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IN RESEARCH FOR DEVELOPMENT

FROM FARM TO MARKET

South African cattle partnerships
Coffee quality lift in PNG
Sustainability and Indonesia's fisheries

From farm to market

Sustainable development and poverty reduction can be achieved through linking smallholder farmers to growing markets. But farmers often face a number of barriers to market, including obtaining reliable data on consumer needs, producing sufficient amounts of high-quality produce, and getting their goods to markets.

This issue of *Partners* focuses on research that is helping farmers overcome these barriers. Research is helping farmers make the transition from subsistence farming, where they produce just what they need, to one where they produce more and sell the excess for a profit. Linking farmers to markets includes information transfer: getting information to farmers on what markets expect and how to increase production of high-quality produce. In some cases it involves getting the market to see that smallholder farmers produce what they want.

In Papua New Guinea demand for high-quality coffee beans for the top end of the market had restricted smallholder access. ACIAR is helping smallholder coffee growers better understand these market needs and is working with them to improve the production process. The story on fresh produce in the highlands of PNG highlights the importance of transport networks and refrigeration in getting the produce to the big centres. Needs for disease-resistant mangoes in Pakistan, and tastier, longer-lasting tomato varieties in Cambodia, were similarly recognised. The 'Beef for Profit' project in South Africa demonstrated to the market that emerging smallholder farmers already produced beef of the quality the market needed, contrary to conventional opinion. Through this understanding and changes to how the two groups approach sales, profits grew all round and farmers are now empowered with the confidence to stand their ground on price.

The importance of linking farmers to markets has been recognised with the establishment of ACIAR's new Agribusiness Research Program. Focusing initially on Indonesia, this program aims to facilitate linkages throughout the supply chain, helping smallholders and agribusinesses to better meet market needs.

Also in this issue we look at Indonesian fishing, from both subsistence and commercial perspectives; the problem of illegal, unreported and unregulated fishing in Indonesian and Philippine waters; and we profile ACIAR's Policy Advisory Council member from Indonesia, Dr Achmad Suryana.

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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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CONTACT: Peter Batt, p.batt@curtin.edu.au

Smallholder coffee lift

ACIAR is working with smallholder farmers in Papua New Guinea to help them restore the country's world-wide reputation as a supplier of high-grade coffee

BY JANET LAWRENCE

Papua New Guinea's reputation as a coffee supplier has slipped in recent years, with the decline of the big colonial-era estates and an increasing reliance on smallholder farmers who struggle to meet the quality parameters set by the world's major buyers. Given that 400,000 rural households grow coffee, and a further 20,000 people are employed in its processing and marketing, the need to reverse this trend is a sizeable and economically essential challenge for the country. Today, smallholder coffee farmers produce about 85% of production—about 56,000 tonnes a year.

Previously, the estate sector was renowned for producing some of the world's best coffee, but its decline has resulted in a parallel decline in PNG's reputation as a consistent supplier of high-quality coffee. For the majority of smallholder farmers, roadside traders pay a single price for parchment (dried beans with the skins still on) irrespective of quality, yet a reliable supply of predictable-quality coffee is crucial for PNG's engagement with the world market.

A group of ACIAR projects has recently set out to redress the problem and to improve the economic returns to smallholder coffee producers and the PNG industry generally. The economics project, now into its second year, has already included a comprehensive analysis of the major constraints affecting the quality of coffee in PNG.

The project began with a review of the marketing arrangements that have traditionally linked smallholders with processors and others in the supply chain. Australian project leader Dr Peter Batt of Curtin University in Western Australia and his PNG counterpart Tom Kukhang, chief scientist of the Coffee Industry Corporation, rose to the challenge. "We began with a scoping exercise, and from this we have learnt a massive

amount," says Dr Batt. "Our team talked to everybody we could locate who was involved in the industry. We were determined to bridge the gap between producers and their customers."

Dr Batt has placed a high priority on communication. "Buyers need to show the farmers how to produce better-quality coffee. While good-quality coffee starts with harvesting of the mature, red-ripe cherries, for growers to maintain production their trees need to be regularly pruned, the weeds controlled and fertilisers applied. Farmers then need to be shown how to process the coffee. This begins with pulping, fermenting, washing and drying. If any one of these stages is not performed correctly, quality will be compromised."

From their initial findings, team members learnt how well coffee-growing fits into the smallholders' way of life, and therefore how important it was to gain the best outcomes for producers. At the individual farm level, the need for year-round capital was evident. They found that the money received from the sale of coffee first went to meet household expenses (including school fees) and to fulfil social obligations before any thought was given to financing labour to prune the trees or to buy fertilisers and chemicals. As the coffee industry has a poor financial record, the major banks are unwilling to extend credit. Thus, there was a need to develop the capacity of farmers to manage their household expenses and their enterprise expenses.

Because of suggestions in earlier reports that market intermediaries extract excessive returns at the growers' expense, the team analysed the marketing margins. These showed that, for green bean (the final processed product), coffee farmers in PNG receive 68–80% of the price offered by exporters in Lae. This figure indicated that the processing/exporting sector was relatively efficient and that growers were receiving reasonable prices as a percentage of the export price. However, such margins were available only to growers close to traders and processors. Others in more remote areas lose some of the margin through the higher cost of transport.

One of the most significant results to emerge from the initial study was the much lower price farmers obtained for parchment relative to cherry. "This is one of those rare instances where farmers get paid more to do less," Dr Batt says.

Farmers are being encouraged to sell cherry rather than to produce parchment, if they are close enough to a wet mill to deliver cherry on the day of harvest, or if the mill itself can collect the cherry. "By having more control of the process, the mill operators are able to produce a finished product with similar characteristics to the plantation-style coffees."

Poor communication is considered responsible for the conflict that often flares between farmers and market intermediaries, due to the farmers' lack of understanding as to how prices are determined on the international market. Farmers were unaware of the financial risks borne by traders and exporters in a volatile commodity market. The team soon realised that informing coffee farmers about risk management and the costs associated with export would improve relationships with their respective traders and exporters.

"While the Coffee Industry Corporation is eager to promote direct marketing from grower to overseas buyers, we have strongly advised against this because of the intricacy of determining price," Dr Batt says. "Prices are determined by supply and demand on the New York Coffee Exchange and the decisions made by the financial houses to either invest or withdraw from coffee futures. If you want to be a coffee exporter, you need to be communicating with the markets and financial

(Below left) roadside traders in Papua New Guinea; (below) picking coffee.

institutions on a daily basis, and smallholder coffee farmers don't have the capacity to do this."

Since 65–70% of the PNG coffee crop is exported, the price farmers ultimately receive will depend on the prevailing price on the day the coffee is sold, he says. "Furthermore, when you're dealing with futures markets you must also be aware of currency exchange rates and shipping rates, for the final price has to factor these in. At the end of the day, farmers may have to settle for less than they expected, especially for 'Y' grade coffee that goes into making instant coffee, as this market is very price sensitive."

Dr Batt says the key is getting farmers to improve the quality and reliability of supply. "Our major challenge is to encourage smallholders to work together and to produce coffee in a reliable, consistent manner. If there are 20 farmers in a district with 500 kg of cherry ready to harvest on the same day, a processor will have no problem sending out a truck to collect it and to process it as premium coffee. The farmers get paid as the cherry is collected and, on average, receive 20% more than they would receive for processed parchment."

Dr Batt says the recent arrival in PNG of US coffee chain Starbucks is leading to a dramatic increase in the proportion of smallholder coffee sold as cherry for those farmers close enough to a commercial mill. It was also the catalyst for developing fully inclusive quality-assurance programs giving guidelines for the physical and cup-quality characteristics.

Hand-sorting green bean prior to export.

"There are also environmental, social-welfare and equity conditions that preferred suppliers must meet. With Starbucks providing the price incentives, these developments align themselves well with our project objectives, especially in promoting the need for quality at the farm level."

Dr Batt says the key to achieving the project's overall objectives is building effective leadership: "The tribal system helps us identify natural leaders among the farmers, and they in turn can influence the formation of collaborative farmer groups and open the lines of communication between the group and the exporters. This is particularly helpful in areas more distant from the wet factories where farmers must produce parchment.

"To ensure that everyone is treated fairly and equitably, it is vital that the parchment is dried to 12% moisture. Farmers who sell parchment with higher moisture content have an unfair advantage over those with parchment at 12% moisture. With the introduction of collaborative farmer groups it is possible to bring in a strict quality assurance that reduces the variation in quality and makes it fairer for all."

Another element that has had to be considered is the value of treating the two crops harvested each year in different ways.

"With the main crop ripening from May to July, the farmers should wherever possible sell their cherry direct to wet mills. However, in December/January, a much lighter 'fly' crop is produced. As the quantities are much lower, it is better for the farmers to process it themselves. They can then store the parchment in their houses and use it like a bank account, taking a portion when they need it and selling it to boost their funds."

Dr Batt says that one of the rewarding aspects of the project, from a personal perspective, is that it is helping to improve the economics of smallholder coffee production while remaining 'in tune' with Melanesian village life. "I find this very encouraging." ■

Producing coffee from harvested cherry

In PNG, the wet processing method is used: the pulp is removed from the coffee cherry after harvesting and the bean is dried, leaving it in the parchment skin. Several steps are involved.

First, the freshly harvested cherries are passed through a pulping machine where the pulp is separated from the bean. The pulp is washed away with water and may be dried and used as mulch. The beans are separated by weight as they are conveyed through water channels, the lighter beans floating to the top while the heavier, ripe beans sink to the bottom.

Next, they pass through a series of rotating drums, which separate them by size. After separation, the beans are transported to large fermentation tanks. Depending on a combination of factors—such as the condition of the beans, the climate and the altitude—the beans remain in these tanks for 12 to 48 hours, during which time the slick layer of mucilage is dissolved away from the parchment by naturally occurring enzymes.

When fermentation is complete the beans feel rather rough to touch. After rinsing they are dried to about 12% moisture for storage. The dry beans, now known as 'parchment', are stored until further processing immediately before export.

The final steps involve removal of the parchment layer, polishing to remove the final traces of parchment (optional), then grading and sorting. At this final stage, the coffee is known as 'green bean'. Upon receipt by the buyer, the green bean is then blended, roasted and ground by the final customer.

PARTNER COUNTRY: Papua New Guinea
PROJECT: Improving the marketing system for fresh produce from the Highlands of PNG (ASEM/2001/037)
DESCRIPTION: By taking a holistic approach to PNG's produce marketing system, researchers hope to help the market expand to meet domestic and international demands
CONTACT: Professor John Spriggs, john.spriggs@canberra.edu.au

Vegetables trade in the PNG Highlands

BY JANET LAWRENCE

In the Highlands region of Papua New Guinea an amazing variety of high-quality temperate-zone vegetables can grow year-round.

Crops such as sweet potato, taro and potato, head cabbage, broccoli, cauliflower and pak choy, beans, peas, eggplant, carrot and pumpkin, salad vegetables, avocado and asparagus all thrive in the mild climate and rich volcanic soils. This bounty could meet the needs of PNG's populous coastal cities and could potentially also supply overseas markets.

It was for this reason that, way back in 1983, ACIAR commissioned a project to find ways to develop a marketing system for Highlands produce.

The project team assessed transport methods and also studied factors affecting produce shelf life. Project team members Dr Kevin Scott, from the then NSW Department of Agriculture, and Garth Atkinson, a New Zealander working with the PNG Department of Primary Industry, produced an ACIAR Technical Report (No. 14) outlining prospects for developing a marketing chain from the Highlands to populated coastal areas.

The project's major achievements were the design of a suitable refrigerated container and the completion of trials testing the transport and handling of vegetables from the Highlands to Port Moresby, using road containers between the Highlands and Lae, followed by ship to Port Moresby. In 2001, during a visit to PNG, ACIAR program manager Ken Menz observed that this system had been taken up commercially in Mount Hagen in the Highlands, and had been operating for a number of years without government support. It was a major supply channel, competing with air freight and non-refrigerated surface transport.

Aware of this success, a government instrumentality now known as the Fresh Produce Development Agency (FPDA) wanted to encourage more operators into the business, but it was not simply a matter of slotting them in. The marketing system needed a holistic appraisal from the viewpoints of all its stakeholders before it was ready to expand.

Thus, ACIAR commissioned another project in 2003 led by Professor John Spriggs of the University of Canberra.

"This project had a different focus," Professor Spriggs says. "We concentrated on socioeconomic change, involving all the people along the chain. Our objectives were to map out the marketing system, find what needed improvement, then determine a program for introducing changes while developing the skills of all those involved in the PNG industry.

"Our major aim was to help the stakeholders—representatives from along the supply chain including farmers, wholesalers, community associations, supermarkets, transporters, government agencies and researchers—come to the best decisions with regard to marketing Highlands fresh produce. So, through a research process known as 'critical action research' we gave the stakeholders opportunities to learn from the results of research conducted by the project team. We also encouraged them to contribute at project workshops and to become directly involved in the action plans drawn up for marketing system development and further research."

The project team assessed transport methods and also studied factors affecting produce shelf life.

Early progress was reported in *Partners* (December 2004) when Professor Spriggs and his team noted that a picture was starting to emerge of the current marketing systems and the barriers to their expansion. It became evident that there was a strong call to develop the physical infrastructure for marketing fresh produce.

The good progress has continued. The stakeholders strongly supported the establishment of consolidation depots in the major highland centres of Goroka and Mount Hagen, served by satellite district depots in the surrounding production regions, and efforts have begun to put these in place.

Attention is also being given to developing a quality-management system for the produce. Two particular supply chains were studied: a land/sea chain for bulky, less perishable produce, and a land/air chain for highly perishable, high-value produce. Trial shipments of produce from the Highlands to Port Moresby were studied to discover the weak links in the logistics chain.

Village extension workers have performed a valuable role. These are full-time farmers who act as conduits of technical and market information from the FPDA and other sources to farmers, and also relay production information from the farmers back to the FPDA. This process opened the eyes of farmers to the reality of markets previously unknown to them.

Blackie, a village extension worker employed by the FPDA, says farmers are cautious about increasing production, but when they see the value of the marketing trials they are more interested.

"The prospect of a regular income is attractive to farmers and the opening of the depots will be an incentive for them to increase production. The marketing trials are opening up new opportunities: getting youth to remain on the land and benefit from selling their own produce, attracting new people into farming to commence productive use of their land, and giving existing farmers a reason to expand production."

One manager from the FPDA also expressed appreciation of the project's ability to bring people together from different areas to advance the work: "We would not have been able to do this without the ACIAR project," he concluded. ■

SOUTH AFRICA CATTLE

PARTNER COUNTRY: South Africa
PROJECT: Developing profitable beef business systems for previously disadvantaged farmers in South Africa (LPS/1999/036)
DESCRIPTION: This project aims to encourage community farmers to be self-sustaining by opening up new markets for their beef
CONTACT: Dr Heather Burrow, heather.burrow@une.edu.au

PHOTO: NEIL MACLEOD

Cattle foster community wellbeing

Although African farmers own 40% of South African cattle, the vast majority of cattle finished in feedlots for the beef market are purchased from the commercial sector. The 'Beef Profit Partnerships' project set about redressing this situation and has helped hundreds of African farmers and their families shape their own destiny

BY BILL WINTER*

Ephraim Matjuda is inspirational. He is a man with a vision who sees his African people being empowered to make their own decisions and to enter the marketplace on a fair footing. He sees them uplifted in spirit and economic wellbeing. I count myself lucky to have met Ephraim, even though the first few hours with him were a baptism of fire. During a long, hot drive from Pretoria to Polokwane, he questioned me on the one hand about my motives for exploring the idea of a beef project in South Africa and whether ACIAR was committed for the long haul, while on the other hand he inspired me with his ideas on how his vision for his people could be achieved.

The idea of short-term, quick-fix projects, with limited development of local capacity, was abhorrent to Ephraim—and to me. By the time we arrived at Polokwane, which is close to his home town, we had a good understanding of how we might work together to make some progress towards that vision.

So what were we talking about? How could Australia contribute to the development of individuals and communities in South Africa? Increasing output from the 5.7 million head of cattle owned by the African farmers was one area worthy of investigation.

South Africans are well known for their love of meat and cooking on the 'braai' (barbeque to Australians), and they place a high value on meat quality. Most cattle are finished in feedlots, but feedlotters have difficulty sourcing cattle to finish. More than 90% of beef in the market is sourced from the commercial farming sector, even though they hold only 60% of the cattle. The African farmers, either as individuals or in various community arrangements, hold the other 40% of the stock, but make up less than 10% of the market.

PHOTO: NEIL MACLEOD

Typical landscape of Limpopo province, where many smallholder communities raise cattle for sale.

Why? The reasons are numerous—some based on prejudice against the breeds of cattle used by the African farmers, some because of the dearth of information about the performance of these cattle, some relating to the lack of experience in marketing by African farmers and some due to profiteering by traders. Ephraim believed that if farmers could get a fair price for their stock, they would become greater participants in the market. But how this negative feedback loop could be broken was not immediately apparent. As scientists, it was time to explore what was and what was not known.

Australian and South African scientists already knew that breeds used by African farmers, such as the Africander and Nguni, were well adapted to subtropical conditions and displayed valuable meat-quality characteristics. This was a positive. However, when presented to the feeder market, these cattle were invariably lighter than equivalent cattle from the commercial sector, and there was no information on how these breeds and other cross-breeds would perform in feedlots after being reared in the 'non-commercial' sector. Market data also indicated that these cattle fetched a much lower price per kilogram than those from the commercial sector. This was largely attributed to the poor bargaining position of the African farmers, given that sales were forced rather than planned, marketing costs were high (particularly for transport) and because stock were not always presented in the best condition. There was no direct link between the African farmers and the cattle market.

The twin thrusts of the project, which became known as Beef Profit Partnerships, were soon clear. First, a comparative study of feeder cattle from the 'non-commercial' and commercial sectors was needed. Comparisons would be made of growth rates, feed conversion efficiencies, meat yield and quality and disease status, with cattle managed under the same conditions. The second component involved working with farmers to help them become mainstream players in the beef supply chain.

The Beef Quality Cooperative Research Centre, led by Dr Bernie Bindon and Dr Heather Burrow, along with CSIRO and the Queensland Department of Primary Industries and Fisheries (QDPI&F), provided the Australian input, combining with the South African Agricultural Research Council (ARC)—where Ephraim was one of the few African scientists—and the Limpopo and North West Provincial Departments of Agriculture.

To compare 'breeds', more than 200 head each of nine types of cattle (four commercial, five 'non-commercial') were assembled at Irene, near Pretoria, and fed for 120 days under feedlot conditions. The surprising outcome was that differences in growth rates, meat quality, disease status and feed-conversion efficiency were of no commercial consequence. Why

Ephraim Matjuda from the ARC and Albert Ntsoane, Limpopo Department of Agriculture.

is this surprising? Because the commercial breeds had been selected for these characteristics for many generations, but had apparently made little, if any, progress, and because the 'non-commercial' breeds were much lighter when they entered the feedlot, which would usually be expected to lead to slower growth rates.

The outcomes of this component of the project have been impressive. Some commercial farmers and the ARC (which provides a bull-evaluation service) were forced to question the effectiveness of their breeding programs and have subsequently adopted more rigorous technologies for assessing the quality of their sires and herds, with significant input from the Australian team. Members of the South African Feedlotters Association, who have been project partners from the outset, have increased the use of cattle from the non-commercial sector, and an African community organisation is considering the establishment of a feedlot closer to this source of cattle in Limpopo province. Further, discussions are being held with a large retail food company to market an African breed of community-farmed beef as part of its drive to source more product from African farmers.

The approach used to help African farmers become mainstream players in beef marketing was groundbreaking in South Africa. The service providers (scientists, extension workers and so on) did not simply tell the African farmers what to do. Such 'instructive dialogue' does not encourage sustainability. Rather, in this case the team felt that it was better to encourage farmers to set their own course and priorities for development of their beef enterprises, and for the service providers to bring knowledge to the farmers consistent with their objectives.

This second element of the project started with the training of about 250 African beef cattle producers from Limpopo and North West provinces in the

Project farmers inspect their cattle, which were raised under feedlot conditions at the ARC research station in Irene.

management of their small enterprises. The primary training tool developed was called the 'continuous improvement and innovation' (CI&I) process (see box page 13). Improving profitability was the main focus, with profit defined as income less expenditure. On the expenditure side, farmers were encouraged to weigh up the cost of inputs against the likely returns, and to compare returns from one potential input with another. As a consequence, expenditures fell as people thought more carefully about whether they would get a return on their investment. The income side is far more complex and interesting. CI&I defines income as throughput (number of cattle through the sale gates) multiplied by price. Most of the technologies promoted by livestock scientists and extension staff pertain to increasing throughput, for example by increasing weaning rates, improving growth rates, reducing losses due to diseases and increasing stocking rates through pasture management. However, in this case the farmers unanimously chose to focus on improving the price they received for their stock: "Why produce more for such a low return?" was their rationale for this priority.

The trainees formed 17 focus groups, some comprising members of a community group and others comprising individual farmers. These groups met regularly and fed data on their farming enterprises back to the team for the life of the project.

What the farmers needed was a better balance of power in the marketplace. The focus groups were part of that empowerment, but the farmers also needed to know the animal weight at sale (given that payment is based on a price per kilogram live weight), current and seasonal price fluctuations at accessible markets, the links of traders and middlemen to the feedlots and how to reduce the cost of marketing.

The project set about providing information on prices, weights and traders, even supporting farmer visits to the markets to observe and learn. Project team members visited the focus groups to weigh potential sale cattle, collect data and generally keep the communication channels open.

The monitoring showed two important changes during the life of the project: the number of stock sold by the groups increased from 23 in 2002 to 389 in 2005, and the price received per kilogram rose from 3.3 rand to 10.5 rand, with these prices about 25% and 90% of the price paid for commercial cattle at livestock markets.

The important problem of how to reduce the cost of marketing (and not being forced to sell) was solved by the farmers themselves. They hold markets within their communities, with traders coming to them rather than vice versa. In some cases, several focus groups combined stock to increase numbers and to improve the attractiveness of the markets.

The success of this collaborative program was reported at a national Beef Profit Partnerships Forum in Pretoria in April 2006. The most inspirational and compelling sessions were those presented by representatives of the focus groups. I heard that one of the earliest community-run cattle sales, where 100 head were up for sale, was deemed a great success, even though no animals were sold. The farmers had flatly refused to take the price offered and sent the traders packing. What a feeling of empowerment this must have been for these farmers. They held their ground and, over the ensuing weeks, all those cattle were sold at a reasonable price. The farmers had sent a strong message to the buyers that they were not going to be taken advantage of. That same community-managed market continues and has grown to be an all-encompassing market for local wares.

Other focus groups reported similar successes, with stock numbers increasing, sale prices rising and community coffers growing. The majority of the presentations were given by women, demonstrating their importance in their communities, and in all cases the presenters and members of those focus groups were immensely proud of their achievements. This aspect has special relevance in South Africa where these

The farmers flatly refused to take the price offered and sent the traders packing.

Community farmer groups hold regular meetings to share information about ways to improve their cattle enterprises.

people have largely lived a life of disempowerment. It also seems that the CI&I methodology actually works, because several groups indicated that now that they were satisfied with the price component of income, they were ready to tackle the throughput element in the equation. Issues such as veldt management, reducing inter-calving intervals and improving growth rates have become areas of interest to these farmers.

What of the future? The National Department of Agriculture and the two provincial agencies are keen to adopt the CI&I approach as their standard extension model. Institutionalising the methodology was the term used by leaders from those agencies. This is an excellent outcome, but it will require coordination through the education and training systems and the development of appropriate extension materials.

There was no prouder man at the forum than Ephraim. His own institution, the ARC, has undergone substantial change to work in partnership with the provincial agencies and with the African farmers, and the project has demonstrated that his people can be active players in the commercial cattle market. But more importantly, hundreds of African farmers and their families are now in a position to shape their own destiny and to do so with dignity. Ephraim has every right to feel proud, and those of us who know him are honoured. ■

** Dr Bill Winter is the research program manager for ACIAR's livestock production systems program.*

Continuous improvement and innovation

The 'continuous improvement and innovation' (CI&I) process encourages beef farmers to set their own priorities for developing and managing their business enterprises. Rather than the scientists telling farmers what to do, CI&I empowers farmers to set and achieve their own targets. The CI&I process has clear steps and questions that help focus thinking and action, enabling people to work in partnership in an upward-spiralling process of improvement and innovation.

THE KEY STEPS ARE:

STEP 1 – SITUATION ANALYSIS

Q. What is the current situation, considering current practices and performance?
Q. What are the opportunities for improvement and innovation?

STEP 2 – IMPACT ANALYSIS

Q. Which opportunities will make a real difference to the situation?
Q. What criteria and evidence do I/we have to decide which opportunities to invest in?

STEP 3 – ACTION DESIGN

Q. What specific actions do I/we need to implement to make a real difference?
Q. How will I/we measure the effects of my/our actions?

STEP 4 – ACTION AND MONITORING

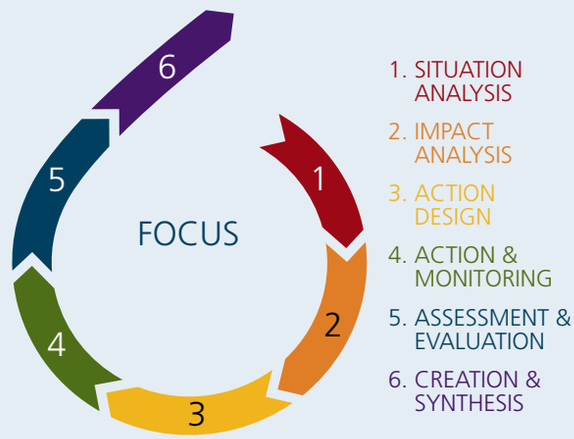
Q. What specific actions am I, and others, taking?
Q. How are we tracking the effects of my/our actions?

STEP 5 – ASSESSMENT AND EVALUATION

Q. What happened as a result of my/our actions?
Q. What made a real difference? Why?

STEP 6 – CREATION AND SYNTHESIS

Q. What new questions and ideas do we now have?
Q. What new and different needs and opportunities should I/we focus on next?



PARTNER COUNTRY: Pakistan
PROJECTS: Development of integrated crop management practices to increase sustainable yield and quality of mangoes in Pakistan and Australia (HORT/2005/153); Optimising mango supply chains for more profitable horticultural agrienterprises in Pakistan and Australia (HORT/2005/157)
DESCRIPTION: Australian researchers are working with Pakistani growers to find a solution to mango diseases, while improving supply-chain management
CONTACT: Associate Professor Ray Collins, ray.collins@uq.edu.au; Chrys Akem, chrys.ake@dpi.qld.gov.au

Research boost for ailing mangoes

Two research projects have begun that will give a boost to Pakistan's potentially lucrative mango industry

BY ROBIN TAYLOR

The sight of large mango trees dying for no apparent reason is an image that Australian mango grower and exporter John Morton recalls vividly from his visit to Pakistan as part of an Australian study group. The problem is known as mango sudden death syndrome (MSDS). Its causes are unknown, yet it reduces productivity in some orchards by more than 20%, and is affecting about 60% of trees in Sindh province, one of the two major Pakistani production areas.

Mr Morton, from north Queensland, says that being a mango grower in Pakistan is a difficult job: "Although Pakistan is one of the largest producers of mangoes in the world, its industry is sadly lacking in regards to marketing, promotion and R&D."

However, Australian researchers and Pakistani growers hope that a solution to MSDS, along with improvements in nursery, tree and crop management, and improvements in supply-chain management, will be the outcomes of two new ACIAR-funded projects.

The first project follows an Australian study group investigation into mango production systems, with an emphasis on disease and pest management. At a workshop in the city of Multan, mango growers, researchers and government officials identified a number of R&D priorities for the industry—a major priority was to determine the causes of MSDS and to develop suitable strategies to control the syndrome.

For the ACIAR team, key issues of concern are early identification and procedures to stop or slow the progress of the disease. Other major issues identified during the visit were problems of orchard management related to nutrition, irrigation and water quality.

With an annual crop of about one million tonnes, Pakistan is the world's fifth-largest mango producer. It exports about 80,000 tonnes (more than the entire Australian crop), mainly to expatriate Pakistanis in the Middle East and the UK. While export volumes have grown over the past five years, the returns per kilogram have not, giving Pakistan the lowest return per kg (about 25 cents) of any major mango exporter in the world. The local market is limited because many people live below the poverty line and cannot afford to buy mangoes. In fact, there are concerns that current returns to growers are not viable. Compounding the situation, poor management practices further reduce growers' returns.

The leader of the new ACIAR project and member of the 2006 study group, Dr Chrys Akem from the Queensland Department of Primary Industries and Fisheries (QDPI&F), says there is an urgent need to train researchers and extension officers in basic diagnosis of plant diseases.

Nursery production of planting material has also been identified as an area that needs urgent improvement to stop or slow down the recycling of disease and pest problems in old and new orchards.

"Orchard management in most of the orchards we visited could be easily improved," Dr Akem says. "In most cases, nutrition appeared to be the main cause of poorly performing trees. In many cases growers were not sure of the nutrients to apply, what combinations to use or when to apply them."

After completing isolations from infected stem samples in Pakistan, the team brought culture isolates back to Australia under strict Australian Quarantine and Inspection Service (AQIS) guidelines, and identified a fungus suspected to be involved in causing MSDS. The cultures will be tested on mangoes in Pakistan to confirm if the fungus is actually involved or causing the disease.

The team visited Pakistan in February 2007 to initiate the new project. They are looking at short- and long-term solutions to the problem of MSDS.

"In the short term, we need some early-detection techniques," Dr Akem says. "The earlier you detect MSDS, the easier it is to follow up with management practices. In the longer term, we want to look at nurseries and establishing a certified nursery program because the problem is just being recycled."

He says nurseries are planted inside infected plantations, "so the young trees coming out of these plantations are already infected.

"We want to establish some kind of 'model' clean nursery, and then encourage some commercial partners to become involved to develop a long-term solution to the problem."

An even longer-term solution will require introducing resistant rootstocks to the dieback. The disease has been present in Brazil for several years and researchers there have identified resistant rootstocks.

"We have some of that germplasm in our collection here in Australia, so we are going to take some to Pakistan where it can be used to establish new nurseries from resistant rootstocks," explains Dr Akem.

While Dr Akem and his team investigated disease and other on-farm issues, another Australian study group focused on supply-chain issues.

Professor Ray Collins of the University of Queensland (UQ), a member of the second study group and leader of another new ACIAR project focusing on these supply-chain issues, says that improving product quality and reducing losses related to quality are the highest priorities for the industry.

Mangoes are grown in the provinces of Punjab and Sindh. Harvest begins in Sindh in late May and finishes in the Punjab in late August, which is the opposite of the season in Australia. Unlike in Australia, where the industry comprises specialist growers, mangoes in Pakistan are usually grown on mixed farms. Plantations range from small 2-hectare holdings up to 400 ha. Most farmers sell their crop at flowering to contractors who manage the crop—from irrigation and pest control, to harvesting, packaging and delivery to commission agents who sell it in the wholesale markets of Lahore, Islamabad, Multan and Karachi.

"Fruit-quality improvement must be the starting point before other issues, such as information management and the role of commission agents and contractors, are tackled," says Professor Collins. "Fruit quality is generally poor, and 30–40% of fruit is wasted in the harvest-to-market system."

Early mango sudden death syndrome (MSDS).
PHOTO: ROBIN TAYLOR

Sharing mango knowledge

SOSHEEL GODFREY AND MUHAMMAD IQBAL* VISITED AUSTRALIA IN NOVEMBER 2006 AS PART OF A PAKISTANI DELEGATION LOOKING AT AUSTRALIA'S MANGO INDUSTRY

The Australia Pakistan Agriculture Sector Linkages program (ASLP) seeks to transfer Australian knowledge and expertise to Pakistan's mango, citrus and dairy sectors. The ASLP has been established to lift the capacity of research, development and extension in Pakistan, and help alleviate poverty.

The tour was funded by ACIAR, utilising AusAID funds through the ASLP, and facilitated by two Queensland Department of Primary Industries and Fisheries (QDPI&F) officers, Rowland Holmes and Chrys Akem, who are based in Ayr.

The 11 Pakistani visitors, who included mango growers, exporters, researchers and horticulture development officers, were briefed on Queensland's mango industry and taken to several modern orchard operations around Ayr.

Our first stop was Queensland Emu Exports, a mango orchard and packing shed belonging to John Morton, who had visited Pakistan earlier as part of an Australian team. The following day we saw mechanised harvesting in operation and visited a gene collection comprising 300 mango varieties from around the world.

At Mareeba, comprehensive presentations were given by scientists at the QDPI&F Mareeba Research Station, and we visited Lagoma Orchards where a computerised micro-irrigation system makes it possible for just two people to manage a 100-ha farm. At Diamond Star, a farm and packing shed with a high-tech vapour heat treatment (VHT) facility, a harvest of mangoes was being packed for export to Japan under Japanese supervision.

We found the Australian farmers' direct involvement in orchard management and postharvest operations, which is not common in Pakistan, to be of great interest.

At the DPI&F in Indooroopilly, general manager John Chapman highlighted the importance of mangoes for Australia and Pakistan. We were given presentations on building and managing supply-chain relationships; achieving commercial success through the supply-chain approach; disinfestation and area-wide management; and postharvest disease identification and control.

At Maroochy Research Station we had a technical presentation on postharvest handling and a briefing on the activities planned under ASLP.

The delegation concluded that the Australian mango industry has large, economical farm sizes that enable it to absorb technology, and this facilitates access to production and postharvest management technologies. The farmers control quality through

Tree with advanced mango sudden death syndrome (MSDS).
PHOTO: ROBIN TAYLOR

For example, at harvest, fruit is often dropped from the tree by either cutting or hitting with a pole, causing severe bruising. Trees are harvested once only each crop, meaning that some fruit will be immature.

"Wide variations among prices at farm, wholesale market and retail levels highlight a system where there are few rewards for quality," Professor Collins says. "And returns are distributed quite unevenly, favouring middlemen."

At the retail level, most mangoes are sold by street hawkers, who purchase their daily requirements from the local wholesale market and have little storage space and no cool rooms. They sell fruit and vegetables from mobile carts or street stands shaded by umbrellas or tarpaulins. At the start of the day the price of mangoes starts high, at about 30 rupee per kilogram, and by the end of the day they may sell for as little as 5 rp/kg (about 10c/kg).

Professor Collins says that a couple of major retail chains are planning to enter the Pakistan market within the next two years. To sell to these outlets the industry would need to meet strict quality specifications. Other multinational companies are also looking to source mangoes from Pakistan to supply supermarkets overseas, which would also require the industry to meet quality, food safety and traceability standards.

The researchers identified major problems at all stages of the supply chain. Poor production systems were combined with inadequate handling, storage and transport.

"The industry faces some major challenges, particularly in postharvest handling systems," Professor Collins says. "There is very little cool storage, and with temperatures often around 50° C during harvest, fruit has a very short shelf life."

Grading and packing is usually carried out in the field, or sometimes in open sheds with earthen floors. Wooden crates are packed until they bulge and the lid is nailed on. Damage occurs from bruising and punctures

well-managed operations starting from growing, harvesting, grading and packing through to storage and ripening. Australia has a well-developed services sector complemented by effective research, extension and industry linkages.

The Australian experience can be replicated in Pakistan in phases if modified to our agro-ecological and socioeconomic conditions. In the short term we should concentrate on selected groups of farmers, traders and service providers who have the means to improve.

We need technical support from Australian institutions like the QDPI&F and the University of Queensland in collaboration with Pakistan's Horticulture Development and Export Board (PHDEB) and universities, as well as provincial agricultural research and extension departments.

In the medium to long term we need to form associations of farmers and traders to take the lead in industry development. Improved production and postharvest management technologies in the whole of the value/supply chain is necessary, as is human resource development through training and degree courses.

** Sosheel Godfrey is the program leader for the Australia Pakistan Agriculture Sector Linkages Program (ASLP); Muhammad Iqbal is chief operating officer of the Pakistan Horticulture Development & Export Board (PHDEB).*

Muhammad Iqbal (standing, fifth from right) and the ASLP Pakistani mango delegation at Johnson Mangoes in Ayr, Queensland. PHOTO: SOSHEEL GODFREY

by nails in the crates. Commission agents also request overloading of trucks, so they can minimise the cost of transport and market levies, which are charged on a per truck basis.

Growers need better access to information, specific skills training and more incentive to take responsibility for the quality of mangoes they produce.

Commission agents hold most of the power in the supply chain and improvements depend on their support and involvement.

The researchers also looked at transport issues. Air space out of Pakistan is limited during the mango season as all airfreight goes on passenger planes. The exporters only get short notice of air space availability, so they are forced to source from the nearby major markets. Many exporters complained about the limited cool storage at Karachi airport and loads are often left sitting on the tarmac, where temperatures can exceed 40˚ C.

In terms of sea freight, many of the small vessels sending fruit to the Middle East are slow, inefficient and barely seaworthy but continue to be used due to cost. Open containers offer no protection or temperature control. Some of the issues associated with exported fruit that the researchers identified were: carton collapse, short shelf life and breakdown from disease, dehydration and shrivelling, damaged fruit and over-ripe fruit.

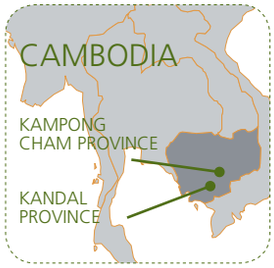
On the export market mangoes from Pakistan have a reputation for being cheap and of low keeping-quality, albeit with good flavour.

Exporters are eager to learn how to extend mango shelf life and how to access new markets; and there is a clear need for technical information to improve exporters' practices.

With this in mind, Professor Collins says the new project aims to identify present market needs and likely future opportunities for mangoes from Pakistan, analyse existing supply chains and develop improved supply-chain management systems and practices.

The two new projects, which have been developed following scoping studies, will be carried out by teams from UQ, QDPI&F, Department of Agriculture and Food, Western Australia, the Pakistan Horticulture Development and Export Board, the University of Agriculture, Pakistan, and the Pakistan Agricultural Research Council.

The first project will focus on improving crop management practices to increase yield and quality, as well as developing improved tree husbandry and management options, improving detection and management of MSDS and other diseases, and building the capacity of the mango industry to undertake integrated crop management. The second project will focus on optimising supply chains by looking at mango quality improvement and maintenance, market research and developing demonstration supply chains. ■



PARTNER COUNTRY: Cambodia PROJECT: Improvement of vegetable production and postharvest management systems in Cambodia and Australia (HORT/2003/045)
DESCRIPTION: Researchers are looking to improve Cambodian tomato and chilli production performance throughout the supply chain
CONTACT: Mark Hickey, mark.hickey@agric.nsw.gov.au

Home-grown crop diversity

Cambodian government agricultural agencies are collaborating with Australian partners in an ACIAR project to improve tomato and chilli production as part of a broader diversification of agricultural production into vegetable crops

BY CHRIS GREENWOOD

Traditionally, rice has been Cambodia's main agricultural crop, but since achieving rice self-sufficiency in the late 1990s the focus has moved towards crop diversification into vegetable production, which has the potential to provide farmers and their families with higher returns. At present, vegetable production is low due to an unreliable supply of seeds, high input costs and lack of knowledge of postharvest handling.

An ACIAR project has set out to develop sustainable 'systems' improvements across the transport, storage, processing and export sectors, which can be readily adapted to a range of commodities. On the way, it hopes to improve the capacity of Cambodian staff in the management of postharvest crop techniques and agribusiness supply chains.

Project partners include the Cambodian Agricultural Research and Development Institute (CARDI), the Department of Agronomy and Agricultural Land Improvement (DAALI), the Asian Vegetable Research and Development Center (AVRDC) Taiwan and the NSW Department of Primary Industries (DPI) in Australia.

Heng Chhun Hy, vice-chief of DAALI's Plant Protection and Phytosanitary Inspection office, is one of the local managers of the project. "The project is important to Cambodia because 85% of our population live on the land and the majority grow rice," he explains. "There is growing demand for vegetables, but local farmers cannot meet this demand, so much of what is needed is imported. We hope we can replace some of these imports."

The first year of the project has involved a number of tomato trials at the CARDI and DAALI research stations in Cambodia and in Australia.

"We are testing a number of hybrid seeds from the AVRDC – World Vegetable Center as well as some varieties popular in Vietnam," Mr Chhun Hy says. "In all, we are field-testing 12 foreign tomato varieties and one local variety."

Now in the second year of the project, the selection has been narrowed down to five varieties, from which

CARDI plant breeder Charya Nin and CARDI's deputy head of agricultural engineering Som Bunna

CAMBODIA
CROP DIVERSIFICATION

Som Bunna, deputy head of agricultural engineering, inspects tomato plants at the CARDI research site at Prateah Lang Commune, Dangkor, Phnom Penh.

PHOTOS: CHRIS GREENWOOD

Heng Chhun Hy, DAALI's vice-chief of Plant Protection and Phytosanitary Inspection office.
PHOTOS: CHRIS GREENWOOD

will be selected the best varieties to introduce to farmers in 2008.

DAALI works with about 40 farmers along the Mekong River in Kampong Cham and Kandal provinces.

"We are working with farmers who are already growing vegetables and have the desire to improve their business but lack the knowledge to do so," Mr Chhun Hy says. "The distribution channels already exist, but farmers suffer up to 30% product loss from farm to market, as well as losses in overall quality, which see their market price even further reduced.

"Not only are we looking to improve our farmers' choice of varieties, but we want to develop postharvest storage and transport systems that enhance the quality of Cambodian tomatoes and allow them to compete better on the market."

Another part of the project is determining optimum nitrogen applications and developing drip irrigation techniques for reduced water use and improved time management.

The success of such a multifaceted and 'whole of chain' approach depends on partner organisations providing their skills to the project.

CARDI's Som Bunna says three divisions of his organisation are involved with the project: Plant Breeding in the field-testing; Socioeconomics in supply-chain and marketing surveys; and Agricultural Engineering in focusing on improving postharvest management of the crop.

"Initial trials have focused on the evaluation of the postharvest performance of the 13 tomato varieties," he says. "We are analysing tomatoes for quality attributes (sugar, acidity) and shelf life (how long they can be stored at 20˚ C or under ambient conditions and still be acceptable in the marketplace).

"There are a number of varieties that may be popular with Cambodian farmers because they are high-yielding, but they have poor postharvest characteristics, such as short shelf life or splitting, so they must be rejected."

MARKET CHAIN ANALYSIS

The marketing and supply-chain analysis is under the supervision of CARDI's Lor Bunna, deputy head of CARDI's Socioeconomic division.

"We've been collecting market prices for more than a year to build up a picture of seasonal fluctuations," he says. "We have also surveyed growers, retailers and sellers to determine the dynamics of the market."

Mr Lor Bunna says that besides building a complete picture of the tomato and chilli supply and value chains

in Cambodia, he hopes this study will enable CARDI to contribute to government policy on the diversification of vegetable production.

"Cambodian farmers have good soils and a good climate, but lack infrastructure. If we are successful in this tomato and chilli project, we will move quickly to the extension components, providing seeds, training and information to farmers.

"Hopefully they can also extend this approach to other crops and begin to replace the mountain of vegetable imports from neighbouring countries such as Thailand and Vietnam, which both have more sophisticated and competitive agricultural sectors."

CAPACITY BUILDING

The capacity-building aspects of this project are being delivered in several ways.

To coincide with harvest time, in February 2006 Dr Suzie Newman, of the NSW DPI, conducted training in Cambodia on setting up postharvest trials and quality and shelf-life assessment.

This was followed in March and April 2006 with a training visit by several Cambodian staff, including CARDI's Som Bunna, to Yanco Agricultural and Gosford Horticultural Institutes.

Along with other training activities in postharvest and field management, the visitors saw tomato and drip-irrigation trials, and surveyed Cambodian vegetable growers in western Sydney. ■

Thevy Hok

The farmer and the wholesaler

FARMER

Vegetable grower Pich Pho discovered the benefits of agricultural research in 1996 when he sought advice from the Cambodian Department of Agronomy and Agricultural Land Improvement (DAALI) to improve his onion and radish crop.

So began a 10-year relationship that has seen him replace his old crop with more profitable tomato, long bean and cucumber crops, and become the leading farmer in Kandal Loue village in Kandal province, 30 kilometres south of Phnom Penh.

Pich Pho

"The DAALI advisers have given me information to manage and improve my crops," he says. "I use the seed they produce because it is resistant to pests and better meets the needs of the market so I can get a better price.

"If I had not taken advantage of the advice they provided I would still be farming – I have no choice, it is all I know – but my income would be half what it is today."

As a leading farmer in the area, he is no stranger to being asked for advice himself: "More than a thousand people came to visit me last year and ask me how to cultivate crops like tomato and long bean."

In the rainy season, when no crops can be planted, Mr Pho can spend up to two hours a day talking to his visitors. Organisations also invite him to participate as a guest lecturer at agricultural field days around the region.

DAALI is taking advantage of Mr Pho's good standing within the farming community. He will be one of the first to participate in the roll-out of the new tomato varieties developed by the project, with a pilot trial plot earmarked for his farm in 2008.

WHOLESALER

Thevy Hok is the only wholesaler of Cambodian-grown tomatoes in the Chba Umpov market, which is one of only three wholesale vegetable markets in the country's capital, Phnom Penh.

Mrs Hok sells to all the retail markets and a number of food service-providers in the city. Depending on the day, she sells between one and three tonnes of tomatoes at an average price of about 900 riel per kilogram (around A$0.28).

She has been selling tomatoes at this market for seven years and says her customers prefer Cambodian tomatoes, but it is often difficult to get enough to meet demand.

"Vietnamese tomatoes are often of a lower quality, yet they sell at a higher price because they offer constant and year-round supply," she says. "I would sell many more kilos of locally grown tomatoes if they were available. The quality is OK, they keep longer and I can buy them at a good price."

Mrs Hok says consistency of quality can be a problem with the local product, but she has few quality worries because she has a middleman who buys to order from the farmers in Kandal province. Although sold through the same channels, second-grade tomatoes often fetch 20–30% less than first-grade product; any lower quality than that and she instructs her buyer not to buy from the farmer in the first place.

PARTNER COUNTRIES: Indonesia, the Philippines
PROJECTS: Artisanal shark and ray fisheries in Eastern Indonesia: their socioeconomic and fisheries characteristics and relationship to Australian resources (FIS/2000/062); Management and policy frameworks for illegal, unreported and unregulated (IUU) fishing in Indonesian and Philippine waters (FIS/2002/019)
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Data harvest yields fisheries' future

Shark longline boats in Lombok PHOTO: WILLIAM WHITE

Against a backdrop in Indonesia of over-fishing, illegal fishing and accelerating demand by China for shark fins, two ACIAR projects ran side-by-side to provide basic biological information about Indonesia's sharks and rays – a virtually unexplored world – and the local economies they underpin

BY KAREN MCGHEE

Before Australian fisheries biologist Dr William White visited Indonesia, he thought that gathering information about the sharks and rays caught by local fishermen would be a reasonably straightforward task. But his first forays into the fish markets of Australia's northern neighbour six years ago quickly taught him otherwise.

"We found all these species that just didn't fit in with what we knew," says Dr White, who was working at the time on an ACIAR project exploring artisanal shark and ray fisheries—traditional operations run along subsistence lines—in eastern Indonesia. He saw sharks and rays of sizes and in locations that were not expected, and encountered species that turned out to be new to science.

The work grew, by necessity, into the most extensive biological and taxonomic investigation of Indonesian sharks and rays ever undertaken, a collaborative effort that ultimately involved scientists from Australia's CSIRO and Murdoch University and Indonesia's Institute of Sciences (LIPI) and Research Centre for Capture Fisheries (RCCF).

Dr White and his Indonesian colleagues, Dharmadi and Fahmi, trained local people in rudimentary aspects of shark and ray biology and taxonomy and, with their help, documented more than 40,000 individual sharks and rays from 14 fish landing sites and markets across Indonesia's east. Basic biological data, such as size and sex, were recorded for almost half of these.

At least 20 new shark and ray species were discovered and late last year ACIAR released a bilingual book, *Economically important sharks and rays of Indonesia*, based

on the project's findings (see box). It will radically expand global awareness of Indonesia's sharks and rays, and is seen as a critical tool for further research into commercial fish stocks of interest to Indonesia and Australia.

"Indonesia is the centre of the world's shark and ray diversity," says Dr White, a former postgraduate student at Murdoch University who recently joined CSIRO Marine and Atmospheric Research in Hobart. "Only about 60 species have been recorded from the more intensely studied North Atlantic Ocean, and yet we recorded 137 species just at fish markets in Indonesia—and these fishermen don't even fish below 500 metres. If you went below these depths you could expect to find a large number of additional species."

During the past 50 years, Indonesia's extraordinary shark and ray diversity has developed into a critical commercial commodity for many millions of people throughout the archipelago.

Massive growth in the exploitation of sharks has been driven in the region, as it has elsewhere in the world, by one key factor: escalating demand from China for shark fins. Almost all species are targets and large dried fins can attract as much as US$1,500 each in Hong Kong. Unsurprisingly, the biodiversity and socioeconomic implications of the fin trade for Indonesia are enormous.

"Shark fins have really become an important source of income for millions of poor fishermen in Indonesia," says Dr Steve Blaber, project leader of ACIAR's shark and ray research. He has been involved with fishery studies in the region for almost two decades and believes most areas are now severely over-fished.

"When we began collaborating with the Indonesians 20 years ago, the government's view was that there were still lots and lots more fish to be exploited and they wanted production to be increased enormously," recalls Blaber. "But in the past five years we've managed to change the mindset in Indonesia on fisheries, and they now acknowledge that these are not bottomless resources that can continue to be exploited—they've got to be managed."

Dr Subhat Nurhakim, the Indonesian project leader, explained that Indonesia is now particularly concerned that over-fishing could lead to the collapse of its shark and ray stocks, with devastating consequences for the millions of people in the country now reliant on them. There is also anxiety that international pressure could force a downturn in the legal but widely condemned shark-fin trade, and that this will also cause hardship for local fishermen and their families.

Like the shortfall in basic biological knowledge about Indonesia's sharks and rays, there is also a dearth of knowledge about the local economies these fish underpin. So while Dr White's study was gathering baseline biological and taxonomic data, Dr Malcolm Tull, Associate Professor of Economics at Murdoch University, was steering research for ACIAR to gain a better understanding of the socioeconomic issues surrounding eastern Indonesia's artisanal shark and ray fisheries.

Similarly to the biologists, Associate Professor Tull, who was assisted by Simon Vieira, an honours student now working for the Australian Bureau of Agricultural and Resource Economics (ABARE), also relied on close collaboration with Indonesian researchers Dr Heri Purnomu and Ms Tenny Apriliani. The socioeconomic research involved gathering information at fish landing sites and markets.

"We collected catch data, market-price data, sales data—anything we could get to give us an estimate of the value of the trade in sharks and rays; and we also made estimates of boat operational data," Associate Professor Tull says.

It was preliminary work that will set the stage for a more expansive investigation, but it has been sufficient, so far, for Associate Professor Tull and his colleagues to prepare advice on policy and management strategies to support more sustainable economic activity for the region's subsistence fishermen. The work confirms that a 'one-size-fits-all' approach to managing the various small local economies that exploit sharks and rays in Indonesia will not work. "Our argument is that there will need to be a disaggregated approach," he says.

Book review

ECONOMICALLY IMPORTANT SHARKS AND RAYS OF INDONESIA (HIU DAN ARI YANG BERNILAI EKONOMIS PENTING DI INDONESIA)

By W.T. White, P.R. Last, J.D. Stevens, G.K. Yearsley, Fahmi and Dharmadi, 2006. ACIAR Monograph No. 24, Canberra, 335pp. $47 incl. GST.

The management of commercially important fisheries and the conservation of threatened species share a basic need: the correct identification of the species involved. Similar-looking species do not always have the same biological attributes, such as maximum size and age, number of progeny, food, or habitat. All are important in designing and implementing management or recovery plans.

Indonesia has the largest fishery for sharks and rays in the world, hence the importance of this identification guide to the country's economically important sharks, rays and chimaeras. Written in English and Indonesian, the 335-page soft-cover book provides descriptions of 137 species, including common and scientific names, colour photos of the whole animal and underside, drawings of teeth and other features, size, distribution, habitat, biology, fisheries, IUCN conservation status and an Indonesian distribution map. A key to the 34 separate families is also included.

Sharks and rays are among the most threatened marine vertebrates, closer to marine mammals and reptiles than fishes because of their internal fertilisation and relatively low number of progeny (as few as one per litter for the gulper sharks, *Centrophorus*). Good catch statistics for the more fragile species are as important for conservation monitoring as for fisheries management. This concise volume should be in the hands of every fisheries officer in the field in Indonesia.

– **John R. Paxton**, Australian Museum, Sydney

PHOTOS: WILLIAM WHITE

(Above) Fahmi and Jenny Giles taking genetic samples; (right) drying shark fins.

The big question now for Barney Smith, ACIAR's fisheries research program manager, and his Indonesian counterparts in the Indonesian Ministry of Marine Affairs and Fisheries, is how best to capitalise on the strong biological and socioeconomic foundations established through this collaborative research effort.

ACIAR is keen also for future work to draw on the experience and expertise gained from another recently completed ACIAR project involving the Indonesian fishing industry. The project explored issues relating to illegal, unregulated and unreported (IUU) fishing in the Sulawesi Sea. IUU fishing has become a hot topic world-wide in recent years because, without full reporting, accurate monitoring becomes impossible, and therefore also the ability to detect accelerating stock collapses and biodiversity losses. The team working on this project comprised Dr Martin Tsamenyi and Associate Professor Ron West, from the University of Wollongong's Centre for Maritime Policy, and their Indonesian colleagues Dr Subhat Nurhakim, Dr Etty R. Agoes, Dr Purwanto, Budi Iskander and Dr Gede Sedana Merta.

The maritime boundaries in the Sulawesi Sea are fuzzy, but essentially the northern section is controlled by the Philippines, while Indonesia has rights to the west. Local fishing fleets exploit confusions about the boundaries, but both nations also have problems with several countries known to be fishing illegally in the sea.

Dr Tsamenyi and Associate Professor West acted as facilitators to guide Indonesia and the Philippines through shaping the legal and policy frameworks thought necessary to address the increasing incidence of IUU fishing in the Sulawesi Sea, and the project is now regarded as a case study with wider application.

"When we started in mid-2003, knowledge and awareness in Indonesia and the Philippines of issues relating to IUU fishing was almost nil," Dr Tsamenyi says. "Half-way through the project, addressing the problem became a national priority for both countries."

Through the efforts of the project team, the Philippines and Indonesia have now entered into an agreement to tackle the problems at a bilateral level. The two nations have committed to work together on joint stock assessments, sharing information on matters such as the licensing of boats and exploring the possibility of sharing surveillance information.

Although the Indonesian Government estimates that IUU fishing costs it US$2 billion annually, it remains a poorly understood parameter in its shark and ray fisheries.

When it comes to the artisanal operators, the IUU fishing issue becomes particularly murky. Indonesian and Australian researchers are reporting that there is a rising trend for large-scale operators to fund traditional fishermen to supply shark fins. These fishermen would once have used all parts of any sharks they caught, but increasingly there are direct economic incentives for them to invest greater effort in chasing more sharks and supply just fins. The lines between commercial and subsistence fishing are, as a result, becoming increasingly blurred.

According to Mr Smith, the sort of diplomatic and legal parameters used to steer a path to resolution in the Sulawesi Sea might go a long way to addressing IUU issues now thought to be besetting Indonesia's shark fisheries. ■

Partnership key to progress

Dr Achmad Suryana, director general of the Indonesian Agency for Agriculture Research and Development

BY ROBIN TAYLOR

Growing up in a small village in west Java in the 1960s, Achmad Suryana decided to pursue a career in agriculture because he recognised its importance to the country's economy.

Now, Dr Suryana is director general of the Indonesian Agency for Agriculture Research and Development (IAARD) and a member of ACIAR's Policy Advisory Council. He heads an organisation of 8,000 staff including 1,800 researchers, who carry out research into food crops, horticultural crops, estate crops (such as palm oil and coconut) and livestock.

After completing Bachelor and Masters degrees in agricultural economics at Bogor Agricultural University, he went to the US for four years to complete a PhD in economics at North Carolina State University.

"I chose agriculture as a profession because at that time it was the backbone of the Indonesian economy," Dr Suryana says. "Even today, although only 16% of the GDP of Indonesia comes from agriculture, 40% of Indonesian workers are employed in agriculture and 70% of people in Indonesia live in rural areas, most of them below the poverty line."

He strongly believes that agriculture has an important part to play in improving the economy and the livelihoods of the poor.

ACIAR and IAARD have a long history of collaboration and Dr Suryana has been involved with ACIAR projects since the early 1980s. He cites some examples of these successful collaborations, such as the series of projects to improve the quality of Bali cattle and ACIAR's response to the December 2004 tsunami, which included a project to rehabilitate degraded aquaculture ponds in Aceh.

"I very much appreciate the partnership model of ACIAR projects because we can share our views, and our researchers can learn from working together with Australian scientists under the ACIAR framework," Dr Suryana says.

One of the main benefits he has seen delivered through collaborative projects between Indonesian and Australian researchers, supported by ACIAR, is an increase in research capacity, for institutions and for individual researchers, as a result of working with international colleagues.

On top of this, Dr Suryana says that "in many areas of research—in the livestock, food crops and economics sectors, for example—findings and recommendations from ACIAR projects have been extended and applied in the field."

Before taking over the leadership of IAARD in 2004, Dr Suryana held senior positions in the Ministry of Agriculture, most recently director general of food security.

As the research arm of the Ministry of Agriculture, IAARD is responsible for providing technology and information to help the other divisions (directorate generals) support improvements to livestock and crop production. Asked to describe the challenges and obstacles in achieving such goals, Dr Suryana says that limited infrastructure is a major obstacle.

He recently visited Australia for a meeting of the ACIAR Policy Advisory Council and toured CSIRO's Black Mountain laboratories in Canberra: "Compared to their facilities my agency has very limited capacity to come up with modern technology," he says.

"Another challenge is developing our human capital. There is a lack of opportunity for training, and researchers cannot keep up with new information."

But Dr Suryana believes collaborative work with organisations such as ACIAR is an important way to increase capacity. "I work very hard to give my best for the institute and I ask my staff to do the same. We have to be professional." ■

"Even today, although only 16% of the GDP of Indonesia comes from agriculture, 40% of Indonesian workers are employed in agriculture and 70% of people in Indonesia live in rural areas, most of them below the poverty line."

– DR ACHMAD SURYANA

ROUNDUP

Australia and Thailand working together

CANBERRA: On 23 and 24 November 2006, ACIAR hosted a joint agricultural research forum between Australia and Thailand. A grant from the Australia–Thailand Institute (ATI) made the forum possible.

The research relationship between Thailand and Australia has matured over the past few years and is now a non-aid, collaborative and co-investment system. A discussion between the two parties was therefore timely, to take stock of the changes and the possibilities those changes bring for future cooperation.

During the two-day meeting in Canberra the participants explored current and future research priorities in both countries and discussed common issues. The parties agreed that there are several research themes on which Australia and Thailand can cooperate with regard to agricultural research, both bilaterally and regionally.

The meeting was held in an open and constructive atmosphere and a full report was sent to the ATI for further consideration.

Dr Suthiporn Chirapanda, Deputy Permanent Secretary of Thailand's Ministry of Agriculture and Cooperatives, presents ACIAR's director Peter Core with a gift at the forum dinner.

PHOTO: ANUSORN SOMSIRI, WORLD VISION THAILAND

Vietnamese Vice-President visits ACIAR

CANBERRA: On Tuesday 10 October 2006, ACIAR had the honour of hosting a visit by the Vietnamese Vice-President, Madame Truong My Hoa. The Vice-President was in Australia as a guest of the Australian Government, and a visit to ACIAR was included in her itinerary in recognition of the long-standing relationship between Vietnam and ACIAR.

During the visit, ACIAR agreed to explore the scope for involving the Women's Union of Vietnam in a new horticultural project on indigenous vegetables. Development of the project proposal is well under way, and will aim to reduce rural and peri-urban poverty and enhance the role of women in the production, promotion, sale and consumption of Vietnamese vegetables.

(From left to right) interpreter Dr Bui Kim Chi, ACIAR director Peter Core, Vice-President of Vietnam Her Excellency Truong My Hoa, and His Excellency Mr Ha Van Hien.

Fun Run in the East Timorese sun

DILI: The 'Seeds of Life' (SoL) program's East Timor team raised $1,600 to win the First Lady's Cup and take home a kiss from the nation's First Lady, Kirsty Sword-Gusmão, in the annual 'Fun Run in the East Timorese Sun'.

Staff from the SoL program turned out in force to meet their country's First Lady at the annual fun run event, which was held in front of the Government Palace in Dili on Sunday 26 November 2006. All funds raised from the event went to the Alola Foundation for needy women and children in East Timor and to Rotary.

The First Lady's Cup is in fact a coffee mug on which are scribbled words of support for Xanana Gusmão. The mug was smuggled into gaol by the now First Lady during Gasmão's incarceration in Jakarta between 1992 and 1999. The cup presented to the team representative, Jose Edy, is now proudly displayed in the SoL office in Dili.

East Timor's First Lady, Kirsty Sword-Gusmão, presents Jose Edy from the 'Seeds of Life' program with the First Lady's Cup after his team's win in the annual fun run in Dili.

PHOTO: LEITH CARROLL

Cambodian Government award for ACIAR

PHNOM PENH: The Royal Government of Cambodia has recognised the contributions of a number of organisations to the agricultural development of the country, including ACIAR. The awarding of two Medals of Sahametrei to ACIAR director Peter Core and ACIAR deputy director John Skerritt was held at the Cambodian Agricultural Research and Development Institute (CARDI) on 9 January 2007, with the medal presented by the Prime Minister, His Excellency Samdech Hun Sen.

Since the 1990s, the Cambodian Government has worked to develop the agricultural sector in the country. Years of civil unrest prior to the 1990s saw both agricultural knowledge and scientific capacity severely diminished. The relationship between Cambodia and ACIAR has centred on the rebuilding and diversification of agriculture beyond rice-based farming systems.

ACIAR has developed a suite of projects aimed at increasing rice-based production systems, critical for food security in Cambodia. Increased yields, and the income that flows back to farmers from this, enable investment in non-rice crops. ACIAR has implemented a number of projects aimed at increasing Cambodian research capacity and farmer adoption of these non-rice-based crops, such as maize, soybean and vegetables.

Cambodian Prime Minister, His Excellency Samdech Hun Sen, presents Peter Core with an award in recognition of ACIAR's assistance with the agricultural development of Cambodia.

Developing the skills of agricultural scientists, through training and funding of small projects, has also been undertaken. Cambodian scientific capacity was behind world standards at the start of the 1990s. Through the Cambodian Agricultural Research Fund and short training courses, Cambodian scientists have received training to help deliver research that supports the government's aim of developing agriculture.

Speaking at the award ceremony, the Minister for Agriculture, Forestry and Fisheries, His Excellency Dr Chan Sarun, thanked the recipients for their help in the "building and strengthening of the agricultural research capacity of the Kingdom of Cambodia".

Country office staffer awarded Public Service Medal

JAKARTA: Mrs Mirah Nuryati, Assistant Country Manager for ACIAR's Indonesian office, located in the Australian embassy in Jakarta, was awarded a Public Service Medal in the 2007 Australia Day Honours List for outstanding public service in the development of collaborative agricultural research projects between Australia and Indonesia. Of those who were awarded the medal in 2007, Mirah is the only non-Australian citizen to receive the honour.

Mirah has worked at ACIAR for 14 years. She has been instrumental in bridging the cultural divide between Indonesian and Australian research institutions and scientists, establishing and maintaining professional relationships at all levels, from farmers to senior scientists and government officials, to international organisations, NGOs and the private sector. Mirah's calm, collected and professional approach has been invaluable, especially during the stressful periods following the Bali bombings, the Marriott Hotel bombing in Jakarta, and the 2004 tsunami.

Mirah has been an excellent ambassador for the Australia–Indonesia collaboration in agricultural research for development, promoting and representing ACIAR and the Australian agricultural research fraternity throughout Indonesia.

Mrs Mirah Nuryati receives her Public Service Medal from the Australian Ambassador to Indonesia, Mr Bill Farmer, and his wife Elaine.

ROUNDUP

Call for nominations for the 2007 Derek Tribe Award

Nominations are requested for the 2007 ATSE Crawford Fund Derek Tribe Award. The 2007 recipient will receive the award at a seminar or other public event, and deliver an address, known as The Crawford Fund Derek Tribe Award Address. In addition, the recipient will undertake a visit of about two weeks to agricultural centres in Australia with the intention of enhancing networking and links between the recipient's home institution and country and similar bodies and individuals in Australia.

The award marks the outstanding contribution of Emeritus Professor Derek Tribe, Foundation Director of the Crawford Fund, to the promotion of international agricultural research. It is made every two years to a citizen of a developing country in recognition of their distinguished contribution to the application of research in agriculture or natural resource management in a developing country or countries.

The inaugural Derek Tribe Award was made in 2001 to Dr Sanjaya Rajaram, a researcher in the wheat-breeding program at the International Maize and Wheat Improvement Center (CIMMYT) in Mexico. The recipients of the 2003 and 2005 Derek Tribe Awards were Dr Luis Salazar, Head of the Plant Protection Department, International Potato Center (CIP), Lima, Peru, and Professor Vo-Tong Xuan, Angiang University, Angiang, Vietnam.

Nominations close 2 April 2007. Nomination forms may be downloaded from www.crawfordfund.org/events/index.htm

New agribusiness research program

The importance of agribusiness partnerships in rural development has been recognised with a new ACIAR research program. ACIAR's agribusiness program is part of the AusAID-funded Support for Market-Driven Adaptive Research (SMAR) initiative, which focuses on the eastern Indonesian provinces of Nusa Tenggara Timur, Nusa Tenggara Barat and South and South-East Sulawesi.

Agricultural research and development have not always considered implications within the market, nor the value chains needed to deliver products into the market. This lack of market focus often limits the impact of research and development, and the ability to adopt changing technologies and subsequent benefits to rural communities. SMAR is designed to facilitate links throughout the value chain, helping smallholders, agribusinesses and supporting agencies access new knowledge that will deliver market results. By being market-focused in the commissioning of new research, SMAR will assist smallholders and others involved in the value chain to better meet the needs of, and be able to access, markets.

SMAR is part of the Australian–Indonesian Partnership within the Smallholder Agribusiness Development Initiative (SADI), whose overall aim is to improve incomes and productivity for farmers and agribusiness in Indonesia. Recent new appointments to SMAR include Dr Luthfi Fatah, research manager in Makassar, Sulawesi, and Dr Saediman Mboe, institutional development adviser based in Bogor, Java.

ACIAR's agribusiness program, which will be managed by David Shearer, will initially concentrate on the SMAR initiative. In the longer term, it is likely to expand beyond SMAR and Indonesia to address issues within the ACIAR mandate throughout the value chain—from the market to the producer.

NEW APPOINTMENTS

Liz Clarke

Liz Clarke is manager of the communications and secretariat unit. The unit is responsible for the communication of information generated through ACIAR's activities to stakeholders in Australia and partner countries; information management; and is the secretariat for the ACIAR Board of Management and Policy Advisory Committee. Prior to joining ACIAR, Liz worked with the Department of Employment and Workplace Relations, the Australian Taxation Office, CSIRO, the Environment Management Industry Association of Australia (EMIAA) and as director of Liz Clarke Communications. Liz has worked in communications and management for many years, and also as a scientist. She has a Bachelor of Agricultural Science from the University of Queensland, a Graduate Diploma in Communication (Public Relations) from Queensland University of Technology and has completed an executive course in general management at the Macquarie Graduate School of Management.

Bridget Knaus

Bridget Knaus joins ACIAR from the National Library of Australia where she was web content manager. Bridget has a Graduate Certificate in Scientific and Technical Communication. She has worked in the government and private sectors developing communication, training and information-management strategies. She has a strong interest in user-centred design and information design, having

worked for two years in the business design section of the Australian Taxation Office. Bridget has taken up the new role of information manager and will be assessing existing information-management systems for usability and functionality, as well as working to identify and implement changes to support the work of ACIAR.

David Shearer

David Shearer is research program manager for agribusiness. David joins ACIAR from the Victorian Department of Primary Industries (DPI) where he was responsible for enhancing the export performance of Victoria's agribusiness sectors in South-East Asia through linking Victorian Government agricultural researchers with their counterparts elsewhere in Australia and throughout Asia. Prior to this he worked as an extension horticulturalist for the Victorian DPI and with New South Wales Agriculture. David has a Bachelors degree in agriculture, a Masters in horticulture, and is completing a Masters in management.

Dr Paul Fox

Dr Paul Fox is the crop improvement and management research program manager. The crop improvement and management program aims to increase the productivity, sustainability and utilisation of significant field (broadacre) crops through identifying genetic or agronomic solutions to productivity constraints. Paul has a Bachelor of Agricultural Science (Hons) and a PhD from the University of Adelaide, specialising in plant breeding. He joins ACIAR from Grain Biotech Australia Pty Ltd, where he was general manager. Paul has worked at the International Center for Maize and Wheat Improvement (CIMMYT), as a breeder and pathologist, and ran the International Crop Information System and International Wheat Nurseries sections. He has also worked in the US as international product development manager for an international seed company.

Dr Gamini Keerthisinghe

Dr Gamini Keerthisinghe is the soil management and crop nutrition research program manager. The soil management and crop nutrition program focuses on projects designed in the context of a systems approach to conservation agriculture.

Gamini joins ACIAR from the Food and Agriculture Organization (FAO), where he was responsible for managing the crop improvement project portfolio of Asia–Pacific. He has led FAO team activities in natural resources management, marketing, extension and livestock programs, as well as in the response to the 2004 tsunami. Prior to joining the FAO he worked for CSIRO Plant Industry on crop nutrition research. Gamini has a Masters and PhD from Germany and has worked for the International Rice Research Institute and the University of Peradeniya in Sri Lanka. Gamini replaces Dr Christian Roth who moves across to the Land and Water Resources Research Program.

Emily Flowers

Emily Flowers is the new communications officer at ACIAR. Although Emily has held various roles at ACIAR over the past two years, her new position involves responsibility for distribution requests, the library, general ACIAR correspondence and website management. Emily has a Bachelor of Science (Hons) in resource and environmental management from the Australian National University, and her Honours work involved the impact of salinity on the breeding and development of a native frog species.

James Ransom

James Ransom joins ACIAR as information technology support officer with the information technology and infrastructure unit. He has a Bachelor of Information Technology Support with an e-business major from the University of Western Sydney and a TAFE diploma in systems administration. James will undertake the role as a trainee.

ROUNDUP

NEW PROJECTS

CP/2006/017	Management of *Eumetopina flavipes*: the vector of ramu stunt disease of sugarcane in Papua New Guinea
CP/2005/167	Optimising the productivity of the potato/Brassica cropping system in Central and West Java
FIS/2006/002	Aceh aquaculture rehabilitation project
FIS/2005/009	Technical capacity building and research support for the reconstruction of tsunami-affected brackish-water aquaculture ponds in Aceh
FIS/2003/033	Integrated fisheries resource management (Rinconada Lakes, the Philippines, and NSW, Australia)
FST/2004/053	Establishing forest-pest-detection systems in South Pacific countries and Australia
HORT/2005/157	Optimising mango supply chains for more profitable horticultural agrienterprises in Pakistan and Australia
HORT/2005/153	Development of integrated crop-management practices to increase sustainable yield and quality of mangoes in Pakistan and Australia
HORT/2005/134	The use of pathogen-tested planting materials to improve sustainable sweet potato production in Solomon Islands and Papua New Guinea
LPS/2004/046	Forage legumes for supplementing village pigs in Lao PDR
LPS/2004/022	Pasture development for community livestock production in the Eastern Cape Province of South Africa
LPS/2003/004	Building agricultural knowledge and R&D capacity in Timor Leste: a small projects facility
LWR/2005/001	Addressing constraints to pulses in cereals-based cropping systems, with particular reference to poverty alleviation in north-western Bangladesh
LWR/2004/033	Zero-tillage rice establishment and crop-weed dynamics in rice and wheat-cropping systems in India and Australia
SMCN/2005/118	Restoration of annual cropping in tsunami-affected areas of Nanggroe Aceh Darussalam province, Indonesia
SMCN/2004/078	Evaluation and adoption of improved farming practices on soil and water resources on Bohol Island, the Philippines

NEW PUBLICATIONS

Monographs

ECONOMICALLY IMPORTANT SHARKS AND RAYS OF INDONESIA

The identification of species of sharks and rays is important for catch monitoring and fisheries management. This comprehensive guide, written in English and Indonesian, is the first of its kind to provide identifications of the sharks and rays marketed in Indonesia. *W.T. White, P.R. Last, J.D. Stevens, G.K. Yearsley, Fahmi & Dharmadi, 2006, ACIAR Monograph 124, $47.00 GST inclusive (plus postage and handling).*

Proceedings

IMPROVING YIELD AND ECONOMIC VIABILITY OF PEANUT PRODUCTION IN PAPUA NEW GUINEA AND AUSTRALIA

Peanuts are an important cash crop and nutrition source for smallholder farmers in PNG. This publication details the proceedings of a workshop following ACIAR research focusing on seed and product quality, private-sector involvement and estate and smallholder production. *Rao C.N. Rachaputi, Graeme Wright, Lastus Kuniata and A. Ranakrishna (eds), 2006, ACIAR Proceedings 122, $40.00 GST inclusive (plus postage and handling).*

HEART ROT AND ROOT ROT IN TROPICAL *ACACIA* PLANTATIONS

Fast-growing hardwood plantations are increasingly important to the economies of many countries around the Pacific rim, including Australia, Indonesia and the Philippines. Understanding and managing heart and root rot can substantially boost the productivity and value of hardwood species. *Karina Potter, Anto Rimbawanto and Chris Beadle (eds), 2006, ACIAR Proceedings 124, $25.00 GST inclusive (plus postage and handling).*

COCONUT REVIVAL: NEW POSSIBILITIES FOR THE 'TREE OF LIFE'

These proceedings document the range of topics covered at the International Coconut Forum held in Australia in 2005, including R&D, business and government, and regional and international agency interests. *S.W. Adkins, M. Foale and Y.M.S. Samosir (eds), 2006, ACIAR Proceedings 125, $25.00 GST inclusive (plus postage and handling).*

Technical reports

CONTROLLED POLLINATION METHODS FOR *MELALEUCA ALTERNIFOLIA* (MAIDEN & BETCHE) CHEEL

The production of tea-tree oil from *Melaleuca* species in Australia has been undertaken for 80 years. This is a practical guide to production of controlled-cross seed of *M. alternifolia* including techniques that may be adaptable to related species cultivated for essential oils and in other locations. *Liliana Baskorowati, 2006, ACIAR Technical Report 63, $17.00 GST inclusive (plus postage and handling).*

Working Papers

THE SEAWEED INDUSTRY IN THE PACIFIC ISLANDS

Pacific island governments and communities are constantly seeking to tap new and established international markets for their farm produce. *Dennis J. McHugh, 2006, ACIAR Working Paper 61*

REPORT ON A REVIEW OF ACIAR-FUNDED PROJECTS ON *RHIZOBIUM* DURING 1983–2004

An overview of *Rhizobium* science and inoculation as a means of facilitating nodulation and nitrogen-fixation of legumes. *David F. Herridge, 2006, ACIAR Working Paper 62*

Impact Assessment Series

FUTURE DIRECTIONS FOR ACIAR'S ANIMAL HEALTH RESEARCH

An assessment of ACIAR's work in meeting the escalating demand for animal protein in the Asia–Pacific region, focusing on delivering sustainable increases in livestock and fisheries production for poor farmers and consumers. *Ian Patrick, David Kennedy, Simon Hearn and Peter Rolfe, 2006, ACIAR Impact Assessment Series 38*

BENEFITS TO AUSTRALIA FROM ACIAR-FUNDED RESEARCH

While funding research in developing countries, ACIAR also delivers benefits to Australia and, in particular, Australian agriculture. *David Pearce, Michael Monck, Kevin Chadwick and James Corbishley, 2006, ACIAR Impact Assessment Series 39*

ZERO TILLAGE FOR WEED CONTROL IN INDIA: THE CONTRIBUTION TO POVERTY ALLEVIATION

This report took the opportunity of an existing survey in India to try to measure poverty-reduction effects of research. *James Corbishley and David Pearce, 2006, ACIAR Impact Assessment Series 40*

ACIAR AND PUBLIC FUNDING OF R&D: SUBMISSION TO THE PRODUCTIVITY COMMISSION STUDY ON PUBLIC SUPPORT FOR SCIENCE AND INNOVATION

A submission to the Productivity Commission study on ACIAR's unique and interesting role, which transcends both Australia's aid program and its innovation system. *ACIAR, 2006, ACIAR Impact Assessment Series 41*

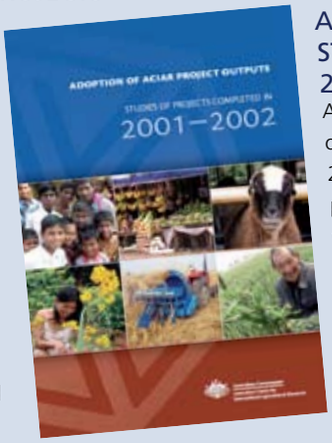
BENEFITS TO AUSTRALIA OF SELECTED CABI PRODUCTS

CAB International is one of the 15 International Agriculture Research Centres that ACIAR provides funding to, and from which benefits flow to Australia. *David Pearce and Michael Monck, 2006, ACIAR Impact Assessment Series 42*

WATER MANAGEMENT IN PUBLIC IRRIGATION SCHEMES IN VIETNAM

ACIAR's impact on irrigation systems is improving public systems in Vietnam. *David Harris, 2006, ACIAR Impact Assessment Series 43*

Corporate Publications



ADOPTION OF ACIAR PROJECT OUTPUTS: STUDIES OF PROJECTS COMPLETED IN 2001–02

A study of the uptake of project results and their impact on local communities from eight projects completed in 2001–02. These studies help ACIAR determine research priorities and improve its capacity to select projects that will be scientifically successful and have a lasting benefit. *Viv McWaters and Jeff Davis (eds), 2006*

COUNTRY PROFILES 2006

Updates on project activities and progress, at the country level and for each active project, by country. Projects that have been recently completed are reported on, with projects under development listed. Indicative priorities for the period are also listed, together with relevant publications. Countries included are: Papua New Guinea, Pacific islands, Indonesia, East Timor, the Philippines, Vietnam, Thailand, Cambodia and Laos, South Asia and China. Each profile covers the period from July 2005 to June 2006.

ANNUAL REPORT 2005–06

ACIAR's annual report for the 2005–06 financial year focuses on project activities by country for the period, as well as statutory obligations and ACIAR's financial performance.

ACIAR'S DISTRIBUTION POLICY

ACIAR provides complimentary copies of its publications to developing-country libraries, institutions, researchers and administrators with an involvement in agriculture in the Asia–Pacific region, and to any scientist involved in an ACIAR project.

For enquiries about complimentary copies, please contact ACIAR's communications unit, comms@aciar.gov.au. For other customers, please use our online ordering facility at www.aciar.gov.au, or direct enquiries to our distributors, National Mailing & Marketing, PO Box 7077, Canberra BC ACT 2610, Australia, phone +61 2 6269 1055, fax + 61 2 6260 2770, aciar@nationalmailing.com.au

Copies of most publications are available as free downloads from the ACIAR website, www.aciar.gov.au

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.

Cambodian children with the family's freshly harvested chilli.

PHOTO BY BRAD COLLIS