguet for farmers, farm trainers and farmer field school representatives, where they discussed the concept of brassica green-manure crops and constraints to their adoption. One of the issues that farmers raised was sourcing, transporting and chopping up enough green material to be effective.

In the Philippines, if farmers grow a large crop, be it mustard or cabbage, they will want to sell it and make money, rather than ploughing it in. In some places, suitable material is available at markets as waste. For example, when farmers sell cabbages they cut off the outside leaves, creating

a municipal waste disposal problem.

Usually, farmers load the leaves on the back of their trucks and dump them by the side of the road on the way home. In the field, when they grow crops like cabbages and cauliflowers, they cut off quite a lot of leaves and stalks, so that is another source of material.

Some larger farms, particularly in Mindanao, will consider growing a brassica crop solely for green manure. If they can control bacterial wilt in their following potatoes, the economics will add up.

“We did some quick budgeting with one of the farmers and it does pay, but it is the practical

aspects of collecting, moving and incorporating so much material around that is the main issue,” says Dr Kirkegaard.

Several ideas emerged at the workshop to find practical ways to integrate biofumigation into the farming system. For example, after a cabbage crop is harvested, a lot of stalks and other residues remain.

It is some time before the next crop of potatoes is planted, so one opportunity the researchers identified would be to broadcast rapidly-growing mustard or radish seed which, together with the old cabbage residues, could generate enough biomass to get an effect.

not the biofumigation effect is occurring.

“In the Philippines, where we know we haven’t been able to chop the tissue up really effectively and in some cases we have used sweet potato leaves (not a brassica) as a control, we have actually got very good suppression (up to 50 per cent) of bacterial wilt.”

Although the researchers were initially suspicious about this result, the more they have come to understand, the more they realise that it makes sense and is actually quite exciting. “It means that those farmers can achieve significantly better yields from using any source of organic matter and without the need for complete tissue maceration,” Dr Kirkegaard explains.

In the Australian experiments, where the plant tissues were being very efficiently macerated, they were getting additional benefits from the biofumigation. But in the Philippines, even just using a rotary hoe, or covering the material using bullock ploughs, is giving some significant suppression from the organic matter effect.

As part of the next stage of the project, the researchers are looking at developing equipment for small-scale use. The project has bought a mulching machine for one of the farmer cooperatives, but it is not clear whether this will achieve sufficient maceration and mixing through the soil.

The leader of the project in the Philippines, Ms Valeriana Justo, an extension specialist who has worked on the FAO vegetable IPM program, is using her networks to run trials in farmers’ fields.

There is no doubt about the economics – with synthetic soil fumigation, which completely sterilises the soil, growers may spend \$1000 to \$2000 a hectare compared to a biofumigation approach, which costs about \$70 a hectare. While synthetic fumigants give broad-spectrum pest control in one hit, biofumigation will need to be part of an integrated approach. “By growing one or two mustard crops a year in a paddock infested with bacterial wilt, you can get the disease levels down to a point where you can get on top of it with other strategies,” Dr Kirkegaard explains.

As consumers continue to demand less chemical approaches to pest control, growers in Australia are looking for alternatives. In recent years, Australian banana growers, for example, have started growing brassica green manures for nematode control.

In the US, farmers are using mustard green-manure crops to replace synthetic fumigation on potatoes, with a saving of US\$125 to \$269 a hectare. They are also finding other benefits such as reduced soil erosion, increased soil organic matter and fertility.

In north Queensland, results in some of the field trials have been excellent. A paddock with high-level infection of bacterial wilt at Mareeba was planted with tomatoes. An untreated block yielded less

than two tonnes of tomatoes, while the area where a brassica green-manure treatment had been applied yielded up to 20 tonnes of tomatoes and had correspondingly lower levels of bacterial wilt.

However, when this experiment was repeated on a farm with heavier soils in Mareeba, the results were not so clear-cut. The researchers believe that biofumigation is much more effective on sandy soils, where clay and organic matter cannot tie up the ITCs.

In the Philippines, trials have been planted at a range of field sites, from high-elevation areas in Benguet, with cabbages, potatoes and other temperate crops, down to lowland areas in Mindanao, where eggplants and tomatoes are the major crops.

The researchers are satisfied that they have proved the concept of using brassicas as green manure to control bacterial wilt in tomatoes in Australia and developed ‘best-bet’ management strategies for adoption. In the Philippines, difficulties in achieving adequate maceration and the loss of some trials due to typhoons, insects or drought have resulted in more variable results.

However, the most promising treatments (radish, mustard and broccoli) have reduced bacterial wilt significantly (50 to 60 per cent) in most of the experiments.

In the latest experiments the team took particular care to ensure everything was right – plants were macerated and the chopped plant material was mixed into the soil before irrigating – to try to achieve on small farmer plots what they had done in Australia.

“In June 2005 we decided to focus on one cropping system, so we are working on controlling bacterial wilt in potatoes grown in the medium- to high-elevation areas of Mindanao and Benguet,” Dr Kirkegaard says.

When potatoes become infected with bacterial wilt it is doubly devastating, because the infected potato becomes the seed for the next potato crop. Bacterial wilt in the fields of Mindanao is forcing farmers to move higher into the mountains, destroying important areas of remnant forest in the process. So controlling bacterial wilt in potato could have a large impact. In the most recent experiments, the best brassica treatments reduced infection by 50 to 70 per cent and yields at the Bukidnon site (Mindanao) increased from 7.4 tonnes to 11.1 tonnes.

While the field trials are continuing, Ms Justo is already out talking to farmer field schools and thinking about how some of the constraints to adoption can be overcome. The final experiments in farmers’ fields are under way and a field manual for biofumigation is being prepared for use in Asian vegetable farming.

The work has also been extended through the FAO IPM program into Thailand, Vietnam and China. ◀

# The first cut is the deepest

Workshops in pruning and other pre-harvest work are helping Vietnam's fruit growers achieve a better quality harvest, reports Rebecca Thyer

Convincing Vietnam's temperate fruit growers to cut some of their fruit-producing trees back to knee-height sounds like a difficult task, especially as the peach and plum trees that dot the mountainous northern province of Lao Cai are an important feature of indigenous farmers' livelihoods.

However, an ACIAR-funded project between the NSW Department of Primary Industries (NSW DPI), the Queensland Department of Primary Industries and Fisheries and the Vietnamese Ministry of Agriculture and Rural Development has persuaded farmers to participate in a project that will improve overall productivity by radically changing how trees are pruned and managed.

Heavily pruned trees quickly regenerate to produce fresh, young fruiting wood and after seeing the project team's results at demonstration orchards, farmers are willing to trial the new methods.

The plums traditionally grown in the region are based on a Chinese cultivar that produces small fruit, which is picked early to avoid fruit fly attack. As the fruit ripens, fruit prices are often greatly reduced to ensure it sells before it rots.

Increasing competition from US and Chinese imports is also an issue.

Project leader Dr Shane Hetherington, from NSW DPI, says the project follows an earlier one which introduced genetically improved cultivars. These cultivars will produce better-quality fruit at different times of the year, helping to boost income and to spread payments over a longer period.

However, to reap the rewards of the earlier project and make the most of the new cultivars, basic pre-harvest techniques, post-harvest handling and marketing must be improved.

"Although we thought we'd be concentrating on improving fruit handling from harvest onwards, we had to take a step back and look at pre-harvest techniques. We have experimental orchards across northern Vietnam which will be used later in the project as demonstration orchards when the benefits of pruning, pest control, fertiliser use and irrigation become obvious."

Demonstration orchards are already showing the benefits of pre-harvest work. They include a traditionally managed orchard, an orchard that has been pruned and moderately fertilised, and an orchard that has been cut back to knee-high trees, fertilised, irrigated and sprayed with pesticide.

"We also believe that Vietnamese orchardists will be more accepting of these new techniques if we use the variety they're familiar with for our demonstrations," says Dr Hetherington. "This is particularly the case because these traditional cul-

tivars are still able to provide a good household income if they're managed correctly.

"The Chinese cultivars have not reached their full potential and within three years, the knee-high plants will be getting a good commercial crop. It's important to show that potential while simultaneously introducing new genetically-improved cultivars."

The new cultivars being gradually introduced will produce better-quality fruit and broaden harvest windows.

Pham Dinh Que, deputy director of Lao Cai Province's Department of Agriculture and Rural Development, says improving fruit quality is the project's aim: "Instead of producing more plums, we want to grow bigger and better plums to meet consumer demand.

"Right now it takes 40 to 50 small plums to yield one kilogram, but we are looking to have only 15 to 20 plums per kilogram."

During the main harvest season, plums are sold at 500 to 1000 Vietnamese dong (VND) per kilogram, but if they are sold two weeks later in June, growers can receive 3000 to 4000 VND per kilogram, Mr Que says.

Farmers taking part in the project, such as Sen Van Cuong, a member of the Nung ethnic minority in Bac Ha District, realise they will produce fewer plums, but agreed to take part for the sake of quality improvement.

Mr Cuong makes about five to six million VND from his fruit in a good season, and three to four million VND after a poor harvest. "I joined the project using more than 30 of my total of 90 trees. It's not easy for people to cut their trees when they can continue to produce fruit, but I have dared to do so."

Pruning skills are also being improved for peach growers in the province's Sa Pa District. Farmer Nguyen Van Khao says he earned 13 million VND from one tonne of peaches grown on 45 trees in 2004. "But these trees in my orchard are 10 years old, their fruit is not very big and it becomes worse and worse. We knew that when we cut the outdated branches, trees would be fresher and give better fruit. However, we previously just cut according to intuition and experience, not from using training. So the prunings didn't reach our expectations."

With the help of the project team, Mr Khao and others are hoping for improved results. ◀

**PARTNER COUNTRY:** Vietnam

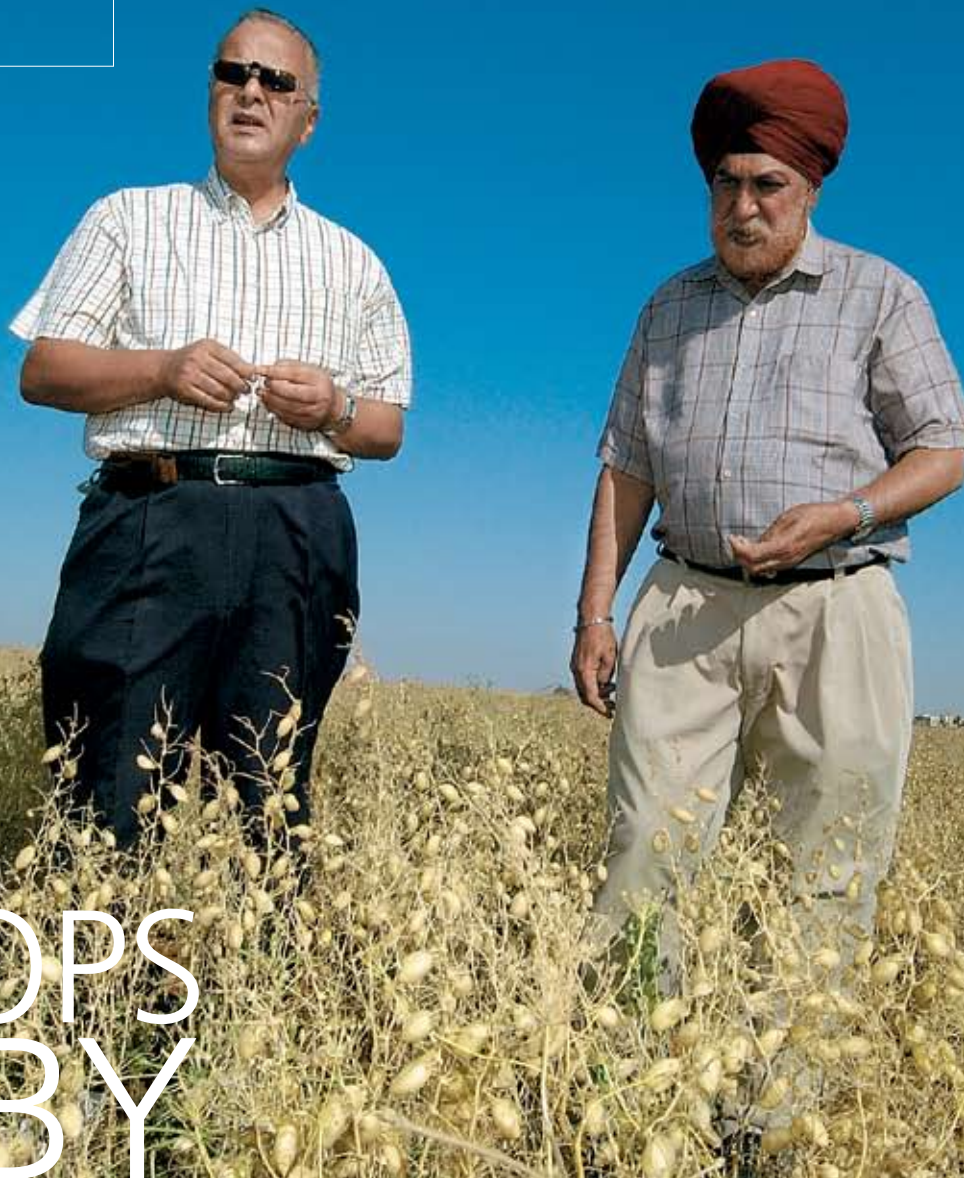
**PROJECT:** Improving postharvest quality for temperate fruits (PHT/2002/086)

**DESCRIPTION:** Changes in pre- and postharvest management can significantly improve fruit quality and lifespan

**CONTACT:** Dr Shane Hetherington, shane.hetherington@dpi.nsw.gov.au



Farmers are hoping to produce bigger and better fruit from their trees by boosting pre-harvest skills.



# VITAL CROPS LIFTED BY SCIENCE PARTNERS

Brad Collis reports on the benefits flowing from ACIAR's support of crop research at ICARDA in Syria

A similar climate and shared plant breeding goals is fostering an increasingly important relationship between Australian crop researchers and colleagues at the International Center for Agricultural Research in the Dry Areas (ICARDA) in Syria.

Of particular relevance is the work in pulses, because of the importance of crops like chickpea, lentils and faba beans in providing high-quality, low-cost protein in many of the world's poorer communities.

These legumes are among the most important crops grown in

sub-tropical dry areas in Asia, Africa and Australia, offering farmers a source of dietary protein and also income. Nitrogen-fixing legumes also provide an alternative to costly fertilisers.

However, production constraints – pests, diseases and impoverished soils – continue to deny farmers the crops' full potential.

The ACIAR-supported ICARDA research that links researchers in Syria and Australia is vital because it marries the vast source of germplasm available in the Mediterranean and Central Asia region with advanced research capabilities in Australia, where the same crops are becoming increasingly important to graingrowers who need more break crops for their cereal rotations.

This has led to an ongoing exchange of varieties that are 'improved' in Australia, in terms of yield and other agronomic advances, then returned to ICARDA to be screened for pests and diseases.

In the chickpea program, which has already resulted in several recently-released varieties in Australia with resistance to *Ascochyta* blight, ICARDA is working with the Department of Primary Industries (DPI) in Victoria and the Centre for Legumes in Mediterranean Agriculture (CLIMA) in Perth to screen chickpea breeding material for the disease *Fusarium* wilt.

The disease has not yet been found in Australia, but the collaboration means researchers will be ready with resistant varieties the moment the disease appears.

The senior legume pathologist with ICARDA's germplasm program, Dr Bassam Bayaa, explains that suitable germplasm and/or breeding material is first identified at ICARDA and then sent to



Legume pathologist Dr Bassam Bayaa (left) with chickpea breeder Dr Rajendra Malhotra, in a plot at ICARDA where plants are exposed to pathogens to screen for resistance.



BRAD COLLIS

**PARTNER COUNTRIES:** Armenia, Azerbaijan, Georgia, Global, Kazakhstan, Kyrgyzstan, Syria, Tajikistan, Turkmenistan, Uzbekistan

**PROJECT:** Plant genetic resource conservation, documentation and utilisation in Central Asia and the Caucasus (CIM/2004/004)

**DESCRIPTION:** Regional diversity, farming systems and evolutionary processes have led to exceptional plant genetic diversity.

**CONTACT:** Dr Ken Street, k.street@cgiar.org, www.cac-biodiversity.org

on the other side, the pathogens are trying to keep ahead for their own survival.”

The challenge for plant pathologists and breeders is to try to introduce resistance genes from plants that also have desirable agronomic traits. But new sources of resistance are often found in plants that are poor agronomically: “Without biotechnology, it becomes a very long process to exploit a good source of disease resistance from an otherwise poor plant,” says Dr Bayaa.

Related ACIAR-supported research at ICARDA includes the study of the epidemiology of major fungal diseases such as the *Ascochyta* pathogen, under Dr Amor Yahyaoui; plant genetic resource conservation, under Dr Ken Street; and a new crop improvement program in Iraq, under former ACIAR research program manager Dr Colin Piggin.

Dr Piggin recently moved to ICARDA to head up a new overarching program, ‘Diversification and Sustainable Improvement of Crop and Livestock Production Systems in Dry Areas.’

This is a holistic program looking at ways to introduce into traditional farming systems modern principles such as conservation cultivation (stubble retention), new crop rotations such as canola and brassicas, and agroforestry opportunities.

“For example, there is a great lack of trees in dryland environments and clearly they can be a useful landscape resource ... but how do you establish such long-term ventures in poor areas ... how do you discourage plantations from being cleared the moment the trees are large enough?”

To address challenges and opportunities like these, the diversification and sustainable improvement program is divided into three groups – small animals, agronomy and crop protection.

Dr Piggin says that even the smallest application of science to traditional farming systems can have long-term impacts. He tells the story of some Syrian farmers whose efforts to diversify from traditional wool and hide products into milk products kept running into quality issues at market.

The milk business was new to them, but vital for their economic wellbeing, because the market for their traditional products had fallen away following a diminishing demand from the Russian army.

ICARDA researchers looked into the issue and solved the first issue – milk spoiling – by simply having the farmers carry the milk in sealed or covered containers.

The second issue – yoghurt being turned into cheese by the rough roads – needed a little more science. The researchers had to experiment with a few different bacterial cultures that produced a firmer yoghurt, less susceptible to the effects of shaking.

In both situations the changes required by the farmers were small, but the benefits were significant. ◀



Dr Colin Piggin in Syria: he sees increased diversification as the key to helping traditional farmers increase their agricultural capacity.

researchers at the Victorian DPI, NSW DPI, the University of Adelaide and CLIMA.

“These genetic resources are used in Australian breeding programs and the most promising lines are sent back to ICARDA for further screening for resistance to major diseases.

“Several hybrid faba beans (five lines and three crosses) sent to us from the program in the University of Adelaide were the best performers in our nurseries at ICARDA in 2005.”

ICARDA researchers are constantly on the lookout for new sources of disease resistance and seed-collecting missions are routinely undertaken in areas where there might be landrace varieties or ancestral plants with broad genetic bases.

An ACIAR-supported mission to China last year yielded 25 new faba bean lines for introducing to the genetic pool.

“Crop protection is a never-ending struggle,” Dr Bayaa says. “On one side, you have breeders trying to find and develop resistance and



## Tragic setback for Iraq project

A senior Iraqi agricultural adviser, Dr Awad Abbas, who was working on a new ACIAR-ICARDA project in Iraq, was assassinated on his return home to Baghdad after a project meeting at ICARDA in Aleppo, Syria. Dr Abbas was murdered on Saturday 10 September, allegedly by forces trying to unseat the new Iraqi Government.

Dr Abbas was the Director General of Extension and Cooperation in the Ministry of Agriculture. He had been visiting ICARDA during July and September to help plan the new Iraq-ICARDA-ACIAR dryland cropping project.

The project – ‘Better crop germplasm and management for improved production of wheat, barley and pulse and forage legumes in Iraq’ – is being funded by ACIAR and AusAID as part of Australia’s contribution to the rehabilitation of agriculture in Iraq.



Dr Ken Street seed collecting in Armenia.

BRAD COLLIS

# ANCIENT SEEDS OF SURVIVAL

ICARDA-based Dr Ken Street has been managing ACIAR-funded germplasm projects in the Caucasus and Central Asia for several years. He reports on why they are important for future crops

**H**ow come two Australian agricultural scientists – a semi-retired professor and a genetic resource scientist – are drinking farewell vodka toasts with a family of villagers high in the mountains of southern Armenia? What do these rugged, friendly villagers have in common with the fair-skinned strangers from across the other side of the world?

The answer concerns us all – an interest in seeds. Seeds of ancient crop varieties, to be specific. Seeds that contribute to the agro-biodiversity that ultimately underpins the survival of the human race.

Within the context of global warming, unchecked population growth, desertification, salinisation and geo-political conflict, agro-biodiversity is becoming more important than ever, because it provides the raw material for modern plant breeding. While there is a multitude of high-yielding modern varieties in use today, the work of plant breeders is by no means finished, because breeding is not a static process. A variety that is successful today can overnight be rendered ineffective by new disease biotypes or changes in the physical environment. So plant breeders have to look to genes within the ancient crop races or wild progenitors to produce varieties that can meet constant challenges to food production.

To support this, seeds of a whole range of farmer varieties, or landraces, as well as wild ancestors, have been assembled in a worldwide network of genebanks. These collections are trying to capture as much genetic variation as possible in the species that are important to world agriculture.

A recent study has found that the use of crop varieties developed

from these genetic resource collections, held by the Future Harvest centres that comprise the Consultative Group on International Agricultural Research (CGIAR), has reduced prices for poor consumers in developing countries, saved thousands of hectares of forests from being turned into farmland and has had a major impact on reducing malnourishment of children.

In Australia, the impact of varieties developed by the International Center for Agricultural Research in the Dry Areas (ICARDA), just one of the 15 Future Harvest centres, using genetic resources held in its genebank, has benefited farmers by an estimated \$10 million a year.

This brings us back to the vodka-toasting Australians (myself and Clive Francis) and the Armenian villagers. The reason for being in a remote and all but forgotten post-Soviet village was, of course, not to drink vodka, but to collect seeds of old crop varieties that have been growing in the region for centuries.

Our mission, comprising Australian, Russian and Armenian plant scientists, covered thousands of kilometres across a tortuous, mountainous landscape, home to an ancient people who, along with their agriculture, have survived an often difficult history dating back to biblical times. The mission's focus was to hunt out isolated villages and highland fields looking for farmer varieties of important crop plants, which over a millennium of passive farmer breeding has resulted in genotypes with extraordinarily broad genetic bases.

This Armenian mission netted more than 600 accessions, including wheat, barley, lentils, chickpeas, faba beans, field peas, a plethora

of vegetable varieties and a host of wild relatives and pasture legumes. Detailed information about the sites where the material was collected has been stored in a database. The seeds and associated site information is now being shared by the genebanks represented on the mission, in this case the Armenian Institute of Botany, the Vavilov Institute of St Petersburg, Russia, and ICARDA.

Once the seeds reach ICARDA they are planted in a field to bulk them up, after which they are stored in a controlled atmosphere environment to ensure their long-term viability. Likewise, the site information is incorporated into the ICARDA database system. This information and the seed are made freely available for research purposes under an agreement which ensures that the original genotype remains for the public good.

Our latest mission was one in a series of successful missions funded by ACIAR since 1998. The missions have seen teams of local and international scientists endure often difficult and dangerous situations, cooped up in rickety Russian 4WDs as they bounce their way over dilapidated roads through the newly independent countries of Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. In total, almost 4000 unique samples have been collected from a staggering diversity of environments and cultures.

But what is so important about Central Asia and the Caucasus (CAC) – an often forgotten but exotic collection of now independent republics that once formed the outer rim of the Soviet Union? The answer is that the CAC region has a physical and climatic environment that is as diverse as the cultures and people who live there.

The landscape ranges from arid desert steppes to lush semi-tropical high-rainfall zones to rugged inaccessible mountain ranges with permanent ice caps. Over time, this diversity of environments and farming systems has led to exceptional plant genetic diversity, both within domesticated species and their wild progenitors.

This was noticed in the early 20th century by the famous Russian plant scientist Nicholai Vavilov, the father of modern plant genetic resource conservation. He mapped out the distribution of diversity

for many agriculturally important crops worldwide. Based on this work, he asserted that the CAC region was an important centre of diversity for a whole range of crops.

Among the crops that originated or evolved there are cereals (wheat, barley, rye), legumes (lentils, chickpea, faba bean, pea), forages (medics, vetches, clovers), vegetables (cabbage, onion, garlic, melons), fruit trees (almond, apricot, apple, pear, pistachio, cherry, plums, walnut, pomegranate, quince, hazelnuts, azarole, cornelian cherry, Russian olive, grape, fig, chestnut, mulberry), industrial crops (safflower, flax, cotton) and countless medicinal and aromatic plants.

These species have been domesticated from the wild, selected by local populations who over time have developed thousands of valuable landraces, highly adapted to a broad range of climatic conditions. Thus the region is a treasure trove of ancient varieties and their wild progenitors.

However, against a backdrop of under-resourced, rapidly changing farming systems and seriously degraded eco-systems, the region's globally important agro-biodiversity is being eroded at an alarming rate.

The crippling economic and social upheaval caused by the collapse of the Soviet Union has left national agricultural and genetic resources programs struggling to address the problem.

That is why the projects funded by ACIAR, the first post-Soviet initiative of this kind in the region, for collecting, conserving and documenting the region's genetic resources, are both timely and important.

While collection missions aimed at securing a representation of the region's biodiversity have been an important facet of the projects, they have not been the only activity. The projects have also focused on developing the capacity within national programs to collect, conserve, document and utilise the region's genetic resources by providing small capital items such as computers, contributing to the development of seed storage facilities, facilitating the development of linkages to the broader global plant genetic resource community and a variety of training activities. ◀



Far left: Dr Clive Francis (CLIMA/UWA) collecting seed in Armenia in 2005.

Left: Natalia Rukhkyan (left), who is being trained in germplasm conservation, with ACIAR support mentor Dr Izabella Arevshatyan, from the Armenian Institute of Botany.



## 'THE REGION IS A TREASURE TROVE OF ANCIENT VARIETIES AND THEIR WILD PROGENITORS'

Seed collection missions often call on village households, asking for a little of any seed kept from bygone times. Invariably it is the old women, with an innate sense of the seeds' importance, who reappear with samples often kept "from my father's time", even "from my grandfather's time". Dr Izabella Arevshatyan from the Armenian Institute of Botany (left) and the Vavilov's Dr Tamara Smekalova (centre) collect seed from villagers.



Volunteer Jenny Giles and colleagues collect information on shark species on sale at a Bali market.

Roger Beckmann reports on some of the activities of Australian Volunteers International, forging new bonds with our neighbours

Wandering around remote Indonesian fish markets, buying the occasional shark and wrestling it into a taxi to take back to the lab is an example of what volunteers in ACIAR projects might get up to. This is what Jenny Giles recently found herself doing.

She had studied marine ecology and Indonesian language at university, and was working for CSIRO Marine Research in Queensland, when she took the opportunity of becoming a volunteer with Australian Volunteers International (AVI), allowing her to use her skills in an ACIAR project.

She moved to the Indonesian Fisheries Gondol Research Station, on the north coast of Bali, in August 2004. So began an interesting, busy and fruitful year in an ACIAR fisheries project, in which Jenny helped local scientists carry out market surveys.

A long-standing agreement between ACIAR and AVI allows Australians volunteering for overseas work to participate in ACIAR projects. In 2004, the two organisations signed a new memorandum of understanding to renew their ties and facilitate the use of volunteers in projects. Both organisations believe in forging connections between Australia and its neighbours at the community level, and in the idea that, through helping, we are also learning.

The current and former AVI volunteers contacted for this article share that belief. All feel that their volunteer placements contributed to local scientific research while also enriching them – not financially, of course, but the volunteer spirit is not motivated by that. Indeed, most volunteers were grateful that they received an allowance that was probably slightly above the average local wage. They did not feel short of money, provided they lived like the locals and avoided tourist areas.

## Peanut problems

Kim-Yen Phan-Thien, from Sydney, volunteered to AVI and is working as a research assistant at the Indonesian Legume and Tuber Research Institute in Malang, East Java. Although she is still in her 20s, Kim is experienced as an Australian abroad, having spent most of 2004 as an Australian Youth Ambassador for Development in China (working on another ACIAR project).

She started in Indonesia in 2005. AVI sent her

# LEARNING THROUGH HELPING



Kim-Yen Phan-Thien interviews a farmer as part of her research into "human relationships".

for in-country language training in Yogyakarta, before she started working on an ACIAR project on aflatoxin, a food toxin, in peanuts.

“It was hard to know where exactly I would be helping out until I got here,” Kim says. “Other staff members were obviously already very experienced. But ACIAR’s original project was enlarged to include study of the peanut supply chain. And that’s where I got involved.”

Kim has a degree in agricultural science from the University of Sydney and experience working with plant growth regulators. But volunteers must be adaptable and resourceful. Kim happily turned her hand from plant physiology to socioeconomic analysis to fit in with the needs of the project.

Her work involves tracking peanuts from farm gate to kitchen plate, with detailed interviews and a cost-benefit analysis of each stage of the product’s movement through the supply chain. Although she now speaks Bahasa Indonesia, she is usually accompanied by a technician to help translate into the Javanese spoken by the locals in the area.

Growth of the aflatoxin fungus and the associated toxin production are mainly determined by environmental conditions. In Indonesia, the problem tends to occur after harvesting (in contrast to the Australian situation, where pre-harvest contamination is more common).

So it is important that people involved in manufacturing and distribution know about the problem and how to minimise it (for example, by ensuring that peanuts are stored under conditions of very low humidity).

Kim was interested to see that Indonesian farmers do not usually organise the harvesting of their crop. Instead, traders offer farmers a sum of money in advance based on an estimate of final crop yield. If the deal is accepted, the traders then organise and pay for the harvesting. As a result, farmers have relatively little interest in the harvesting conditions and the postharvest fate of their crop. So, it is not enough for the scientific word to get out only to farmers. Instead an understanding of the entire supply chain in Indonesia and how it works is important if the problem is to be successfully addressed.

Kim’s surveys involve some tricky, subjective concepts. It is not quite the same as the science she has done in the past.

“We are finding out about the relationship between farmers and traders. How do farmers choose their trader? I need to ask about qualities such as trust, honesty, and satisfaction. These are culturally loaded terms.

“You can translate the words, but they may mean something quite different to a Javanese Muslim. For example, I’ve learnt that if you ask whether a trader has a good reputation, it may not be interpreted in the context of dealing in peanuts. Instead it could have more to do with whether the man is religiously devout. Hence, I’ve always got to be on the lookout for cultural loading in the way I ask questions and interpret answers.”

Kim is learning fast about how to work in the social sciences. She is taking advice from experts in the field and reading widely. ACIAR paid for her to attend a conference in Thailand that helped her learn from others carrying out similar work in Southeast Asia.

“I volunteered thinking I would be working in the lab on aspects of the plant-fungus relationship. Instead I’m working on human relationships!”

Australian project leader Dr Graeme Wright, of the Queensland Department of Primary Industries and Fisheries, is thrilled with the contribution Kim has made to the project. “The main benefit has been to provide a full-time presence for a range of project activities in Indonesia, which is always difficult to achieve via the normal short-term visits made by other Australian personnel,” he says. “She has been able to keep the Australian project leaders in contact with ‘happenings on the ground’ in Indonesia, as well as adding significant



Manual shelling of peanuts: sorting of peanuts for consumption is being encouraged as aflatoxin contamination is typically worse in diseased, damaged or immature kernels.

## BID TO CONTROL AFLATOXIN

Peanuts everywhere are susceptible to infection with a fungus (*Aspergillus flavus* and related species) that releases a highly poisonous and possibly carcinogenic toxin. Infected nuts are usually discoloured and wrinkled. The issue is a serious one for the peanut industry, and aflatoxin levels must be regularly monitored.

ACIAR project PHT 97/017 (Reducing aflatoxin in peanuts using agronomic and bio-control strategies in Australia and Indonesia) is working on ways of reducing aflatoxin in the Indonesian and Australian peanut food chains, via a range of management strategies, which are aimed at minimising the environmental conditions conducive to fungal growth during both the pre- and post-harvest phases of the crop.

value to the project by her initiation of new activities, such as the supply chain studies.”

But Kim still helps out in the lab during busy times. Like other volunteers, she also finds that her English skills are in demand, and she helps colleagues when she can by proof-reading journal articles and giving practice and tuition for any English tests they are facing.

## More than teaching English

Being an informal English ‘teacher’ was also something that Leigh Nind did during her stay in Ho Chi Minh City as a volunteer from 1996 to 1998. Leigh was working at Vietnam’s National Veterinary Company (Navetco) on an ACIAR project dealing with diagnostic methods and vaccine development for duck plague and, later, on similar tasks for *Pasteurella multocida* infections in pigs and poultry.

Leigh was finishing her PhD (through the University of Queensland) when she went to Vietnam. It was an eye-opening experience for a young person. At that time, Vietnam had only recently ‘opened up’, and she was the only foreigner on site at Navetco’s headquarters.

As a foreign woman in her mid-20s, many Vietnamese colleagues concluded that she must have been employed as an English teacher. Why else would such a young woman be there? And, of course, whenever possible she helped staff with their English, whether in conversation or writing. Indeed, it took a while for people to realise that she was there because of her scientific and veterinary skills rather than to correct their English.

“It was very useful to have the ACIAR in-country manager there



Leigh Nind (second from left) catches up with former colleagues at Navetco on her visit to Vietnam in 2004.

to resolve issues like this. Eventually things fell into place.”

Leigh had attended a one-month intensive language course through Navetco and the Overseas Service Bureau (as AVI was then called). But this was not enough to make her fluent in a language as challenging as Vietnamese. “There were interpreters in Navetco, with whom I worked closely. But gradually my language skills improved as I interacted with locals every day.”

While in Vietnam, Leigh was quite isolated from the outside world, as there was no ready access to the internet and email at that time. “I stayed with a local family, renting a single room from them, living like anyone else.” The rent for her room in the four-storey apartment building was about US\$300 a month, which was half of the monthly allowance she was paid as a volunteer.

“I came to appreciate a communal life. When I got sick, people in the building looked after me, bringing me meals. I made wonderful friends, whom I still know today. And I have been back since and renewed my ties.”

## Shared stock

When not dealing with sharks in the market in Bali, Jenny Giles also found that her ability to speak Indonesian was an important attribute. At the research station she helped her co-workers develop their English writing skills, and provided support for visits from international project collaborators.

But her main work involved conducting biological surveys on shark and ray catches in local fish markets, as part of ACIAR’s project on artisanal shark and ray fisheries in eastern Indonesia.

Jenny was part of a large project to help in the management of elasmobranch (shark and ray) fisheries that straddle the marine divide between Australia and Indonesia. The research involves comparing the genetics of Indonesian elasmobranchs with those found in Australian waters, to see to what extent the stocks are shared. This is vital information for the management of shark and ray fisheries on both sides of the border. In Indonesia, a wide range of products is obtained from sharks and rays, primarily for export to other parts of Asia. Shark fin is the highest-value product and it is this export demand that tends to drive the market.

Jenny visited numerous fish markets in Bali, Java and Lombok, where she and her Indonesian colleagues examined and identified the produce on sale, occasionally taking samples for genetic testing, gathering reproductive information and collecting specimens to build an Indonesian reference collection. (Hence the occasional need to fit a large dead shark into a small taxi!) Indonesia has the greatest diversity of sharks and rays in the world, so there was plenty for Jenny to find, and it sharpened her taxonomic skills.

Jenny is fluent in Bahasa Indonesia, but of course most of the locals spoke Balinese or another regional language as a first language. With the help of her Indonesian colleagues she learnt how to negotiate the gap between Indonesian and the local language.

In the end, Jenny became immersed in local life, joining a gamelan orchestra and performing in local temples. Her many friends and colleagues called her the shared stock – as she formed such an effective bridge between Australia and Indonesia.

“I believe my presence gave both my Australian and Indonesian colleagues a closer understanding of the needs and priorities of both sides,” she says.

## Culture shock?

AVI helps to prepare volunteers for the inevitable culture shock and readjustments that will come when trying to live on a local allowance in a developing country whose customs and language are usually quite different from Australia’s. No amount of pre-departure workshops and briefings, however well presented, can fully prepare people for the reality, and all the volunteers acknowledged a period of adjustment at first. Most were already aware of cultural sensitivities, in terms of their own dress and behaviour, and these lessons were quickly reinforced.

But culture shock can also operate in reverse. Jenny, who was in a remote and non-tourist part of Bali, recalls being mildly shocked when meeting other Australians there.

But it is when returning to Australia that volunteers often feel culture shock all over again. They leave behind friends, a familiar way of life, the sights, sounds and smells that they have become accustomed to, and the language that they have been regularly speaking.

As Leigh Nind puts it: “I came back and found it hard at first to adjust to the move from a collective way of life to a highly individualist culture.”

It can also be hard to find a job back home, unless the previous position has been kept open. Leigh had to start job-hunting straightaway, and is now a senior veterinary officer with Biosecurity Australia in Canberra.

Looking back on her time, she is thrilled that she played a small part in the eventual development of a rapid diagnostic test for duck plague, and the formulation of an effective cheap vaccine, made in Vietnam. The result has undoubtedly helped maintain duck populations (an important food source), thereby enriching the country. But Leigh feels she too has grown richer from the experience. And so do the other volunteers.

Jenny, for example, believes that the professional skills she learnt in Indonesia are highly transferable to her job back in Australia. Among other things, working in Indonesia made her more resourceful, flexible and patient – all of which help her to work effectively across two widely different cultures.

The benefits are clear all round: ACIAR gets skilled personnel, embedded in the partner country with local scientists and operating on a local salary; AVI increases its pool of volunteers and useful, worthwhile and well-organised projects in which to place them; and the volunteer gets a challenging and enriching experience that can bolster their skills when they return.

The unique position of the in-country volunteer helps ensure that the project really acts as a bridge. The volunteer is the embodiment of the notion of a partnership. Ideally, the volunteers can give invaluable feedback on local priorities to senior managers in both countries so that the project can be fine-tuned in a way that ensures its results deliver benefits where they are needed.

A footnote: ACIAR project leader Dr Graeme Wright reports that his son Dan is going to Cambodia in 2006 as an AVI on an ACIAR fisheries project. ◀

# Flu: alert or alarm?

Warren Page looks at the facts behind the threat of avian flu – and some of the international efforts to counter it

**H**ow real is the threat of a pandemic of avian influenza? Some media reports have suggested that it is only a matter of when, not if. References to the 'Spanish flu' outbreak of 1918 to 1919 have aimed to justify this threat, supported by the rapid geographic spread of avian influenza from Asia to Europe.

The current avian influenza is one of many strains known to exist. It is, however, far more virulent and pathogenic (harmful) than other known strains – referred to as Highly Pathogenic Avian Influenza or HPAI. Another term to describe it is the H5N1 strain (see What is bird flu?, right). Humans contracting this strain have often died, with the source of these infections attributed to an association with birds.

For a pandemic to occur, the virus would need to mutate to allow transmission from person to person, a possibility that increases the longer the virus circulates. Efforts are focusing on controlling outbreaks among bird populations, to limit the opportunity for mutation.

Avian influenza is not new, first being identified in the 1890s in Italy. What is different about this virulent strain is that it has only recently been recognised, leaving much about it unknown. These gaps in knowledge have fuelled speculation on the potential for a pandemic.

Balancing this speculation against improved controls needs more information, something the international research community and governments are focusing on providing. Developing and distributing this knowledge can reduce the impact of the H5N1 strain of HPAI, and other diseases transmitted from animals to humans.

The Australian Government has initiated a coordinated response, including involvement from AusAID, the Australian Department of Health, the Department of Agriculture, Fisheries and Forestry, the Australian Quarantine and Inspection Service and ACIAR.

Each is providing expertise to help develop a coordinated Australian and regional response, and to build capacity in Southeast Asia.

ACIAR's role is focused on this last aspect, including expanding the knowledge base regarding avian influenza.

Indonesia, Vietnam, Cambodia and Laos will all be involved in projects now being developed or under way. The first two countries have been hardest hit, both in terms of outbreaks and human and bird fatalities.

The projects are being developed as part of a

suite of ACIAR projects with three broad aims:

- ▶ building up knowledge of the virus;
- ▶ using this to increase the effectiveness of surveillance; and
- ▶ understanding the costs of the disease to inform control options.

The first emphasis is to build up knowledge of the virus and disease. Ducks are often kept in close proximity or farmed with chickens. Chickens are a known infection 'reservoir', but what is unclear is whether ducks, like chickens, can pass on the disease. Determining the existence and levels of virus antibodies (a sign of past infection) and current infection rates will help answer this. Ducks may act as hosts of the virus, allowing it to remain alive and also amplify or change; if so, this has implications for control strategies.

A related area of research under development is identifying how avian influenza is transmitted from poultry to humans. All human fatalities from the disease have been attributed to some form of direct association between birds and infected humans.

Chickens are an important income earner and contributor to food security in smallholder and village-based farming systems. Poultry are often left to scavenge food. Mortality rates are high, especially for maturing chicks. Disease plays a large part in this mortality.

Targeting controls against bird flu, Newcastle disease and other diseases, as well as control strategies and surveillance, relies on effective systems reaching villages. In Cambodia and Laos an ACIAR project, under way, is testing village-based disease control and surveillance systems.

A complementary project under development and targeting Indonesia is focusing on the role of agencies responsible for community-based systems operating in villages, the front line in monitoring and control. A proven 'toolbox' approach to surveillance, equipping local extension officers with the knowledge to assess disease losses, will be tested.

One key element of control is helping policy makers better understand the

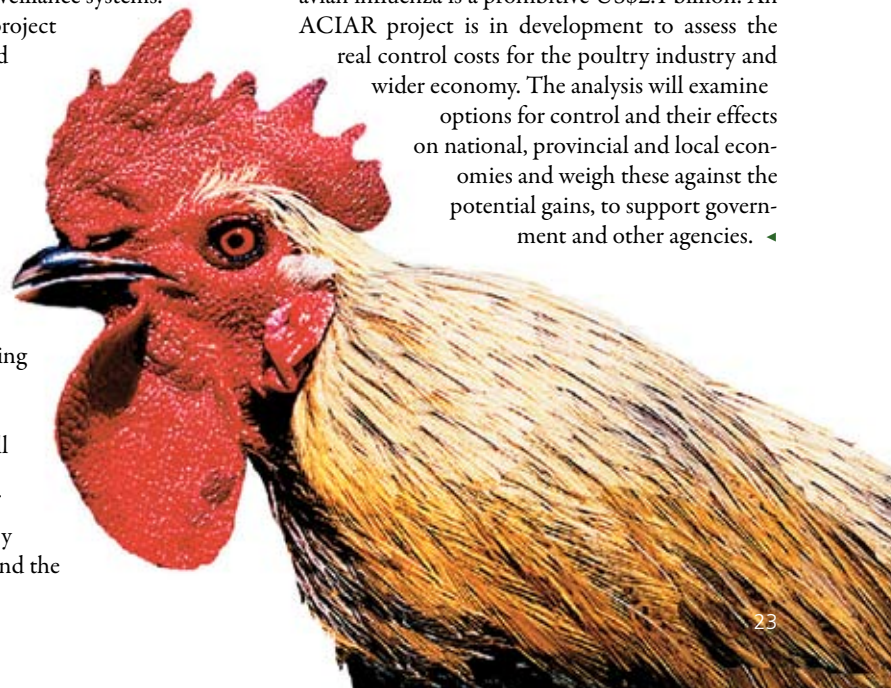
## WHAT IS BIRD FLU?

There are three types of influenza virus – A, B and C. Bird flu is an A-type virus with multiple subtypes, these being defined by combinations of two proteins (HA and NA) which exist on the surface of the virus. The HA protein has 15 different subtypes, the NA nine subtypes. The combination formed by one HA and one NA protein is used to name the virus subtype. Bird flu is known as H5N1 virus, being a combination of HA5 and NA1 proteins. The Spanish flu of 1918–19 was attributed to the H1N1 strain and is believed to have originated from an avian strain of the disease. It is estimated that up to 50 million people died from this strain. Other strains known to cause fatalities are the Asian flu (H2N2) of 1957–58 and the Hong Kong flu (H3N2) of 1968–69, which still circulates today.

Avian influenza viruses are also classified by their level of pathogenicity (or the level of harm caused to the infected subject) and their virulence (the speed and ease of transmission). Highly pathogenic avian influenza (HPAI) has a high mortality rate in poultry, capable of killing between 90 and 100 per cent of infected chickens. Low pathogenic avian influenza (LPAI) causes less severe symptoms; in many cases no illness may occur in infected chickens. But LPAI viruses can evolve into HPAI viruses, requiring that both be monitored should outbreaks occur.

potential gains from a variety of control options. Current controls rely on mass cullings and limited vaccination of unknown effectiveness. As an example, the World Bank puts the direct cost to Vietnam for bird flu in a range between US\$30 million to US\$105 million. Indirect costs, such as lost jobs and reduced income trickling down to smallholders and throughout the economy, are up to eight times the direct costs.

In Indonesia, the estimated cost of eradicating avian influenza is a prohibitive US\$2.1 billion. An ACIAR project is in development to assess the real control costs for the poultry industry and wider economy. The analysis will examine options for control and their effects on national, provincial and local economies and weigh these against the potential gains, to support government and other agencies. ◀



# LOCAL VEGETABLES TO BOOST CAMBODIAN DIETS

Rowena McNaughton reports on efforts to replace Cambodia's imported vegetables with local produce

**O**n any given day, Lonh Peauline may go to the market and buy vegetables for her three children, husband, grandmother, two uncles and cousin who share her Phnom Penh apartment. After smelling and prodding the vegetables, Lonh carefully peels two 500 riel notes (US\$25c) from a large wad of cash containing her husband's monthly salary. Grumbling to the vegetable seller about the price, she purchases a kilo of tomatoes.

Although they are large and glistening, Peauline says the taste will not be good. But as on many other days, she must buy imported Vietnamese tomatoes rather than the small but flavoursome Cambodian variety she prefers but can rarely find.

Peauline's inability to find Cambodian produce is a common story. Enter any Cambodian market and it is likely the vegetables you purchase will not be Cambodian. In fact, despite unreliable sales statistics, Cambodian Agricultural Research and Development Institute (CARDI) scientists estimate that at least 40 per cent of the vegetables sold in Cambodia are imported.

Compounding this statistic for Cambodia's vegetable industry is that vegetable consumption in Cambodia is among the lowest in Asia. Rice comprises more than 75 per cent of an average Cambodian's daily calorie intake, according to CARDI research.

A recent statement made on World Food Day by the Cambodian spokesman of the United Nations World Food Program raised alarm over the fact that 64 per cent of children under five years of age, and 59 per cent of Khmer women, reportedly suffer from iron deficiency or anemia, "which drains them of energy and makes them more susceptible to disease".

In a bid to strengthen the Cambodian vegetable industry, improve household nutritional levels and replace imports with local produce, ACIAR has recently supported a three-year project on improvement of vegetable production and postharvest management systems.

Since implementation in October, scientists from the NSW Department of Primary Industries (NSW DPI), CARDI, the Department of Agronomy and Agricultural Land Improvement (DAALI), the Asian Vegetable Research and Development Center (AVRDC) and the Cambodian Department of Planning, Statistics and International Cooperation (DPSI) have been methodically tracking the Cambodian vegetable industry from seed to market.

"Such a project could only have been implemented in recent years," says Sakhan Sophany, one of the project leaders and head of plant breeding at CARDI. "Since attaining a rice surplus in 1999, Cambodia has only just reached a position where development efforts can move away from food security to nutritional security. The focus is now on crop diversification, as while Cambodian stomachs are full with rice, insufficient vegetable consumption means that many lack necessary vitamins and minerals that rice simply cannot substitute."

The success of this project, which also has an Australian component, relies heavily on achieving improved farmer access to reliable vegetable seeds of suitable varieties, and improving post-harvest storage and quality. "Rice production has benefited significantly from research, but now we must concentrate on improving non-rice crops," says Ms Sophany. "This will enable farmers to improve cash incomes, to improve competitiveness with imported produce and inevitably diversify the Khmer diet.

"Cambodia's vegetable industry is erratic and characterised by seasonal gluts. Frequent supply shortages are compensated for with cheap products from neighbouring countries, predominantly Vietnam. Unsuitable imported seed with unreadable foreign instructions creates a further problem. Seeds, generally from Thailand, Vietnam and Taiwan, are expensive. We need to develop hybrid Cambodian vegetable seeds that are more pest and heat resistant, to compete against the imported seed."

For the project to succeed, Ms Sophany says, "inadequate production technologies, supply reliability and quality management must be addressed. We were able to improve rice production rates by developing better rice varieties and training farmers on better farming practices. This can be replicated in the vegetable industry."

With a project of this size, post-harvest physiologist Dr Suzie Newman, from the NSW DPI, says sharing expertise among the collaborating institutes is vital. "Cambodian scientists will be working together with their Australian counterparts to improve production and postharvest management of vegetable crops. While both Cambodian institutions will be involved in variety evaluation, DAALI scientists and extension staff will focus on improving production practices while CARDI scientists will be looking at improving the postharvest management."

In a recent visit to Dumkor Market, one of Phnom Penh's typical 'wet' markets where produce is sold to retailers and consumers alike, the project team witnessed vegetables arrive in an array of packaging, delivered by truck, bus, motorbike, bicycle and cyclo (a three-wheeled passenger bicycle). While there is very little storage of vegetables, and no refrigeration, with more than 80 per cent being transported by motos (motorbikes), Dr Newman is positive that simple changes will have significant results.

Australian project leader Mark Hickey, also from the NSW DPI, agrees: "By tracking the supply chain we can identify where improvements can be made. For instance, simply reducing handling and strengthening the baskets used to transport with bamboo will greatly lower the amount of vegetables lost postharvest.

"We have estimated that at least 25 to 40 per cent of vegetables

**PARTNER COUNTRY:** Cambodia

**PROJECT:** Improvement of vegetable production and postharvest management (PHT/2003/045)

**DESCRIPTION:** There is much potential for Cambodian farmers to diversify into income generating vegetable crops

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Improved production systems for chilli will be studied later in the project. Sok Khim, from Prey Yeay in Kandal province, helps sort her family's latest crop.

BRAD COLLIS

are damaged in Cambodia due to poor postharvesting techniques. In Australia, only 10 per cent loss is acceptable.”

While educating farmers on better postharvest techniques to extend shelf life is important, he insists that improved vegetable varieties are the integral part of developing a better vegetable industry.

A recent report by the AusAID-funded Agricultural Quality Improvement Project found that 10 to 40 per cent (depending on commodity) of all vegetables in Cambodia are ruined by poor seed and production technologies.

By targeting leading commercial farmers, the central aim of this project is to increase vegetable productivity rates, which will translate into significant economic gains for Cambodian farmers. The key component of this project is to establish a model of best practices for enhancing production rates, which can be replicated for different vegetables.

Mr Hickey explains that this is the key to the sustainability of the project. Tomatoes are the first crop to be investigated, due to their significant market potential for Cambodian vegetable farmers, and the recent involvement of AVRDC in selection of improved varieties for Cambodia.

“Tomato is an important food for Khmer people,” says Ms Sophany. “It is a staple part of everyone’s diet and is filled with nutrients. Many Khmers believe it is good for their skin. Following the completion of a model for improved production and performance for tomatoes, chilli and leafy vegetables will also be considered due to their importance in the Cambodian diet.”

Ultimately, ACIAR’s involvement in the vegetable project is about generating more income for Cambodian farmers and improving dietary intake of vegetables for Cambodians. Since little is known about the market supply chain for Cambodian vegetables, this project stands as the first of many steps. However, with the trial of several tomato varieties successfully under way at both CARDI and DAALI research sites, Cambodia is on the way to producing productive, disease-resistant tomato varieties and as a result, the resurrection of the troubled vegetable industry looks promising. ◀

## SUPPORT FOR SMALL FARMERS TO GROW MORE VEGETABLES

BY ED HIGHLEY

Fruit and vegetables make up more than 20 per cent of developing country exports and can yield small farmers much higher incomes than graingrowing, said Dr Tom Lumpkin, director general of AVRDC – The World Vegetable Center, at a recent seminar at ACIAR.

Dr Lumpkin was visiting Australia to promote and seek support for the Global Horticultural Initiative, which AVRDC is leading in collaboration with the Science Council of the Consultative Group of International Agricultural Research, the International Society for Horticultural Science and France’s Agricultural Research Centre for International Development. The initiative will boost what Dr Lumpkin believes is currently a low investment in the horticulture sector by the international community.

For the bulk of small farmers in Asia, who have an average landholding of just half a hectare, horticulture offers a much more promising route out of poverty than growing grain, Dr Lumpkin noted. The initiative aims to raise the incomes of poor farmers to about \$1 to \$2 per day.

The challenges are great and include not just poverty itself, but also rapid population growth, land degradation and pesticide abuse. Malnutrition is another serious problem that increased vegetable production can help overcome. Levels of vegetable consumption in the less developed regions of Asia, Africa and Latin America are generally well below those recommended by world health authorities. A wide range of vegetables is being targeted, including tomatoes, capsicums and cucurbits (indigenous species whose potential remains largely untapped), and ‘nutriceutical’ species such as bitter gourds, which have indications for managing type II diabetes.

There is strong private-sector participation in the initiative, especially from seed companies, under the umbrella of the Asia and Pacific Seed Association. Members have so far donated more than five tonnes of seed of vegetable varieties adapted to areas affected by the Asian tsunami. Aside from that, the market for hybrid vegetable seeds in the region is estimated to be worth \$200 million. Even for small-scale farmers, the benefits of using hybrid seed would exceed the extra cost.

The initiative will also target post-production factors, aiming to reduce the huge postharvest losses that occur in traditional markets.

# PEANUT POTENTIAL

In the heart of PNG's fertile Markham Valley, farmers are working with research agencies to improve the profitability of peanuts, reports Robin Taylor

**PARTNER COUNTRY:** Papua New Guinea

**PROJECT:** Improving yield and economic viability of peanut production (ASEM/2001/055)

**DESCRIPTION:** Gathering information on peanut production, storage, use, marketing and aflatoxin contamination in PNG and developing economics management software for the Australian industry

**CONTACT:** Dr RCN Rachaputi, rao.rachaputi@dpi.qld.gov.au; Dr Lastus Kuniata, lkuniata@ramusugar.com.pg; Dr A. Ramakrishna, a.ramakrishna@global.net.pg; Geoff Fahey, gfahey@trukai.com.pg

## MARIA MAKES A DIFFERENCE

Maria Linibi is an innovative farmer living in the Markham Valley. About 80,000 people live in the valley, which stretches from Dumpu in the north-west to Lae in the south-east. Maria and her husband Peter grow a number of crops, including peanuts, coconut, rice and taro. She is participating in research with the National Agricultural Research Institute (NARI) on rice and other food crops. Initially involved in the ACIAR project as a smallholder farmer, Maria has been engaged by Ramu Sugar as a service provider to liaise with local farmers who are implementing the seed village trials.

"I was involved in an Asian Development Bank project to raise awareness and provide training in improvement of crop production so I have a good network of farmers," she explains. "Before I came back to the Markham Valley, where my husband's family had a farm, I was an information officer with the PNG government at Mt Hagen.

"I could see that the information flow to farmers could be better. They needed more links with NARI and other information providers."

Maria is now a member of the NARI Regional Research Advisory Council. She is also involved in training farmers in downstream processing of raw products, such as coconut oil and soap from coconuts, peanuts into peanut butter and biodiesel. The farmers then sell these products at local markets. Maria believes the seed village approach is very important, as farmers need to see results before they will accept the new peanut varieties and management practices.

"They are already using the variety White Spanish and will need to see that the new varieties are better before they will change," she says.

Maria has travelled widely – through the Pacific, on a study tour to Vietnam, to Singapore and Australia. "It is difficult for women farmers in PNG to be outspoken," she says, but these opportunities have given her confidence.

With Norah Omot, an economist (and former ACIAR John Allwright fellow) at NARI, Maria wants to establish a PNG Women in Agriculture organisation. The only thing holding her back is access to modern communication facilities – but it will take more than these not insignificant obstacles to stop her.



The new face of PNG peanut-farming: Lastus Kuniata and Maria Linibi.

Off the main road, and several kilometres down a bumpy track bordered by tall grass, a block of peanut plants is one of the sites for a 'seed village' being trialled to evaluate new varieties and management practices, identified as part of an ACIAR project. Peanuts have been grown in PNG for many years, mainly as a subsistence crop, but yields are generally low because of poor management and lack of access to improved varieties.

However, peanuts can provide an alternative crop to betel nut, the other major cash crop in the Markham Valley, which has recently been devastated by a bacterial disease. If land is reclaimed from this and other unproductive uses, 230,000 hectares is potentially available for food crops, including peanuts.

In a recently concluded ACIAR project, researchers from the Queensland Department of Primary Industries and Fisheries and the PNG National Agricultural Research Institute studied the industry and the constraints facing smallholders. Two commercial operators, Ramu Sugar and Trukai Industries, were also involved as project partners.

Forty-three improved peanut varieties were introduced from the International Crops Research Institute for the Semi-Arid Tropics and promising high-yielding varieties were selected.

The next step is to transfer the new varieties and associated management practices to smallholders in such a way that new technologies are recognised and quickly adopted by the farming communities. This is where the 'seed village' concept comes into play, as part of a new project to start in January 2006.

The seed village is a block of land (up to a hectare) owned by one or more farmers and made available to the project for conducting trials. Several seed village sites have already been planted in the lower and upper Markham and Eastern Highland provinces. In these on-farm trial sites, farmers, researchers

and extension workers collaborate to compare new varieties and management practices, selecting the most effective and profitable combinations.

The seed village also provides a place for field days and training workshops and for seed multiplication. The project supplies seed and crop management inputs while the grower supplies land and limited labour.

Seeds of promising new varieties are being multiplied by Ramu Sugar, and this seed will be used in seed village trials next season.

A pilot seed village was conducted near Umi Bridge in the upper Markham Valley during early 2005. At a field day at the site in July, farmers expressed interest in the new varieties and management packages, although there was concern about the costs of fertiliser and pesticides, the lack of extension services and access to financing, especially for farm machinery.

The field trials also showed that recommended management practices resulted in higher peanut yields than conventional management methods. The estimated profit was 3000 kina (A\$1300) per hectare.

In the follow-on project, the seed village concept will be extended to at least three sites each in the lower and upper Markham valley, as well as the Eastern Highland Province.

Ramu Sugar, which produces sugar cane, palm oil, beef cattle and timber, is interested in growing peanuts as a rotation crop on the company's own land and also contracting growers in the Ramu Valley, to secure a guaranteed supply. The manager of agricultural research at Ramu Sugar, Lastus Kuniata, says the seed village concept will allow the company to demonstrate to smallholders the type of management required.

A 40 per cent increase in peanut production in Morobe and the Eastern Highland Province is expected within five years of completion of the new project, which should result in additional net income of 4.5 million kina (about A\$2 million) a year at current market prices. ◀



GREG MILLS

## GROWING ROLE FOR WOMEN

Recognising the important role of women in PNG agriculture, a component of the ACIAR project was a survey to see what women thought were the priorities for training and the constraints involved with peanut production.

Julie Kolopen, Geoff Fahey, John Bafui and Humphrey Saese, from Trukai Industries, conducted a survey of 52 women farmers at two of the proposed seed village sites in the Markham Valley, where peanuts are a major source of income. Julie presented the findings to a recent workshop in Lae.

More than 80 per cent of the women indicated that peanut was their major cash crop, returning an average 1050 kina (A\$480) annually. This constitutes 75 per cent of their total income, the rest coming from crops such as watermelon, cucumber, coconut and betel nut. The survey also examined the role of women in decision making, their level of participation in peanut production, constraints and training needs.

Given the well-established subsistence peanut culture, women are familiar with general husbandry practices of land preparation, planting, weeding, harvesting and marketing.

The survey revealed that as well as the traditional areas of childcare and family planning, crop cultivation and crop selection were key areas where women were involved in making decisions. Similarly, women had a high level of participation in labour-intensive activities such as seed sourcing and storage, marketing and weeding. In fact, women are involved in all major aspects of peanut production except for pest control.

Women are fairly knowledgeable about traditional peanut farming practices and ranked training in husbandry practices such as weeding, planting, bagging and harvesting as low priorities. Basic bookkeeping, pest and disease control and understanding soil fertility problems were, however, recognised as important areas where training was needed. The farmers recognised that improving their skills in these areas would help them increase their income from peanuts. Women also indicated a need for training on land preparation techniques, marketing and post-harvest technology.

# LIVESTOCK THRIVE

Former ACIAR project leader Max Shelton reports on the progress, five years on, of an ACIAR-supported project that he and his team completed in 2000 to lift the quality and use of leucaena for feeding cattle and goats in Papua New Guinea, the Philippines, Vietnam and Thailand

In the Philippines, leucaena (called ipil-ipil locally) has long been an important feed source for cattle and goat production. Its growth, however, has been limited by the psyllid insect, which arrived in the mid-1980s. This affects leaf production when it is most needed in the dry season. The severity of the psyllid challenge has abated somewhat in recent years although leucaena is still attacked early in the dry season when it is most needed.

Nevertheless, leucaena remains a major source of high protein feed for ruminants in the Philippines.

In the late 1990s, with our Bureau of Animal Industry collaborators, we introduced our new hybrid KX2 leucaena for testing by the villagers at Mabini in Batangas Province.

On this return trip, I met Mariano Bautista, president of the Farmers' Association in Mabini, and his friend Gaudencio Manebo. They have successfully grafted KX2 scions onto existing leucaena trees in their fields. Mariano now has more than 300 KX2 trees, while Gaudencio has more than 500 trees. They use them to feed goats.

Mariano has five breeding does and about 15 goats overall. He attributes the frequency of triplets to the high amount of KX2 leucaena in diets. Both farmers have become convinced of KX2's superiority over ipil ipil. It is resistant to psyllids, its growth is better than the local variety, and they say it can be cut at least twice for every one cut of ipil ipil. KX2's wood yield is also higher; an important factor due to the need for a year-round supply of fuelwood for cooking.

Adoption by farmers where the project team worked has been excellent, but the spread of the technology to other villages and regions will be slow – the hybrid must be vegetatively propagated, and support and training for propagation nurseries and extension services is inadequate.

I also visited Cebu Island, an island province with about 3.5 mil-

lion people. Cattle and goats are major livestock industries with increasing demand from urban consumers. Consequently, livestock fattening is an important income stream.

Leucaena was first introduced in 1977 as part of a Philippine-wide program to help rural communities. Incentives were introduced to promote multi-purpose tree planting. For instance, no one was allowed to marry, or graduate, unless they planted trees, and these were often leucaena trees.

More than 1000 smallholders in the village of Dabayaag adopted ipil ipil, but because of the psyllid problem, *Leucaena diversifolia* was introduced to the village by Larry Fischer, working for World Vision, in the mid-to-late 1980s. Farmers now collect seed of *Leucaena diversifolia* for on-selling to other farmers. Since the new species was psyllid-resistant, it solved a feed gap and was immediately adopted.

We spoke with farmer Benigno Alcarzaren, who had just produced nine kilograms of *L. diversifolia* seed for sale. He feeds cattle *L. diversifolia* with a mixture of corn bran, plus some coconut meal, to fatten them. He aims to buy cattle at 200 kilograms and in four months lift their liveweight to about 300kg. These weights are all estimates, as there are no scales.

In another village on Cebu (Balaygtika), more than 80 per cent of 800 households fatten cattle on traditional ipil ipil leucaena. Victoria Casipona and her family daily feed a mixture of chopped ipil ipil and melina (*Gmelina arborea*) leaves, plus corn bran to fatten bulls bought at the local market. The bulls are bought at around 300kg liveweight and fattened for two to four months and sold. The bulls do well on this diet, which she also believes controls intestinal worms.

KX2 was even more also successful in Vietnam, where there is less of a history of leucaena use in ruminant feeding systems. However, smallholders are similarly dependent on sale of livestock products for income, and the KX2 leucaena offered a cost-effective protein supply.

The fertile Moc Chau Plateau in Son La Province is about 200 kilometres west of Hanoi and has a thriving dairy industry, supplying fresh milk to the Hanoi market.

The smallholder dairy farmers at the Moc Chau Milk Company said that cattle find KX2 leucaena palatable and there is no problem with the taste or smell of the milk. When they feed 5kg of fresh KX2 a day per cow (10 to 12 per cent of diet), there is an increase in milk yield (one to three litres a day), butterfat percentage and milk density. They said that KX2 produces forage year-round and does not frost in winter like the grasses.

Mr Hoang Minh Duc, in Moc Chau District, has 15 Holstein Friesian cows, and he feeds them elephant grass, 4kg to 6kg concentrate (minerals, maize bran, rice bran, soybean, promix) per day, and KX2. At the moment he has 400 square metres of KX2 but he wants to expand this to 2000 when KX2 cuttings become available. He can increase milk yield by about two litres a day to 18l/d in winter and 20l/d in summer by feeding KX2 leucaena. The Vietnamese

## LEARNING BY EXPERIENCE

Each year, 40 to 50 ACIAR-funded projects are completed, but ensuring that benefits continue beyond an assignment's life remains a challenge. Successful projects impart knowledge and skills and leave in place technology that is sustainable in the long term under local conditions.

Looking back at large projects, three to four years after completion, helps evaluate and highlight uptake levels and project results. ACIAR carried out and published the first of these adoption studies in 2004. A second compilation has just been released, *Adoption of ACIAR Project Outputs*, which looks at projects completed in 2000 to 2001. From the lessons learnt in these studies, ACIAR hopes to improve its future efforts and provide direction for subsequent economic impact assessments. Gaining insight into research selection and management practices also helps ACIAR decide on future research directions and priorities.

For copies of the report contact [comms@aciar.gov.au](mailto:comms@aciar.gov.au).

# ON TREE HYBRID



## SEVERAL LARGE RANCHES IN THE MARKHAM VALLEY ARE BEGINNING TO USE LEUCAENA-BASED GRAZING SYSTEMS, DUE TO THEIR HIGH PRODUCTIVITY

team, through their links with the Forest Research Institute nurseries, have produced more than 50,000 rooted cuttings without difficulty. Nevertheless, continued support for training and extension services will be necessary to ensure continued adoption and realisation of the full potential of KX2 leucaena.

In Papua New Guinea, several large expatriate-owned company ranches in the Markham Valley are beginning to use leucaena-based grazing systems, due to their high productivity and robustness under grazing pressure.

The success of the cultivar Tarramba, originally released in 1997, has lifted the potential for ruminant production in the Markham Valley. This has led to almost 1000 hectares being planted by the company-owned cattle properties that service the live cattle export market to the Philippines and Indonesia.

At Markham Farms, manager Scott Young has 400ha of existing leucaena and has just planted a further 50ha. When he arrived to take up his position with the British-owned property, he found that 40ha of leucaena planted in the late 1990s had been abandoned and allowed to grow tall. Although he was advised to bulldoze the area, Scott cut it back and he is now feeding 600 cattle on the area for much of the year. He finds that he needs this high stocking rate to control leucaena's rate of regrowth in this favourable environment (plenty of water, heat and fertile soil). Leucaena plus some inter-row

grass is the main pasture feed supply, although he says it is hard to find a grass that can survive these high stocking rates.

Scott says that the leucaena has given him the confidence to expand the operation. He now plans to increase his leucaena area by 100ha a year for next five years.

His strategy is to plough strips and plant double rows of leucaena at 10-metre centres, saying that the wide rows will give grass a better chance to survive the high stocking rates, and it will give him better control over the leucaena.

Livestock raising for beef and milk has also become popular in north-eastern Thailand. In the past, cattle were mainly used as draft animals and were poorly fed with rice straw. Now, with a strong economy and strong demand for beef and milk, cattle are worth a lot of money. There is insufficient feed for these intensively raised cattle so some farmers (those with irrigation) have grasped the opportunity to become specialist grass growers. There is opportunity to expand the use of leucaena in north-eastern Thailand as it grows naturally in many districts, however due to high demand for forage by cattle farmers, improved grass plantings are currently high priority.

*Max Shelton is an associate professor at the Faculty of Natural Resources, Agriculture and Veterinary Science, University of Queensland.*

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Left: Victoria Casipona and her family daily feed a mixture of chopped ipil ipil (leucaena) and melina (*Gmelina arborea*) leaves, plus corn bran, to fatten bulls bought at the local market.

Right: grafted KX2 trees.

## Ecosystem services not a free gift

**F**armers need to manage the Australian landscape, including rivers, wetlands and estuaries, in ways that are ecologically sustainable – and city dwellers need to pay them for doing so. This was the message from Dr John Williams in his 2005 Farrer Memorial Oration. An ACIAR board member and former Chief of CSIRO Land and Water, Dr Williams was awarded the 2005 Farrer Memorial Medal for distinguished services in agricultural science in Australia.

While targeted at Australian agricultural management, his words will echo universally as farmers everywhere face production and environmental constraints caused by overworked soils that have turned saline or acidic, urban growth that is pushing them off the best soils and on to increasingly marginal country, and the spectre of global warming,



BRAD COLLIS

Dr John Williams: universal message.

In a speech titled 'Sustainable Agriculture in Australia – Some Ways Forward', Dr Williams said the agricultural community should not be expected to produce cheap, clean food and fibre, as well as provide a free service to maintain all the ecological functions of the landscape.

Dr Williams said the search for sustainable agriculture began in Australia with William Farrer, who in 1886 had suspected English wheat breeds were unsuitable because they were especially vulnerable to rust fungi. Farrer's search for varieties more suited to Australian conditions began the "long journey that farmers and scientists have trodden for the last 125 years," he said.

"It is a demanding journey to build an agriculture that works for the climate and soils of the great south land," he said. "Unfortunately farming

based around annual crops and pastures does not work well in the Australian landscape."

The problem is that annual crops and pastures leak far too much water into the ground, leading to rising salt levels in valley floors, rivers and wetlands, soil acidification, soil nutrient depletion and the delivery of increased nutrients to groundwater, streams and wetlands.

"The challenge is to build agro-ecosystems that generate wealth from food and fibre products and which have within them flows of water, nutrient and carbon that are well matched to the flows that can be accommodated in hydro-geochemical cycles of the ancient continent."

Dr Williams said there is sufficient knowledge now to shape the rethinking of our farming systems. However, to do so would require "radical change" to current land use. These changes should incorporate:

- ▶ commercially driven tree production systems for large areas of the current crop and pasture zones;
- ▶ new farming systems made up of novel mixes of annual and perennial plants;
- ▶ new cereals, pulses, oilseed and forages able to substantially reduce deep drainage and nitrogen leakage; and
- ▶ new land-assessment tools that best locate trees, other perennials, high-value annuals and native vegetation and match them to water targets and biodiversity goals. These tools should help identify land which should be farmed and those areas should be used to protect native biota.

Dr Williams said the future form of sustainable agriculture would be "a mosaic of new and old agricultural enterprises".

### Forestry prize

**P**rofessor Phil Evans, director of the Centre for Advanced Wood Processing at the University of British Columbia, and a former graduate student at the centre, Dr Rico Cabangon (now with the Forest Products Research and Development Institute in the Philippines), have won the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development Prize for their work in an ACIAR project on development of high-strength, oriented, wood-wool cement composites for use in emergency shelters and affordable housing.

The work addressed impediments to the use of *Acacia mangium* as raw material for the manufacture of particle boards made of wood-cement composites. Such particle boards are known to be very

suitable for the construction of low-cost housing, and are used for this purpose in the Philippines in particular. The project developed methods that optimise processing conditions for the production of composite boards from cement and wood of acacias, in particular to overcome constraints associated with the incompatibility of acacia timber with cement. As *Acacia mangium* is one of the most important plantation species in Southeast Asia, the project has identified a major new resource for the production of these boards.

Dr Cabangon received a cash prize for the award and a plaque. The prize was awarded in the face of competition from several international and national agricultural and forest research institutions.

### Vale John Vercoe

**D**r John Vercoe, a long-time friend of ACIAR and supporter of international agricultural research, has died in Queensland at the age of 69. Dr Vercoe had a successful career as a ruminant nutritionist.

From 1966 to 1996 he worked at CSIRO Rockhampton, carrying out research on breed differences in feed utilisation and performance, and became director of the Tropical Beef Centre.

From 2001 to 2004, Dr Vercoe chaired the Board of Trustees for the International Livestock Research Institute and, from 2002 to 2004, the Committee of Boards and Chairs of the Consultative Group on International Agricultural Research (CGIAR). He was also a member of the Executive Council of CGIAR from 2002 to 2004.

Friends and colleagues at ACIAR will miss Dr Vercoe's enthusiasm and good humour. Our sympathies are with his wife Jan and family.

### Database success

**T**he Tropical Forages database continues to gain users and momentum, following its international release in July 2005. The database is the result of a major collaborative effort between CSIRO, the Queensland Department of Primary Industries and Fisheries, Australia's Centre for Biological Information Technology, the International Center for Tropical Agriculture (CIAT) and the International Livestock Research Institute.

Its aim is to boost productivity and sustainability of pastures in tropical and subtropical regions around the world. Through a web-based selection tool, users can find the best-adapted forages for

# ROUNDUP



## NEW APPOINTMENTS

John Murray

ACIAR's new country manager in Indonesia is John Murray, who brings a wealth of experience in development assistance. Before joining ACIAR, John worked for more than 12 years with AusAID. In Canberra, he worked on AusAID's Lao, Kiribati, Micronesia and Vietnam programs and also as a rural development policy adviser. John had a posting to Zimbabwe with AusAID and was also its representative on Bougainville. He later returned to Zimbabwe, where he worked on a project that promoted chilli pepper as a cash crop for smallholders to deter elephants from causing crop damage. For the past two and a half years John worked in a contract position in Phnom Penh as manager of AusAID's program support unit, where he supervised staff involved in the implementation of Australia's aid program to Cambodia. A graduate of La Trobe, the Australian National University and Cambridge, John's qualifications are in economics, natural resource management and development.

## NEW PROJECTS

- ADP/2005/041 Trade and agricultural development in developing countries – China and India  
ADP/2005/031 Linking smallholders and agribusiness, social capital and rural development in Eastern Indonesia  
CIM/2003/014 Seeds of Life 2 (East Timor)  
FST/1999/095 Improving the value chain for plantation-grown eucalypt sawn wood in China, Vietnam and Australia: genetics and silviculture  
LPS/2004/023 Strategies to increase growth of the weaned Bali calf  
SFS/2003/069 Policy options for improving the value of land use in smallholder Fijian agriculture

## NEW PUBLICATIONS

### Monographs

#### [Integrating knowledge for river basin management – progress in Thailand](#)

The authors have developed an integrated approach to water resources assessment and management. Their experience in Thailand demonstrates that multi-disciplinary and multi-agency teams can be successfully built to tackle complex problems. A Jakeman, R Letcher, S Rojanasoonthon and S Cuddy (eds). ACIAR Monograph 118, 224pp, price \$30 (plus postage and handling).

#### [Guidelines for surveillance for plant pests in Asia and the Pacific](#)

This manual will assist plant health scientists to devise surveillance programs and to transmit specimens to the laboratory for identification and preservation. Teresa McMaugh. ACIAR Monograph 119, 192pp, price \$30 (plus postage and handling).

### Working Papers

#### [Survey of the mineral status of livestock in the Tibet Autonomous Region of China](#)

This report is the outcome of a cooperative program involving scientists from the Tibet Academy of Agricultural and Animal Sciences, the Institute of Animal Science, the Chinese Academy of Agricultural Sciences and Australia. They assessed the mineral and trace element status of yaks, cattle, horses and sheep from different environmental and management systems. N Tashi, L Xugang, Y Shunxiang and G Judson. ACIAR Working Paper 59, 36pp.

### Impact Assessment Series

#### [Impacts of mudcrab hatchery technology in Vietnam](#)

R Lindner. ACIAR Impact Assessment Series No. 36

The impact assessment series and working papers are freely available as pdf files at [www.aciar.gov.au](http://www.aciar.gov.au). ACIAR's distribution policy is to provide complimentary copies of its publications to libraries, institutions, researchers and administrators in developing countries with an involvement in agriculture, and to any scientist involved in an ACIAR project.

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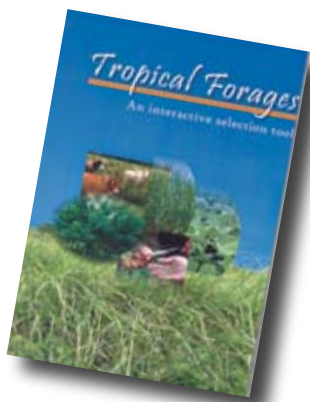
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their specific soils, production systems and management practices.

Tropical environments covered in the database range from wet lowland systems to high-altitude and semi-arid systems.

Information on the adaptation, use and management of more than 180 tropical and subtropical forage plants is presented in the database as informative, illustrated fact sheets, incorporating the knowledge of more than 100 international forage experts.

The database and selection tool is available on the internet at [www.tropicalforages.info](http://www.tropicalforages.info), a website hosted by CIAT in Columbia.

Project leaders Bruce Cook and Bruce Pengelly are pleased with the reception and increasing use of the system.

"We've received very positive feedback on the database since the launch from researchers and extension officers working in the tropics," Dr Pengelly says. "We've also been delighted with feedback from educators and trainers who have indicated they are considering changing their teaching methods in agronomy to make use of the system."

The Tropical Forages database and selection tool is also available as a CD-ROM by contacting CSIRO ([Kristy.Wilson@csiro.au](mailto:Kristy.Wilson@csiro.au)).

The project was funded by ACIAR, with additional financial and technical support from Deutsche Gesellschaft für Technische Zusammenarbeit, the Food and Agriculture Organization and the UK Department for International Development. ◀

## 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.