



Australian Government

Australian Centre for International Agricultural Research

NOVEMBER 2008 – FEBRUARY 2009

www.aciar.gov.au

partners

IN RESEARCH FOR DEVELOPMENT



**FOCUS ON
FOOD SECURITY**

**'SEAFOOD' FROM SALINE SOILS
THE BUSINESS OF SUSTAINABILITY
HIGH RETURNS FROM AGRICULTURAL RESEARCH**



ACIAR

www.aciar.gov.au

partners
IN RESEARCH FOR DEVELOPMENT

RESEARCH RELATIONSHIPS MANAGE FOOD SECURITY COMPLEXITIES

The food crisis is seemingly on everyone's lips these days and has prompted a flurry of commentary in national and international media pushing explanations ranging from global warming through to international trade policies, the emergence of biofuels, increasing urbanisation and population growth (see page 4).

The strain on food production and food supplies is the culmination of numerous and complex factors—environmental, social and political. The first communities to suffer are those in developing countries where the link between enough food and farming is most direct. For the majority of the world's people there is no vast retail and food-manufacturing infrastructure buffering them from agricultural constraints.

These constrictions pose challenges that test the limits of agricultural knowledge and science, and they pose challenges that also continue to present researchers and policy-makers with shifting targets as overarching factors bear down—in particular climate change and the capacity of pests and diseases to evolve their way past previously built defences.

The spectre of global food shortages looms closer and larger with each passing season. The pressure on agriculture is immense and it is at the ground level of agricultural production that ACIAR's research management performs a critical role.

For a comparatively small organisation, ACIAR's reach and impact is deep and wide. This is because it has established over almost three decades a highly successful model for supporting international agricultural research. For most in the developed world, food security is a recent worry, but it has been ACIAR's focus since its inception.

ACIAR is a facilitator. It creates research partnerships that entwine the advanced agricultural science available in countries like Australia with the needs and circumstances of smallholder farmers in developing countries. It plays a 'linchpin' role, drawing together

partnerships that apply the best possible skill-sets to each challenge at hand, and in a manner that leaves a legacy of increased local capacity within the communities involved. ACIAR's work is shown to bring high rates of return to developing countries, in part because of its investment in capacity building (see page 24).

This capacity building extends beyond the nuts and bolts of agricultural research. It embodies a systems approach that reinforces changes, such as modified cropping or livestock activities, with specialist support for associated policy development and trade reform at government level.

A prime example of this is ACIAR's role in the Smallholder Agribusiness Development Initiative in Indonesia—an extensive collaboration between a wide spread of research providers and commercial businesses (see page 8). It is driving a new 'market pull' approach to agricultural development among poor rural communities by establishing mutually supportive relationships between farmer groups and their produce buyers. The changes needed to create more sustainable and productive farms are given a direct commercial value, which is proving to be a strong stimulus for farmer adoption of research

The initiative exemplifies ACIAR's experience in leveraging research and funding relationships to maximise the outcomes and benefits. The program is funded by AusAID, with ACIAR drawing together strategic partnerships among research providers, farmer groups and private companies like the global confectionary and pet food corporation Mars, Incorporated.

As president director of Mars Symbioscience Indonesia, Noel Janetski, says in this issue's report on the program, ACIAR brings to projects the required technical capabilities and also enormous credibility—crucial ingredients that make an often eclectic mix of stakeholders willing to work together to achieve what the world so desperately needs—sustainable, resilient and productive farming systems. ■

Partners in Research for Development is the flagship publication of the Australian Centre for International Agricultural Research (ACIAR). *Partners* 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.

This publication is freely available from ACIAR'S website at www.aciar.gov.au. It is also freely available on request from ACIAR.

The use of a trade name does not constitute any endorsement of, or discrimination against, any product by ACIAR.

ISSN 1031-1009

© Commonwealth of Australia 2008

This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without prior written permission from the Commonwealth. Requests and inquiries concerning reproduction and rights should be addressed to the Commonwealth Copyright Administration, Attorney-General's Department, Robert Garran Offices, National Circuit, Barton ACT 2600 or posted at <http://www.ag.gov.au/cca>

Published by the Australian Centre for International Agricultural Research (ACIAR)
GPO Box 1571, Canberra ACT 2601, Australia

For further information contact:
ACIAR Communications and Secretariat Unit
+ 61 2 6217 0500

Letters from readers are welcome,
and should be addressed to:

The Editor
Partners in Research for Development
ACIAR
GPO Box 1571
Canberra ACT 2601
Australia

Email: comms@aciar.gov.au

Photos: All photos ACIAR unless credited

coretext

Managing Editor: Brad Collis, Coretext Pty Ltd
Associate Editor: Dr Gio Braidotti, Coretext Pty Ltd
Design and Production:
Coretext Pty Ltd, +61 3 9670 1168, www.coretext.com.au

Printing:





Annual Crawford conference sounds food security alarm 17

ACIAR has been called on to join global efforts to stem climate change threats to the world's food production

Dry fallow rice paddies make beds of opportunity 18

The farming potential of Bangladesh's rice paddies during the dry, fallow season is being tapped to grow wheat and chickpeas and raise the prosperity of poor farmers



Agricultural research earns high rates of return on investment 24

Independent assessments of ACIAR's specialist agricultural R&D solutions show they are delivering significant measurable impacts in the developing world



Features

Seeking answers to the food crisis 4

Julian Cribb, author of a forthcoming book on the global food security crisis, examines the main driving factors and ACIAR's response to them

Farmers grasp the business of change 8

An Australia-Indonesia program is linking research agencies, extension service providers and private companies in a market-driven collaboration to reduce rural poverty



Food security the key, not self-sufficiency 21

A project investigating the impact of China's accession to the World Trade Organization on Chinese agriculture reveals the long-term economic pitfalls of food self-sufficiency policies

Flower power begins to bloom in the Pacific 22

ACIAR scoping studies in the Pacific show that local markets hold the best growth potential for high-value horticultural crops such as cut flowers and vegetables



India's 'fish-out-of-groundwater' story 14

India's saline-affected crop plots are being transformed into small inland seas to create new aquaculture opportunities for local farmers



ACIAR roundup

Foreign Minister visits ICRISAT 26

McMullan in Papua New Guinea 26

New work in Iraq 26

Report from food crisis task force 26

Project leaders win World Bank grant 26

TRAINING

John Allwright Fellows visit ACIAR 27

Cocoa partner to study research adoption 28

Latest Fellows announced 28

John Dillon Memorial Fellowships 28

First John Fryer Scholarships announced 29

Aquaculture course hatches its 100th graduate 29

Forestry intern at ACIAR 29

ACIAR what's new

New appointments 29

New publications 30

New projects 31

Seeking answers to the food crisis

Julian Cribb, the author of a forthcoming book on the global food security crisis*, examines the main driving factors and ACIAR's response to them



Food markets are places of bustle and colour, but the farms that supply them are under severe pressure as arable land and water are diverted to non-agricultural uses and the pressures of climate changes start to be felt.

On World Hunger Day 2008 the grim news arrived that 33 countries around the world had levels of hunger that were either alarming or extremely alarming, according to the International Food Policy Research Institute (IFPRI).

Significantly, this assessment did not include the recent hike in global food prices, nor the crash on financial markets.

"Rocketing food prices—some of which have more than doubled in two years—have sparked riots in numerous countries," *Time* magazine reported. "Millions are reeling ... and governments are scrambling to staunch a fast-

moving crisis before it spins out of control. From Mexico to Pakistan, protests have turned violent."

"A brutal convergence of events has hit an unprepared global market, and grain prices are sky high. The world's poor suffer most," declared *The Washington Post*.

Starting with the 'tortilla riots' in Mexico, public unrest over food prices was reported by media in Malaysia, Indonesia, the Philippines, Bangladesh, India, Burkina Faso, Senegal, Cameroon, Morocco, Mauritania, Somalia, Ethiopia, Madagascar, Kenya, Egypt, Ivory Coast, Yemen, the UAE, Mexico and Zimbabwe. In Haiti riots forced the resignation of the Prime Minister and obliged the World

Food Programme to send emergency aid to 2.3 million people. The UN's Food and Agriculture Organization (FAO) declared that 37 countries were facing food crises due to conflict or disaster, adding that 1.5 billion living in degraded lands were at risk of starvation. *The Economist* succinctly labelled the food situation a "silent tsunami".

World Vision Australia's CEO Tim Costello called it "an apocalyptic warning" and President of the World Bank Group Robert Zoellick bluntly stated "What we are witnessing is not a natural disaster ... it is a man-made catastrophe."

Joachim von Braun, Director-General of IFPRI, says the world has made only slow

progress in reducing hunger in past decades, with dramatic differences among countries and regions: "Population and income growth, high energy prices, biofuels, science and technology, climate change, globalisation, and urbanisation are introducing drastic changes to food consumption, production, and markets."

Dr von Braun says the global financial crisis further complicates the picture: it actually brings some short-term relief for hungry people, as it contributes to reduced commodity prices, but the credit crunch makes access to capital difficult, including for agriculture, and that adds another obstacle for overcoming the food crisis.

At first the hunt for someone to blame focused on speculators, investors fleeing the Wall Street wreck, growth in biofuels, Chinese appetites, bad weather and other causes. The unarguable fact was that in seven years global grain stocks had sunk from 115 days supply to less than 50—the lowest level since records began half a century ago (though they have since improved slightly with the northern harvest).

In reality, the global food security crisis is complicated, driven by the confluence of profound forces acting on both food supply and demand.

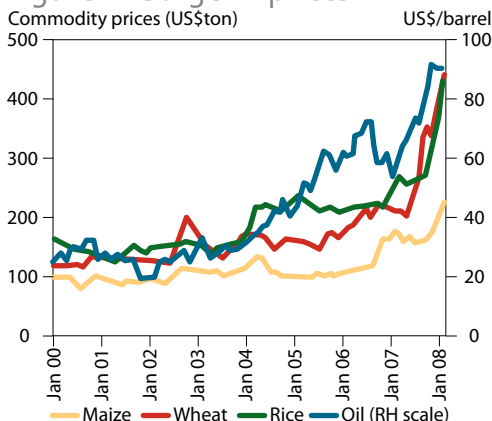
On the demand side

POPULATION

Although the rate of growth in human numbers is slowing, the present upwards trend of 1.5% a year points to a population of about 9.2 billion in 2050—3 billion more than in 2000. This will mainly take place in poorer countries and in tropical/subtropical regions.

CONTINUED ON PAGE 6

Figure 1 Surge in prices



Source: IFPRI, based on FAO and IMF data

ACIAR HELPS RAISE FARM PRODUCTIVITY

ACIAR's response to the global food security crisis has been to increase efforts to raise the productivity of smallholder farming systems and to explore more productive crop mixes to improve nutrition for poor people, says deputy CEO and head of R&D at ACIAR Dr John Skerritt.

"For the poor who live on less than US\$1 a day the consequences of the price increases are disturbing," he says. "Typically these people spend about 70% of their total income on food. This compares with an average of less than 20% spent on food by people in developed countries. With the rise in food prices, poor families face a choice between devoting more of their slender incomes to buying essential foods, or else buying less food, or food of a poorer quality."

Lifting productivity involves a wide range of research designed to lift the output of staple

crops, develop crops that stand up better to pests, disease or climate variability and introducing second crops or enterprises into farming systems where there is an opportunity to do so. An example of this is growing a crop of wheat in Bangladesh during the Rabi (dry) season, following the traditional rice crop using spare water stored from the wet season (see page 18). Other ways to boost productivity include introducing better management of water and other natural resources.

"This approach fits both our goals of helping smallholder farmers to improve their livelihoods, and giving them a chance to grow crops for the market that will take them beyond subsistence agriculture," Dr Skerritt explains.

In its current annual operational plan—developed with the food security crisis in view—ACIAR is laying particular weight on:

CONTINUED ON PAGE 6

"With good research and care in engaging the communities as partners, you can introduce a new enterprise into these systems that will not only improve local food security but give the farming family a source of income they didn't have before."

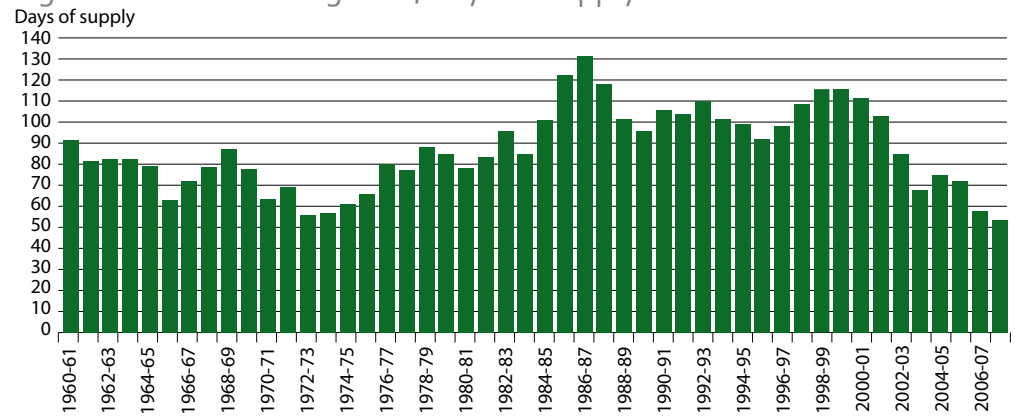
— DR JOHN SKERRITT, DEPUTY CEO, ACIAR

Table 1 Global demand for food

Regions	Asia	Latin America	West Asia and North Africa	Sub-Saharan Africa	OECD and Russia
Food need 2000	100	272	154	262	–
Food need 2050	4,150	520	390	1,350	Same as 2000
Food need multiplying factor	2.34	1.92	2.5	5.14	~1

SOURCE: GRIFFON M

Figure 2 World total grains, days of supply 1960-61 to 2006-07



Source: National Farmers Union Canada

Not to everyone's taste, but food is food. These fried spiders have become a regional delicacy in Cambodia where people purportedly discovered the arachnids' edibility during the desperate years of starvation under the Khmer Rouge rule. They are a species of tarantula called 'a-ping' in Khmer and are about the size of a human palm.

CONSUMER DEMAND

Demand for protein food such as meat, milk, fish and eggs from consumers on better incomes, mainly in India and China, but also in South-East Asia and Latin America is rising rapidly. In China alone, meat intake per head has tripled in the past 15 years from 20 to 60 kilograms, requiring a 10-fold increase in grain to feed the animals and fish. Overnourished western societies continue to gain weight. The average citizen of Earth eats one-fifth more calories than he or she did in the 1960s—a 'food footprint' expanding by the day.

This combination of population growth and expansion in consumer demand points to a global requirement for food about 110% larger than today by 2050, with the heaviest needs as shown in Table 1 (page 5).

On the supply side

WATER CRISIS

Farmers presently use 70% of the world's readily available fresh water to grow food. Rivers, lakes and groundwater resources are



PHOTO: BRAND COLLIS

drying up in key foodbowls such as the North China Plain, the Indo-Gangetic Plain and the US mid-west. On present trends megacities will swallow half or more of the available fresh water.

To meet the increased demand, the world will have to find an additional 2,000 cubic kilometres more water a year, warns Dr Colin Chartres, Director-General of the International Water Management Institute. He cautions that the "food crisis is as much a water crisis".

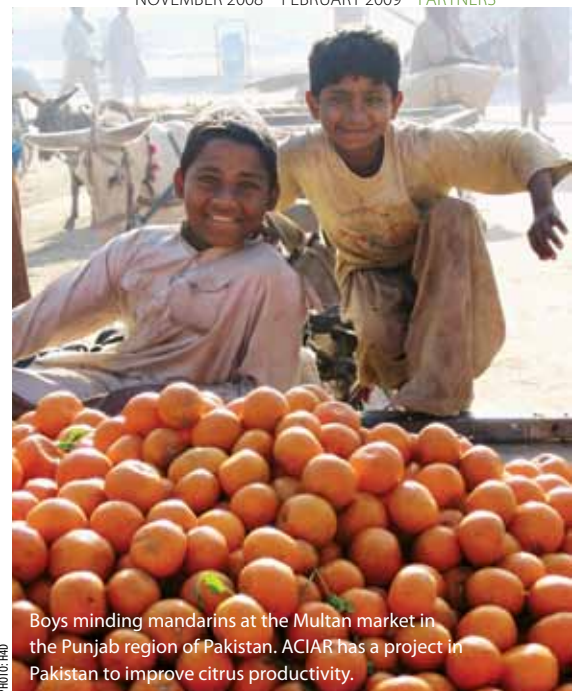


PHOTO: HAO

Boys minding mandarins at the Multan market in the Punjab region of Pakistan. ACIAR has a project in Pakistan to improve citrus productivity.

LAND SHORTAGES

Shortages of good farmland are emerging. A quarter of the world's farmland is now seriously degraded, says the FAO. Cities have sprawled, smothering an area of fertile soils half the size of China in concrete and asphalt. Recreational land uses (such as golf courses), conservation and reforestation are also diverting food-producing country out of agriculture. Some land is badly affected by toxic industrial pollution. Only in Brazil and Russia do large potential new areas of farming land exist. For the past two decades expansion in farmland has failed to keep pace with growth in food demand by a factor of 10.

FOOD WASTE AND NUTRIENT LOSSES

Civilisation produces 4,600 calories of food per person per day, and wastes 2,600 of them, says the Stockholm Water Institute. Globally about half of the fertiliser applied on-farm—100 million tonnes—does not reach the target crops or pastures. In wealthy countries half the food produced is lost or thrown in the garbage and most of the nutrients in the waste stream are also discarded. Although there is ample raw material for making fertiliser in the near term, scarcity of both oil and phosphorus point to shortages and unaffordable fertiliser prices as the century advances. Indeed, the world may already have passed 'peak phosphorus'.

ENERGY LIMITS

Current trends around peak oil indicate that fossil fuels may be unavailable for agriculture globally within 20–30 years, either through scarcity or high prices. As a result many farmers are moving to biofuels, which could see the world burn about 400 million tonnes of grain by 2020. The World Bank attributes 75% of the recent surge in food prices to the impact of biofuels production in competing for land, energy and fertiliser. The surge in oil prices over

FROM PAGES

- developing crop varieties and production systems that use less water and give higher yields;
- developing rotations that introduce a second crop onto the same land where seasonal conditions permit;
- improving the efficiency of nutrient and water use in rain-fed and irrigated systems;
- finding ways to integrate livestock and fish production with cropping systems to boost farm protein production;
- assisting smallholders to develop horticultural sidelines for cash income; and
- helping design better agricultural policies that encourage economic growth and improved food security.

"A particular focus is on encouraging agricultural diversification," Dr Skerritt says. "In many places there is a tradition of growing only one or two things, but when you look into the system you find that land which could be producing food is lying fallow half the year, there are crop byproducts which could feed animals or stored water which could produce a second crop.

"With good research and care in engaging the communities as partners, you can introduce a new enterprise into these systems

that will not only improve local food security but give the farming family a source of income they didn't have before."

Mixed farming offers particular opportunities if crop rotations are designed to support a livestock enterprise by providing fodder at the right times of the year. At the household level, growing the right sorts of vegetables can help overcome nutrient deficiencies and improve overall food security, he adds.

Dr Skerritt emphasises that solutions to the food security crisis cannot depend on costly or scarce inputs, unsustainable farming practices or short-term aid approaches. "We need to fully understand the total farming systems used by local people—why they do what they do—and then identify ways we can increase its output without compromising either its natural resilience, or further running down soil fertility and water resources."

Co-author of the World Bank's *World Development Report 2008* Dr Dennis Byerlee says of this approach: "ACIAR ... is held up internationally as an innovative example of support to agricultural science for development that pays high returns and benefits poor farmers and consumers in developing countries and also in Australia."



Researchers such as Cheth Kim Ngoy at the Cambodian Agricultural Research and Development Institute (CARDI) are working hard to develop alternative crops to diversify food production in traditional rice monocultures, hence this mungbean trial.

2007 and the first half of 2008 also caused big lifts in the price of fertilisers and farm chemicals, forcing many farmers to cut back on fertiliser use, just at the time when greater productivity was needed.

OCEANS

With 29% of fisheries already collapsed, leading scientists have warned of the total collapse of sea catches by the 2040s. Coral reefs, which support about 500 million people, are at high risk due to climate change and acidification. While fish farming has grown strongly it faces water-quality problems (sediment, nutrients and toxic chemical runoff); it also takes 5 tonnes of other fish or 10 tonnes of grain to grow a tonne of farmed fish. All this points to unsatisfied global demand for fish protein falling on land-based agriculture.

TECHNOLOGY

For two decades the engine of the modern food miracle—global scientific research—has been running down, as seen in the decline in annual yield gains in developing countries. A report by the Consultative Group on International Agricultural Research (CGIAR) in September 2008 found that funding for international agricultural research has not increased in real terms since 1976, although the world's population has doubled, and the main agricultural research countries have all cut back their national efforts, as have some developing countries. Farmers worldwide are heading into a technology pothole, with less new knowledge available in the medium term to help them lift output.

CLIMATE

The climate is becoming more variable and also changing, with potential for drought to grip half the planet by the second part of the

century. Storms, floods, droughts and sea-level rise are expected to become more frequent and intense, with rising and unpredictable impacts on food security, refugeeism and conflict. Food production in Africa could fall by half and in South Asia by 30% by 2030, the World Bank has said. Defence planners are warning already of the risk of food wars.

ECONOMICS, POLITICS AND TRADE

Limited progress with trade liberalisation and removal of farm subsidies continue to distort world markets, sending the wrong price signals to farmers and deterring investment in improving production, according to a 2008 report by Dr Andy Stoeckel released by the Rural Industries Research and Development Corporation (RIRDC). The world financial crash is also expected to cut into agricultural investment and undermine higher commodity prices. Speculators have destabilised commodity markets, making it riskier for farmers to take production decisions. Some countries discourage or ban food exports, others tax them. Still others subsidise biofuels, diverting their farmers from growing food. A web of health, safety, labour, food and environmental regulation is hampering food output.

This shows that major constraints to raising production are coinciding with and feeding into one another at the same time as the greatest peak in demand for food in history. This confluence is producing sudden and sharp spikes in food prices, which affect everyone, but hit hardest the world's poorest billion citizens. ■

* *The Coming Famine* by Julian Cribb, University of California Press and CSIRO Publishing, 2009. The book is supported by grants from Land and Water Australia and the Crawford Fund.

"ACIAR ... is held up internationally as an innovative example of support to agricultural science for development that pays high returns and benefits poor farmers and consumers in developing countries and also in Australia."

– DR DENNIS BYERLEE,
CO-AUTHOR, WORLD BANK'S
WORLD DEVELOPMENT REPORT 2008



Inland fisheries and the communities that rely on them are under particular pressure, but to substitute wild catches with aquaculture will require a massive lift in research and development.

FARMERS GRASP THE BUSINESS OF CHANGE



An Australia–Indonesia program, working initially with peanut and cocoa growers, is linking researchers, extension officers and private companies to alleviate rural poverty by encouraging farmers to operate more commercially

BY BRAD COLLIS

Sitting, legs folded, on the mosque's polished porch in their village, Pengenjet, in central Lombok, the farmer group sips coffee and talks animatedly about its first experience of working with agricultural researchers as part of an ACIAR initiative.

In two seasons the new knowledge the farmers have learnt and applied to growing peanuts in paddies after the rice harvest has had a rapid effect on quality and yields and this, of late, has taken on a new significance.

Previously peanuts were a handy, but not overly rewarding, crop that could be grown in the dry season by taking advantage of soil moisture remaining in the paddies. Crop productivity and nut quality were highly variable, generally adequate only for low-priced local markets, and sometimes came with a high aflatoxin health risk.

However, for the farmers of Pengenjet and several other Lombok districts, their peanut crops have new-found stature. While rice provides staple food, peanuts provide money, and the level of payment relates directly and transparently to improved quality and productivity. Peanut growing, and by extension, farming, is becoming a business, not merely

a traditional way of life. And a more reliable income from this business means money for improved health and education and a far more secure existence.

These Lombok peanuts, and also cocoa in Sulawesi, are two of the pilot crops at the heart of an ambitious new program—the AusAID-funded SADI initiative. It is an extensive collaboration between a wide spread of research providers and companies and it is introducing a new approach to agricultural development among poor rural communities. Based on 'market pull' as opposed to 'research push', the program—SADI stands for Smallholder Agribusiness Development Initiative—is endeavouring to lift smallholder farming from its traditional poverty-stricken levels to a farming structure that is more robust and sustainable because it has a commercial driver. The rationale is that if conditions exist to directly link successes in yield and quality (and landscape management) with significantly higher net incomes, a more permanent improvement in agricultural production will result.

Thinking and working within a commercial framework is a fundamental shift in perception and practice for most smallholder farmers. It is

a change being nurtured by the establishment of a vertically integrated supply chain, joining production to processing, and raised market expectations. Research and extension support is being applied at both ends of the chain to make sure higher-quality crops are matched by



PARTNER COUNTRY: Indonesia

PROJECT DESCRIPTION: The Smallholder Agribusiness Development Initiative (SADI): support for market-driven adaptive research

CONTACT: Dr Peter Horne, horne@aciarc.gov.au

Peanut farmers in central Lombok, Mr H. Syukri (left) and Mr H. Muhajirin (centre) discuss their crops with senior agronomist Mr Lalu Wirajaswadi.



PHOTOS: BRAD COLLIS

Peanut growing, and by extension, farming, is becoming a business, not merely a traditional way of life.

higher quality—and higher value—processed product.

PARTNERSHIPS ARE THE KEY

The model, of course, requires long-term commitment and partnerships among researchers, farmers and the companies buying the crops.

For both peanuts and cocoa, the International Finance Corporation (IFC) is managing the agribusiness development in partnership with GarudaFood, which provides the buyer/processor input for peanuts, and Mars Symbioscience (a division of the global food company Mars, Incorporated), which is the commercial partner for the cocoa initiative.

For the Pengenjet farmers, researchers from the ACIAR project showed them how regular seed spacing improved sowing efficiency, the crop's water-use efficiency, and made cultivation and harvesting easier. The improved water-use (irrigation is limited), along with improvements to the rate and timing of fertiliser applications, has contributed to increased yields, and new knowledge about the use of fungicides has helped them deliver a

much healthier and higher quality harvest.

When they deliver to GarudaFood the farmers remain present while their peanuts are assessed. The company buyers explain or demonstrate the quality parameters behind the peanuts' valuation. For example, if the crop has been harvested too soon, the immaturity results in a lower price, but the farmer is instructed how to avoid repeating the mistake.

FARMERS IN RESEARCH

Leader of the Pengenjet farmer group Mr A. Indra says the experience has been enlightening for the villagers, who are keen to continue being involved with ACIAR in research trials. Next season they hope to be sowing seed from improved varieties and are already looking forward to assessing the results. Mr Indra says the program has opened their eyes to possibilities they were not aware of: "Until now our farm productivity has been unchanged for as long as we can remember. Now we are seeing what we can achieve and our ambition is not just to grow peanuts, but to grow high-quality peanuts."

This is the kind of thinking that transforms a farm into a small business.

CONTINUED ON PAGE 10

TRIALLING A HOLISTIC MODEL FOR PROGRESS

The \$38 million Smallholder Agribusiness Development Initiative (SADI) is a new, innovative approach to lifting smallholder farming from traditional subsistence levels to a more sustainable and more business-oriented agricultural economy.

The 10-year program, in Eastern Indonesia, contains three sub-programs:

1 Community development by enhancing smallholder production and marketing—implemented by the Indonesian Government through its national community development program (PNPM) with management support from the World Bank.

2 Strengthening private-sector agribusiness and developing small to medium enterprises—implemented by the International Finance Corporation (IFC).

3 Supporting market-driven adaptive research and development (ACIAR).

The initiative is a partnership between AusAID and Indonesia's National Development Planning Agency, BAPPENAS.

Dr Peter Horne*, who has been ACIAR's manager

of the 'Support for Market-Driven Adaptive Research' sub-program, explains that SADI is designed to bring the three principal elements together, to find ways in which research, agribusiness development and rural development can be combined to maximise the overall impacts.

Under sub-program one, farmers can apply for block grants to spend on mentoring support or technologies that will help them collectively improve their agricultural livelihoods.

Sub-program two, run by the IFC, is aimed at strengthening agribusinesses, particularly agribusinesses linked to supply chains that involve large numbers of smallholders. Two examples of this are farmer–processor developments in peanuts and cocoa production. The IFC looks at ways of improving these business relationships, and of improving access to finance and markets, by partnering farmers with lead firms.

The third sub-program, managed by ACIAR, is helping province-based research organisations build their capacity to undertake research targeted towards the priorities of the province



Dr Sahardi Mulia (left), head of BPTP in South Sulawesi, with ACIAR's Dr Peter Horne.

and its market opportunities (Figure 1, page 10).

Dr Horne says it is 'adaptive research' since it recognises that, for many of these priorities, there are already promising technologies that just have not been locally adapted. "This adaptive research can involve examining adaptation to local biophysical factors (such as climate and soils), but also adaptation to the constraints and opportunities that exist within local farming systems and social environments, and adaptation towards local market opportunities.

"During the first three-year phase—the pilot

CONTINUED ON PAGE 10

Lombok peanut farmers Mr A. Saprun (left), co-operator farmer from Pengenjek village, and leader of the Pengenjek farmer group Mr A. Indra (right) showing the effects of the fungal diseases late leaf spot (upper leaves) and rust (mid and lower leaves). These are predominant in tropical environments. Yellowing of leaf can be either due to jassid (sucking insect pest) and/or nutritional disorders.



FROM PAGE 9

phase—we are learning how to strengthen the concrete linkages between community development, agribusiness development and adaptive research.

“If you look at the peanut program in Lombok as an example (sub-program two), the IFC has partnered with GarudaFood, a major Indonesian peanut buyer and processor, to identify ways in which they can improve peanut farmers’ access to markets, finance and technical support.

“At the same time, ACIAR–SADI has funded an adaptive research project to address technical issues such as water management, crop management, varieties and improved seed supply.”

“There are overriding challenges, such as transport infrastructure, and we also need to find more companies like GarudaFood and Mars Symbioscience that are genuinely interested in developing—with farmers—vertically integrated supply chains on the understanding that their future is based on farmers having a sustainable future.”

• Dr Peter Horne is now ACIAR’s Livestock Production Systems research program manager in Canberra. The new Makassar-based ACIAR sub-program manager for SADI, as of February 2009, is Dr Thomas Oberthur.

FROM PAGE 9

BUILDING BUSINESS

This ACIAR–SADI project is working directly with farmers linked to the GarudaFood supply chain. GarudaFood currently sources peanuts from 3,500 farmers in Lombok, but through the partnership with SADI, plans to expand this to 18,000 farmers.

The GarudaFood processing plant in Lombok is managed by Mr Budiono Sukadri, who says the venture is concentrating on the fresh-peanut market, in which demand far exceeds supply; there is ample room in which to accommodate increased production.

Mr Sukadri says the Lombok peanuts are cleaned, boiled and partially roasted before being sent to the company’s Java headquarters for final processing and packaging.

He says the company opened its Lombok plant in 2005 hoping to increase production by increasing the area planted to peanuts. However, it soon realised that putting up a sign saying ‘We will buy your peanuts’ was not enough to bring farmers and their peanuts to the front gate. The villagers were just as happy growing maize or soybean in rotation with rice. They needed a reason to take the risk of committing to peanuts.

AUSTRALIAN CONNECTION

In March 2008 the key Australian partner, the Queensland Department of Primary Industries and Fisheries, hosted a visit by Mr Sukadri and a

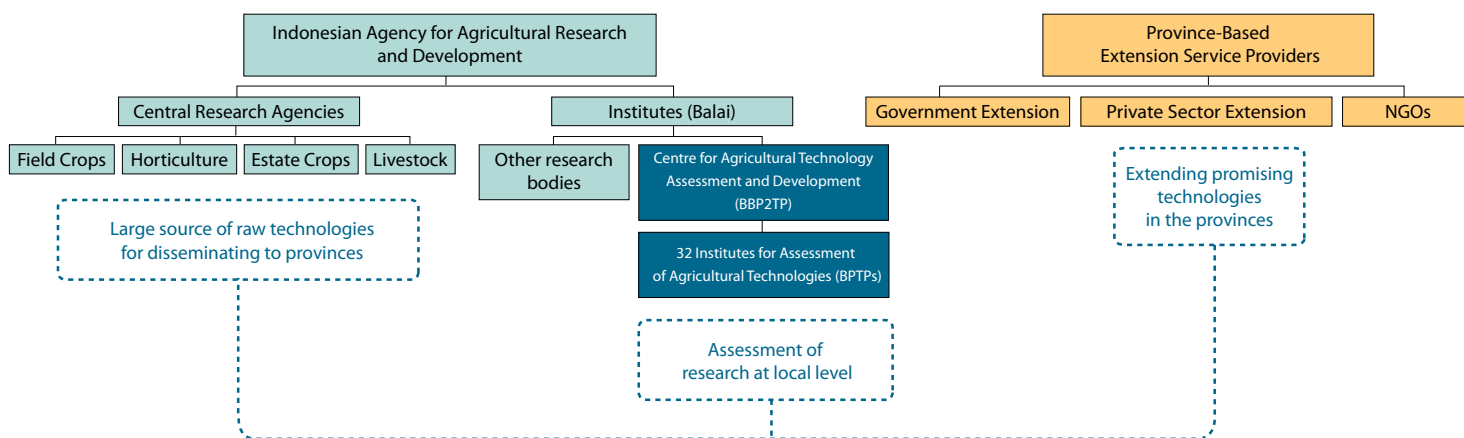
group of Indonesians to the heart of Australia’s peanut industry—Kingaroy, Queensland. They studied how the industry operates and manages a vertically integrated supply chain, albeit on a vastly different scale, and looked at methods and technologies that might be able to be scaled and adapted for use in Indonesia.

“The main constraints in Lombok are water and seed management, and lack of mechanisation, because manpower is a big problem,” Mr Sukadri says. “Like everywhere, the young people are moving to the cities, so farmers have serious labour shortages at seeding and harvest. So we need mechanisation, but it has to be adapted to smallholder operations.”

Mr Sukadri believes Lombok peanut production has made a strong start towards achieving its initial goal of replacing some of the 100,000 tonnes of fresh peanuts that Indonesia currently imports each year, but he says success will rest heavily on mutual development: on growers being able to meet higher quality and supply parameters and on the company continuing to be able to pay growers adequately for their efforts.

Figure 1 is a simplified view of the structure of agricultural research and extension in Indonesia. Through the Smallholder Agribusiness Development Initiative (SADI), ACIAR is working closely with Indonesia’s Centre for Agricultural Technology Assessment and Development (BBP2TP) and the province-based Institutes for Assessment of Agricultural Technologies (BPTPs). Strengthening their links with the central research agencies and province-based extension services is improving the flow of information between national research initiatives and on-the-ground needs of farmers. This puts provincial extension providers in a better position to adapt and adopt beneficial research outcomes that may otherwise fail to reach farmers. The Eastern Indonesian program could become a model that can be applied elsewhere to boost the effectiveness of agricultural development.

Figure 1 Strengthening links between research and extension



ACIAR is helping to strengthen links between research initiatives and extension at the national and province level.

Future rests on genetics

The development of partnerships through SADI is also playing a key role in the revival of the cocoa industry on the eastern Indonesian island of Sulawesi. There are more than half a million smallholder farmers on the island, making it the third-largest cocoa producer in the world over the past 20 years.

Cocoa growing began seriously in Sulawesi in the late 1980s and considerably lifted the fortunes of cocoa-growing communities over the next two decades. But since the early 2000s production has been hit hard by a build-up of pests and diseases, tree senescence and deteriorating soil fertility, causing many farmers to lose heart and abandon the crop.

The SADI program, with its extensive government and commercial partnerships, is bringing in the expertise and technologies to revive and improve the industry. It is giving smallholder farmers more control over the long-term sustainability of their cocoa production,

and is restoring the economic opportunities that cocoa offers poor rural communities.

GENETIC BASE

Central to the rebuilding effort is the need for a large-scale cocoa genotype improvement program that can deliver to growers disease and pest-resistant seedlings which produce good-quality cocoa that is also locally adapted. This involves farmers identifying superior individual plants in their area from which grafts can be taken for cloning onto rootstocks. It is labour-intensive and requires farmers to be trained in cocoa selection and grafting techniques. Grafting is preferred over conventional seed propagation because clonal propagation transmits all the characteristics of the parent tree without dilution.

Training and nursery establishment are now under way, boosted by the involvement of the main buyer for cocoa, Mars, which is still a family-owned company with a long history of building mutually beneficial relationships as part of its business strategy.

NEW TECHNOLOGIES

Noel Janetski, president director of Mars Symbioscience Indonesia, says cocoa production has the potential to continue to make a substantial difference to the economic and social circumstances facing smallholder farmers

in Sulawesi (and Eastern Indonesia generally), but considerable technical intervention and social awareness are needed to overcome the production constraints that have built up.

"Many of the current trees originate from seed brought from Malaysia without quality screening," Mr Janetski says. "So we need an improvement program (to lift quality and pest/disease resistance), we need advanced tree management and agronomy, a lift in soil fertility, and improved postharvest hygiene and quality control. Compounding this is the hesitancy of smallholder farmers to adopt or stick with new technologies. This is caught up with sociological issues and a lack of appreciation that their farms can be, or need to be, run as businesses."

Mr Janetski says the complexity of the challenge means the only way

CONTINUED ON PAGE 12 →



Cocoa grafts.

THE HARD GRAFT AFTER THE HONEYMOON

La Trobe University botanist Dr Philip Keane is one of the scientists whose expertise is being made available to Indonesian cocoa smallholders through the support and facilitation of AusAID and ACIAR.

Dr Keane explains that the problems afflicting Indonesia's cocoa industry are symptomatic of the end of the natural 'honeymoon period' for cocoa growing, after its initial rapid expansion in a new region, such as Sulawesi. The same situation occurred in Papua New Guinea in the 1960s.

Trees can grow quite healthily for up to 20 years, he says, before succumbing to the build-up of pests and diseases and decline in soil fertility associated with a lack of management that can be common among smallholder farmers during the initial production period.

For the past two decades Indonesian farmers have enjoyed a cocoa boom, but Dr Keane says farmers now need a concerted program of

varietal improvement and more advanced farm management to ensure the industry overcomes the production constraints that have built up.

To place the industry on a long-term sustainable footing, Dr Keane says the involvement and training of farmers is crucial to the program's success.

Farmers are being taught how to identify superior types among their own genetically diverse cocoa and how to graft this better material onto substandard trees, which are eventually cut back to become the rootstocks. Alternatively they can graft seedlings, which are then planted into gaps in the farm.

"Farmers are encouraged to compare the performance of the selected genotypes with their standard trees," Dr Keane says. "This is one of the 'big ideas' we are promoting: farmer experimentation ... 'suck-it-and-see'. This helps farmers consider themselves as businessmen and

as 'scientists' and helps to dispel the perception that they are merely 'peasant' farmers.

"We are trying to do the same with simple pest and disease-control methods: try them on 20 trees and compare the results with neighbouring trees."

Working in PNG in the 1970s, Dr Keane discovered the fungal cause of vascular-streak dieback (VSD), which is a destructive disease in the region.

In this ACIAR-supported project he is working with La Trobe colleague Dr Peter McMahon, Professor David Guest from the University of Sydney and Dr Smilja Lambert from Mars Australia. Dr Jeff Neilson from the University of Sydney is conducting sociological research on factors limiting the uptake of new farming methods. And Mars Symbioscience field coordinator, Mr Hussin bin Purung, has been applying these ideas with farmer groups in Sulawesi.



Agriculture students Adi Cahyo (left) and Alfina.

FROM PAGE 11

forward is by working in partnership with others, so a spread of resources and expertise can be leveraged.

“On the technology development side we have found ACIAR a very good partner because it brings a technical capability and has the credibility that allows it to connect with organisations such as the Indonesian Cocoa and Coffee Research Institute and Indonesia’s Institutes for Assessment of Agricultural Technology (BPTPs),” Mr Janetski says. “Also, when we start working with ACIAR in developing or adapting technologies, it provides a catalyst for others to start partnering to transfer those technologies and to involve farmers in the decision. It is laying down much stronger foundations for sustainable change—for the creation of a new, sustainable farming system.”

FARMER INVOLVEMENT

Mr Janetski says that, where possible, farmers are being helped to take responsibility for developing some of the support services that are needed, such as nurseries and fertiliser supplies. In this way other small businesses can develop on the back of farming.

Some farmers are establishing commercial nurseries. The limited supply of seedlings and grafted plants originating from high-yielding and disease and pest-resistant stock is a major factor holding back farmers’ renewed enthusiasm for cocoa. Supplying this demand for superior trees is providing new business opportunities for farmers who develop quality-controlled nurseries, often with the support of commercial partners such as the IFC or Mars.

Research into turning pod husks, pruning

The ACIAR–Mars collaboration has been crucial in demonstrating to farmers the connection between improved cultivation and access to higher-value markets.

– DR SAHARDI MULIA



Australia’s Minister for Foreign Affairs Stephen Smith and Indonesia’s Foreign Minister Hassan Wirajuda meeting with farmers, researchers and buyers at a demonstration cocoa farm in South Sulawesi in August.

waste and other organic waste, such as seaweed, banana stalks and rice paddy stubble, into compost is also adding a new commercial element to smallholder cocoa production. The compost is a valuable source of nutrients, especially during the early growth stages of newly planted seedlings. The compost improves soil condition and carbon balance, feeding the microorganisms that provide natural controls to the soil-borne fungus that causes pod rot disease.

Composting is a simple technology, but it has become a venture that turns waste matter into a product with value, whether farmers make compost for themselves or for sale.

ACIAR–MARS COLLABORATION

Dr Sahardi Mulia, head of BPTP South Sulawesi—the institutional link between research and grower adoption—says the ACIAR–Mars collaboration has been crucial in demonstrating to farmers the connection between improved cultivation and access to higher-value markets.

He says this has given much more impetus to resolving problems, such as the susceptibility of existing trees to cocoa pod borer, vascular-streak dieback (VSD) and pod rot disease. In particular he says the supply of new pest and disease-resistant genotypes and integrated management is reviving farmer confidence in cocoa.

“Until the disease and pest problems started, farmers growing cocoa enjoyed a better economy,” Dr Sahardi says. “Their standard of living was higher and many could even afford to send their children to university.” In Indonesia, farmers receive about 80% of cocoa’s market value, much higher than in other major

cocoa-growing countries.

Cocoa farmer and head of a farmer group in the Luwu Utara district, Mr Pesianus Lesnusa, says the level of collaboration between the Indonesian agencies, Mars and ACIAR has given farmers in his area new confidence in their future.

He says knowledge of management practices, such as pruning and fertilising, plus the prospect of new pest and disease-resistant varieties, has shown farmers that not only can they maintain their production, but improve it.

“Cocoa is very important to us because the market is good, the prices are good and this crop changed the whole economy of the district,” he says. “When cocoa pod borer, VSD and phytophthora appeared it was a serious worry.”

Mr Lesnusa and his farmer group, Beringan Sejahtera (which comprises more than 700 members), are hosting an ACIAR cloning trial in which 12 new genotypes are being assessed for local adaptation and cocoa quality. He says the problem now is a shortage of seedlings from the superior clones. However, this is something that farmers are learning how to address themselves.

Mr Lesnusa says the research, the knowledge and the ACIAR clone trials have improved the district’s economic outlook and done much to lift morale in the district.

TRAINING THE NEXT GENERATION

The cocoa revival is exemplified by the jump in students studying cocoa cultivation and management at the local vocational school for agriculture. The number of first-year enrolments in cocoa studies has risen from 25 to 110 in three years.

The school works closely with extension staff from Mars. Students have established almost 12,000 trees, which have become a source of superior genotypes for wider distribution.

Student Adi Cahyo says he decided to study agriculture because it offers a rewarding career and cocoa promises economic security. His classmate Alfina says she is studying agriculture and cocoa management so she can contribute to the improvement of her family’s farm. The family switched from corn to cocoa two years ago, believing it now offers better options. Students such as Adi and Alfina see farming and agriculture as careers, not just as the continuation of a family tradition. They have been shown that their landholdings, as small as they are, can be more productive, more diverse and capable of providing sustainable incomes as well as staple foods. ■

PARTNERS FIND A COMMON VOICE FOR FARMER DIALOGUE

The hope that the ACIAR–SADI program will engender a more commercial mindset among Eastern Indonesia's smallholder farmers has been helped by a new framework of collaboration recently established among the different research and extension agencies, particularly in the cocoa sector. This has arisen from the formation of the Cocoa Sustainability Partnership (CSP), a forum through which the many stakeholders have been able to synchronise the messages that are delivered to farmers.

Chair of the CSP's secretariat Rafiuddin Palinrungi, from the International Finance Corporation (IFC), says the CSP is a forum in which Indonesia's cocoa stakeholders discuss all aspects of the cocoa-rehabilitation program—technical activities, research and farmer/community empowerment.

The CSP includes the IFC, Mars Symbioscience, PT Hakiwa (cocoa exporters), State Crops Development of South and West Sulawesi, Trade and Industry Department of South Sulawesi, the Indonesian Cocoa Association, the Indonesia Coffee and Cocoa Research Institute, the BPTPs (the province-based institutes that assess new agricultural technologies) and a variety of NGOs that implement programs in the field.

Rafiuddin says that from 2001 to 2005, when efforts to save the cocoa industry began in earnest, there were numerous projects being funded by government agencies and private companies. They were all aimed at maintaining and even improving cocoa production by trying to resolve the worsening pest and disease problems.

"But these stakeholders were all working independently and this was resulting in cocoa farmers receiving different messages," Rafiuddin says.

"For example, many groups were working on preventing infestations by cocoa pod borer. One body of advice was frequent harvests, pruning, fertilisation and improved postharvest sanitation. Others were recommending changes in pesticide management, and there was one recommendation to cover the pods with plastic to keep out the borer. Each institution was promoting its own ideas to the same groups of farmers and, not surprisingly, farmers starting asking whose advice they should follow. That's when people realised we had to standardise the messages."

Rafiuddin says the first practical outcome

from this was the development of 'standard practices', which are the minimum practices that farmers need to apply, and 'additional practices', which are practices required for specific local conditions or environments.

The engagement with farmers is critical for any lasting changes to farming practices and 'farmer empowerment' is a central component of the ACIAR–SADI program.

GLOBAL COCOA MARKET

Part of the move to raise farmers' awareness of their smallholder farm as more than a basic food provider, but rather as a business, is to give farmers more control over the sale of their crops. To put farmers in a stronger bargaining position when selling, the IFC has developed an SMS service that provides farmers with market information for cocoa and maize.

The service provides global cocoa prices from the New York and London commodity exchanges, and converts this into local currency so that farmers can relate their production to world markets.

Rafiuddin says this price information service has been running for two years and its use is increasing as farmers realise the benefits of entering a sales negotiation knowing what the wider market is paying. He says the service is now receiving up to 5,000 'hits' a month, with farmer awareness of the service being raised by reminders printed on a popular agronomy/growing-season calendar.

The CSP calendar has been designed to allow different research and service-provider partners to

customise it according to their particular services, brand it with their logo and distribute it to the farmers they deal with. In this way it is widely circulated. The calendar's main communications element is the provision each month of information relevant to the management of the crop at that time. "May and June, for example, are harvest months for cocoa, so the calendar provides information on after-harvest care of cocoa beans, plus the reminder to access current market information using the SMS service."

The calendar supplements a website, quarterly newsletters, and farmer training manuals and brochures.




Field coordinator for Mars Symbioscience Hussin bin Purung, the Cocoa Sustainability Partnership has helped to coordinate the training of field officers and the advice given to farmers.

REVITALISING COCOA IN INDONESIA

Cocoa is the main source of income and livelihood for more than one million farm households in Indonesia and contributes export earnings in excess of US\$1.4 billion a year. More than half of these producers are in Eastern Indonesia. These farm livelihoods are now being threatened by declining quality and productivity of cocoa through increasing pest and disease pressure, ageing tree stock and declining soil fertility. Farmers are experiencing losses of up to 50% of the production they might have had if those pests and diseases

were properly managed and if good farming practices were consistently employed.

In mid-2008, the Indonesian Government announced a large national program for revitalisation of the cocoa industry (known as Gernas Pro Kakao). With funds from AusAID and ACIAR, the Indonesian Cocoa Industry Association (ASKINDO) co-sponsored a workshop in Indonesia in October 2008, under the umbrella of the CSP, to provide technical recommendations for the implementation of Gernas Pro Kakao.



India's 'fish-out-of-groundwater'

India's saline-affected crop plots are being transformed into small inland seas to create new aquaculture opportunities for local farmers

BY MELISSA MARINO

In a land-locked state in northern India, 1,000 kilometres from the nearest coast, a most unlikely enterprise is beginning to flourish: seafood. The new aquaculture ventures are being fed by salty water, pumped from underground to fill man-made ponds. It is the same salty water that has been partly responsible for the gradual degradation of the land, which has made it increasingly unfit to support traditional wheat and rice crops.

Drawing on the expertise of Australian and Indian scientists, the project aims to make saline-affected, unproductive lands in the two countries profitable again and create new industries from popular seafood species, including prawns and trout. It is being funded by ACIAR, the NSW Department of Primary Industries (DPI) (Fisheries), Murray Irrigation Ltd and the Central Institute of Fisheries Education (CIFE) India.

Across India and Australia millions of hectares of agricultural land is threatened by salinity. Management options, such as pumping rising saline groundwater from shallow aquifers into large ponds to evaporate, have been effective, but are expensive and offer little in terms of outputs.

The ACIAR aquaculture project aims to use saline water to transform otherwise useless agricultural land into lucrative inland seafood production grounds.

In India the program is leading towards a new industry in giant freshwater prawns (*Macrobrachium rosenbergii*), which are capable of living in non-saline water, but need saline water in which to breed.

In Australia the most promising species for potential mass production is rainbow trout (*Oncorhynchus mykiss*), which has been successfully grown in ponds using inland saline water pumped from underground.

For India the timing of the project, which

began in 2004, could not have been better. The country had been experimenting with the technology for more than 20 years and successful giant freshwater prawn farms were already operating at coastal sites. It had the experience, the know-how and Federal Government support for new farms.

In Haryana, home to the CIFE's specialist Rohtak Centre and experts in the field, there was also a massive salinity problem—half a million hectares.

"There are water-logging problems and salination problems and areas have become quite barren," says CIFE principal scientist Dr Narinder K. Chadha, now based in Mumbai. "Soil fertility is very low and productivity has gone down, so that is why, for many, aquaculture is the only option left."

Project leader in India, CIFE principal scientist Dr Sudhir Raizada, says the research could help turn around farmers' fortunes in a region where more than 50% of the groundwater currently

Senior scientist and project leader Dr Sudhir Raizada inspects a tank in a nursery at the Central Institute of Fisheries Education's Rohtak Centre.

Prawn hatchlings, approximately 10 days old, bred in saline groundwater at the CIFE prawn hatchery.



PHOTOS: MELISSA MARINO

story

PARTNER COUNTRY: India

PROJECT DESCRIPTION: FIS/2002/00: Developing aquaculture in degraded inland areas in India and Australia

CONTACT: Dr Stewart Fielder, stewart.fielder@fisheries.nsw.gov.au



used to irrigate crops is saline. "It could go from a threat to an opportunity," he says. "What has been a tragedy for the public is an opportunity for the public."

CHEMICAL CHALLENGES

Although it is full of salt, the saline groundwater actually has a different chemistry profile to seawater, with generally lower levels of potassium, which is necessary for a prawn's

growth, and higher levels of calcium, which can be fatal to larvae.

Through a series of experiments at the CIFE Rohtak Centre, the researchers found adult prawns could live relatively well in low-level saline groundwater of 4–6 parts per thousand (ppt) salt without any extra potassium required; so well, that prawn weight rates per hectare were similar to common production on the coast.

This low-saline profile is readily found in water sourced from existing tube wells across the region, as is groundwater with higher salt content (6–10 ppt), which can be easily augmented with potassium to ensure optimal prawn growth.

But the researchers struck trouble when attempting to breed. "In the hatchery it was a very different story," says Australia's project leader Dr Stewart Fielder, who is based at the NSW DPI. "The larvae hatched and they pretty much all died soon after."

While existing Australian research on snapper had already confirmed that adding potassium to groundwater would make it more like seawater, it was only part of the picture. So the scientists set to work on analysing calcium as well as magnesium concentrations and ratios.

They quickly established that not only were levels of calcium too high in the groundwater, but so too was the ratio of calcium to magnesium. The trick then was to identify a simple, cheap and effective way to redress the balance on a large scale. And it took a stroke of genius to find it.

In a move of audacious simplicity, Dr Raizada applied a technique similar to that used to purify drinking water, passing the groundwater through negatively charged zeolites, which adsorb the positively charged magnesium and calcium ions.

The filtering process is simply repeated until enough calcium is removed. Magnesium is then added to bring the groundwater's chemistry up



Workers net fish grown at CIFE.

"Although we are working on different species, in different places, many problems we face are the same. This is a worldwide problem and it's growing day by day."

— DR SUDHIR RAIZADA

Senior scientist Dr N.K. Chadha (left) and Dr Sudhir Raizada watch as low-saline water is pumped from underground at CIFE.

Senior scientist Dr Sudhir Raizada with post-larval prawns bred in saline groundwater.



to a level that mimics seawater.

"I guess in hindsight you think, 'Gosh isn't that obvious', but until the bell rings it's not really that clear," Dr Fielder says. "That really was the key, and once we did that and got the chemistry ratios right, then everything fell into place."

VIABLE ALTERNATIVE INDUSTRY

Dr Raizada's discovery led to the first-ever successful breeding of giant freshwater prawns to post-larval stage in inland saline water. It was also a key breakthrough that was needed to ensure the project could result in a viable alternative industry for Haryana's small-scale farmers.

Without access to their own hatchlings, the farmers would be forced to pay for post-larvae to be flown up to 2,000 km from the coast to grow out in their ponds—too high an expense to make their new businesses profitable.

Also, that delivery of post-larvae would be at the discretion of coastal suppliers and likely to arrive much later than if inland growers had access to locally bred specimens, curbing the grow-out period and, therefore, the prawns' ultimate size and price.

Dr Raizada says the Rohtak Centre is now capable of producing about 500,000 freshwater prawn post-larvae per cycle, or 1.5 million per season. "Now, through this water, we have been able to produce seed that farmers can get on their doorsteps," he says.

The consistent supply of post-larvae is also thanks to another simple innovation implemented at the Rohtak Centre as part of the ACIAR project in the shape of heavy

polythene-covered, steel frame structures erected over selected ponds, known as polyhouses.

Functioning like a hothouse, the polyhouses ensure broodstock survive year-round as temperatures in Haryana, which can reach up to 50° C in summer, plummet to a fatal 0° C over the three months of winter.

But despite the freezing temperatures outside, the temperature inside the polyhouse never drops below about 17° C and trials have shown a 90% prawn survival rate.

Dr Fielder says this allows farmers to have post-larvae available just as the weather starts to warm up to make the most of a seven-month grow-out period from April to November. "We've pretty much got the whole production cycle sorted in terms of broodstock and post-larval product supply," he says.

Today, further research is planned on stocking additional species in the grow-out ponds so that when the prawn season finishes in November, business can be maintained over winter through, for example, Indian major carp or catfish.

The researchers will also collect on-farm production data from several trial growers that will feed into economic modelling to be used by new farmers and other investors. Extensive training workshops are also planned for hatchery operators and farmers.

CLIMATIC CHALLENGES

It is work that has funding for the next 12 months from ACIAR and CIFE to November 2009, but which has been disrupted in 2008 in Haryana by incessant monsoons,

which have flooded the ponds with freshwater. Work is expected to resume in March.

Back in Australia, inhospitable climatic conditions of the opposite type have also affected progress, with drought halting in its tracks a promising new Murray–Darling Basin rainbow trout aquaculture industry at Wakool, NSW.

"Our water source has dried up," says Dr Fielder, who is in the process of identifying an alternative site. "It will happen, I'm confident of that, it's just whether it will happen in the not-too-distant future. It's just got to rain, that's all."

But despite the recent setbacks, the knowledge gained through the collaboration is timeless in its value, Dr Fielder says. And it's knowledge that may never have been realised in isolation.

"We took our knowledge of water chemistry, especially regarding potassium, to India which solved some of the story and we've since learnt from them about the role of calcium/magnesium ratios in larval culture and how to address that," he says. "So there's been a really direct benefit to both countries, from both countries."

Dr Raizada also credits the polyhouse construction as a tangible result of the collaboration, which has pooled the knowledge of experts to address common issues and advance the new industries, despite different economic drivers, land availability issues and environmental protocols.

"Although we are working on different species, in different places, many problems we face are the same," he says. "This is a worldwide problem and it's growing day by day." ■

ANNUAL CRAWFORD CONFERENCE SOUNDS FOOD SECURITY ALARM

BY GIO BRAIDOTTI

In the 1960s the world faced the challenge of feeding a rapidly growing global population in part by establishing an international agriculture research network, coordinated by the Consultative Group on International Agricultural Research (CGIAR). In the 2000s, the same network that delivered the Green Revolution is at the forefront of efforts to deal with the negative impacts of climate change on food security.

This expanded mandate was the focus of policy discussions at the 2008 Crawford Fund's 'Agriculture in a Changing Climate Conference', held in Canberra during September. Meeting at this year's event were Katherine Sierra of the World Bank; Dr Cary Fowler of the Global Crop Diversity Trust; Tony Burke, Minister for Agriculture, Fisheries and Forestry; several directors-general of CGIAR centres; Dr Mark Howden of CSIRO's Climate Adaptation Flagship; and Professor Ross Garnaut from the Climate Change Review.

Dr Fowler, who heads the organisation responsible for safeguarding the world's agricultural biodiversity in the Svalbard Global Seed Vault, said that agriculture was facing a "perfect storm"—climate change exacerbating the pressure on food production from population growth, land development and degradation, low food stockpiles, and an overdraft of water from aquifers and rivers.

He further noted that the Green Revolution's success had spawned complacency towards agricultural R&D, resulting in chronic under-investment in agricultural research in recent decades.

Professor Garnaut said that, worldwide, public-sector resources going into the international agricultural research system have declined alarmingly in real terms. "The realisation over the past year of a very large global challenge of food supplies is beginning to get people thinking again about how we need to arrest the decline in that effort, strengthening it and its institutional base."

A strategy to revitalise agricultural research efforts was the main focus of the World Bank

presentation by Katherine Sierra, vice-president for sustainable development. Ms Sierra, who also chairs CGIAR, placed under-investment in agricultural science at the heart of the food crisis and acknowledged the World Bank's own role in the neglect, adding that "a lack of research has cost us a couple of decades of development".

With the World Bank committed to doubling its investment in CGIAR's 15 research centres to \$1 billion in five years, the initiative is seeing CGIAR's poverty-reduction mandate expanded to include alleviating food security threats posed by climate change.

At the national level, Professor Garnaut recommended an expanded role for ACIAR—into climate change, in line with international changes to the agricultural research network.

"I think part of what Australia needs to think about, going forward as it addresses the issue of climate change, is how it contributes to the international research effort in scientific areas that are closely related to our old interest in agriculture and forestry," he said. "The Climate Change Review recommends that the mandate of ACIAR be explicitly expanded to encompass climate change, in its biological, biophysical and social science dimensions." ■

ACIAR has been called on to join global efforts to stem climate change threats to the world's food production.

Dr Cary Fowler, executive director of the Global Crop Diversity Trust.



PHOTO: BRAD COLLIS

Professor Ross Garnaut

Garnaut Review recommends expanded mandate for ACIAR

Acknowledging the difficulties climate change poses for developing countries, Professor Ross Garnaut identifies in his final report the intersection of climate change with sustainable development and agriculture as an appropriate focus for action.

He argues that in developing countries incentives, such as a price or cap on emissions, are unlikely to drive innovation in mitigation, and improved climate science will struggle to promote adaptation. Instead, international and Australian funding should, "as a matter of priority", fund a collaborative research endeavour based around agriculture.

The Climate Change Review offers three reasons for this focus: "First, agriculture is one of the sectors most vulnerable to climate change. Second, it is one of the most important sectors for developing countries. And finally, there is also significant mitigation potential in changed agricultural practices."

Noting ACIAR's success in promoting development-relevant agricultural research, the review recommends that ACIAR's mandate be explicitly expanded to encompass climate change. The review further notes potential benefits of the inclusion of broader environmental issues—such as air quality and waste management—and ACIAR involvement in translating climate projections into forms meaningful to local decision-makers.

ACIAR's involvement in developing scientific capacity in developing countries was also noted in the review. Since this capacity-building relies on collaborative projects with Australian scientific institutions, the review recommends that ACIAR consider future partnerships with Australian research centres working on climate change. These include CSIRO's Climate Adaptation Flagship, the National Climate Change Adaptation Research Facility based at Griffith University, and the proposed Australian climate policy research institute.

More information: Garnaut Climate Change Review, www.garnautreview.org.au

PHOTO: BRAD COLLIS

Dry fallow rice paddies make beds of opportunity

PHOTO: RICHARD BELL



The farming potential of Bangladesh's rice paddies during the dry, fallow season is being tapped to grow wheat and chickpeas and raise the prosperity of poor farmers

Sowing lentils with a new zero-till planter for a two-wheel tractor at Dinajpur, northern Bangladesh.

BY JULIAN CRIBB

Hheavy soil erosion on the slopes of the Himalayas is turning the Ganges delta into one of the fastest-growing arable regions in the world. As fertile silt from the uplands piles up, new expanses of rich, dry soil are appearing on land once located beneath the waters of the Bay of Bengal.

The farmers of southern Bangladesh traditionally grow rice in the rainy season, but for several months a year during Rabi (the dry season) the land lies largely fallow, producing little more than weeds or thin grasses. Because much of the land is under water during the

rainy season, livestock are few.

In 2003, when Australian agronomist Howard Rawson started looking into extending opportunities for wheat production in a joint project with ACIAR, the UN's Food and Agriculture Organization (FAO) and the Bangladesh Wheat Research Centre, the situation was becoming urgent. Each year Bangladeshis consume four million tonnes of wheat, but local production has steadily fallen from two million to less than a million tonnes, driving up the country's import bills. Recent world grain price hikes have redoubled the pain.

UNTAPPED FARMING POTENTIAL

It became clear that southern Bangladesh had untapped farming potential in all the land that was lying fallow from November to March, a time many regarded as too hot, dry and risky to grow wheat or other crops. At the same time, Mr Rawson and his colleagues from the Bangladesh Agricultural Research Institute (BARI) could not help noticing that there was still plenty of water lying around after the wet—in canals, drainage channels and ditches. Not enough to grow an irrigated crop of boro rice, but sufficient to grow wheat. The big question was: how much wheat?

Their preliminary on-farm trials, over two seasons, indicated 2.5 tonnes per hectare was assured, using three irrigations and high input of fertilisers. But it was not clear whether these were two unusually good seasons and whether fewer inputs—within the means of poor farmers—could realise the potential of the land, Mr Rawson says.

BARI and a unique Australian farming model called APSIM (Agricultural Production Systems sIMulator) supplied the answers: there were an estimated 800,000 hectares of potentially suitable, but unused, agricultural land at this time of the year and long-term weather data indicated the climate was also possibly suitable. Exploring this, using on-farm trials managed by Mr Rawson and an ACIAR research project led by Dr Peter Carberry of CSIRO, revealed that yields of 2 to 2.5 tonnes a hectare were achievable without irrigation, and 3 to 4 t/ha with as little as a single watering.

Working with farmers in the southern regions of Noakhali and Barisal and on Bhola Island in the delta, BARI project leader Dr M. Saifuzzaman, Dr Carberry and Mr Rawson together demonstrated the scope for a dry-season wheat industry capable, conservatively, of producing a million tonnes of wheat a year on the fallow lands. Potentially, this could generate import savings worth several hundred million dollars a year for the Bangladesh Government, as well as giving a major economic boost to an otherwise poor region.

“All the ingredients are there for wheat production to take off,” Dr Carberry says. “The soils are fantastic. There is good soil moisture left over from the wet season, so a wheat crop only requires one or two irrigations, compared

with up to 30 for boro rice. And, at the moment, there is nothing being grown on much of this land in the dry season.”

In fact, he says, there is even a possibility of growing two dry-season crops in some years, wheat followed by mungbeans, before returning to wet-season rice.

A puzzle is why wheat is not more widely grown, when the needs of Bangladesh's 150 million citizens are great, import costs are soaring and there is vacant land available, Dr Carberry says. Reasons may lie in a traditional dietary preference for rice, in perceptions that dry season wheat is ‘risky’ and in the fact that many farmers are accustomed to working off-farm at that time of year. Standing water is also used by locals for fish production.

WHOLE-OF-FARM APPROACH

In a vital part of the project partnership the non-government organisation PROSHIKA is exploring the reasons behind this and talking to farmers about the opportunities offered by a year-round farming system.

PROSHIKA takes a ‘whole-of-family’ approach, dealing with both men and women, as well as the needs of children, and also plays a role in helping to develop markets for the new crops. Its staff are devising simple farm-management packages to help farmers switch to the new system, and training both farmers and extension workers. In particular it is finding that women are enthusiastic advocates for the new cropping opportunities, and are eager to spread the word in nearby communities.

Growing wheat on the delta flats poses technical challenges. Often the land is saline, from having recently been the seabed of the



PARTNER COUNTRY: Bangladesh

PROJECT DESCRIPTIONS: LWR/2005/146 and LWRE/2005/001: Expanding the area of dry-season cropping in southern and north-western Bangladesh

CONTACT: Dr Peter Carberry, peter.carberry@csiro.au; Professor Richard Bell, r.bell@murdoch.edu.au

Bay of Bengal, but successive wet seasons are gradually flushing this and salt can be managed, as Australian farmers have found. Second there is a delicate balance to be struck between the timing of the single irrigation and the needs of the growing wheat plant for nitrogen, Dr Carberry says. The team is working to establish the optimal time for both.

The impressive yields on participating farmers' land have sparked interest among neighbouring farmers in all three trial areas, he says. “Farmers in nearby villages have started planting wheat and, without advice, have achieved yields of 3 t/ha. While this has been happening, wheat prices have more than doubled, making it much more attractive.”

The project encourages farmers growing wheat to sell their seed locally, becoming mini seed suppliers to their neighbours in order to accelerate uptake.

ALTERNATIVE CROP OPTIONS

Even greater success is reported from another ACIAR project in the High Barind Tract (HBT) in north-west Bangladesh under somewhat different conditions, where chickpeas, lentil, mustard, mungbeans and maize are being trialled as alternative dry-season crops to boro rice. The rice crop relies on water from tube wells, which are often contaminated by arsenic and are in any case diminishing as demand on groundwater increases in both Bangladesh and neighbouring India. As in the south, this means a growing area is left fallow during Rabi.

“These crops are far less thirsty than rice, and fetch good prices in the market, so the farmers are very interested in them,” says project leader Professor Richard Bell of Murdoch University in Western Australia.

The key to successful Rabi cropping in the HBT lies in being able to get the new crop in the minute the rice harvest is off, to



Neil Dalgliesh and farmers at Barisal in southern Bangladesh inspecting wheat root depth in soil core.



Neil Dalgliesh and PROSHIKA field officer discussing wheat trial on Bhola Island.

make optimum use of precious soil moisture. However, with most farmers flat out harvesting and threshing rice, labour to plant the new crop is scarce.

MINIMUM-TILL ADVANTAGES

The answer, Professor Bell says, lies in mechanisation, using local contractors with the increasingly ubiquitous, small, two-wheeled Chinese cultivators to get the crop in as quickly as possible. These normally use a rotary hoe for tillage, which churns up the soil causing loss of moisture, so the team has adapted the Australian water-conserving technique of minimum till, inserting the seed into a narrow slot in the rice stubble without prior tillage.

“Our aim is to grow the Rabi crop purely on stored soil moisture and rainfall—without any irrigation,” Professor Bell says. “We’re also optimistic that, with the good weed control resulting from the flooded rice crop, there will be little or no need for the herbicides used in other minimum-till systems.”

Chickpea yields vary from 0.5 to 1.5 t/ha and, with market prices twice what they were a year or so ago, there is no lack of farmer enthusiasm. The new approach is spreading rapidly from neighbour to neighbour.

ENCOURAGING ADOPTION

Like the delta wheat project, the HBT project places a high priority on understanding what encourages and discourages farmers in adopting new systems, which are often more complex than they are used to, Professor Bell says. Here too, NGOs PROVA (People’s Resources Oriented Voluntary Association) and RDRS (Rangpur Dinajpur Rural Service) are providing the critical insights and links into the farming community and helping the extension workers in the Bangladesh Department of Agricultural Extension in the task of packaging and delivering the new methods.

Both projects exemplify the new style of aid emerging worldwide, engaging both international and national research and funding agencies, national agricultural research and extension services, and NGOs working directly with local farmers and including women as the spearhead of technology delivery. This ‘family focus’, in particular, is an innovation on the traditional modes of farm technology delivery, Professor Bell and Dr Carberry agree.

The projects will also benefit Australian and other farmers facing hot, dry and saline

environments. The main tool used to identify the huge promise of dry season grains is APSIM, an Australian farm-modelling package widely hailed as the finest of its kind. Its use in Bangladesh is giving scientists the opportunity to fine-tune the model so it can deliver further benefits to farmers in all countries, including the Australian wheatbelt, where cropping options are coming under close scrutiny as the climate changes.

“In these southern areas of Bangladesh

wheat used to be regarded by many locals as unsuited to the region or a low status crop,” Mr Rawson says. “But faced with the evidence of good yields, with prices that have trebled in recent years and with new disease-resistant varieties, they are starting to take it more seriously. The most encouraging thing is that there are large areas of Bangladesh where we can take this dry-season cropping, if we can persuade them it works. It could make a very great difference.” ■

PHOTOS: NEIL DALGLISH



Dr Howard Rawson discussing wheat plant development as part of a training program conducted at the Bangladesh Agricultural Research Institute (BARI) field station at Joydebpur, near Dhaka. Staff employed by the project were trained in a range of field-monitoring techniques before taking up their regional roles in Bhola, Barisal and Noakhali.

Proud farmer and son standing in the family’s high-yielding wheat crop near Jessore. The family’s plot formed part of a village trial in which 12 individual farmers grew their wheat under a range of treatments.



FOOD SECURITY THE KEY, NOT SELF-SUFFICIENCY

A project investigating the impact of China's accession to the World Trade Organization on Chinese agriculture reveals the long-term economic pitfalls of food self-sufficiency policies

BY ROBIN TAYLOR

In China's Yunnan province, former tobacco growers are now growing high-value cut flowers and benefiting from the country's opening to world trade markets. Smallholder farmers in other parts of China are earning off-farm income in new manufacturing industries. These are the winners from the country opening itself to international trade. However, other smallholder farmers in resource-poor regions, with limited opportunities to change crops or move out of agriculture, will need help to access such trade benefits.

The message from a recently completed ACIAR project investigating the effects of China's accession to the World Trade Organization (WTO) is that the focus of food policy should be food security, not food self-sufficiency. Food security policy considers whether people have sufficient income to provide a reasonable diet, irrespective of whether the food is produced domestically or imported.

By modelling the Chinese economy, the project, undertaken by researchers from the Australian National University (ANU), the China Center for Economic Research and the Center for Chinese Agricultural Policy, has demonstrated the high cost of policies that focus on food self-sufficiency.

The results show that, as a result of WTO accession, China's agricultural sector will have to make substantial adjustments, in particular moving out of land-intensive activities, such as grain production, and into labour-intensive activities, such as horticultural products and agricultural product processing where it has a comparative advantage. These structural adjustments will inevitably benefit some households, but disadvantage others. However, by taking an economy-wide approach, rural poverty should be alleviated by households earning off-farm income.

Australia's Minister for Trade Simon Crean touched on this theme when he delivered the biennial Sir Alan Westerman lecture on Australian trade policy, emphasising that trade liberalisation on its own was not enough to drive economic development.

"We need to help developing countries build capacity through structural reform, to allow them to better reap the benefits of international trade," Mr Crean said.

The ACIAR project demonstrated that as incomes increase, agriculture's share of the economy shrinks. Consequently, China is likely to become less self-sufficient in many commodities.

One of the project leaders Dr Chen Chunlai says that, even though China will always have to produce most of the food its large population consumes, non-farm income will become more important as development proceeds.

Dr Chen believes smallholder farmers in China can benefit from appropriate policy interventions, both in the short-term transition to WTO compliance and in the longer term as markets open up.

"Our work is helping equip Chinese policy-makers with information to examine the full range of policy options, for the most effective means of helping smallholders gain the benefits of WTO accession," he says.

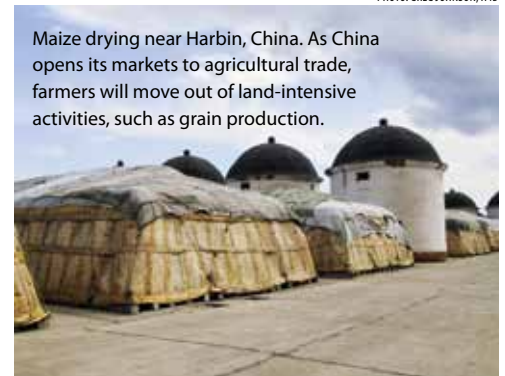
The project's most important message is that macro-economic and other policies not directly aimed at the agricultural sector, such as promotion of urban development in inland areas and gradual reform of monetary policy, can greatly improve the livelihoods of rural households.

ACIAR research program manager for agricultural development policy Dr Simon Hearn says that to achieve the potential economic gains agricultural policies also need further reform.

"These reforms include abandoning price support and regional self-sufficiency policies, reform of monopolistic agricultural marketing and distribution activities, and reform of the state grain storage system," Dr Hearn says.

An earlier ACIAR-funded project, carried out by the International Food Policy Research Institute, investigated the impact of WTO accession on smallholders in western China, a region that accounts for more than 70% of China's poor.

PHOTO: GREG JOHNSON, HAD



Maize drying near Harbin, China. As China opens its markets to agricultural trade, farmers will move out of land-intensive activities, such as grain production.



Mushrooms at a market in Lanzhou. The Chinese are experts in mushroom cultivation.

PARTNER COUNTRY: China

PROJECT DESCRIPTIONS: SMADP/1998/128:

Achieving food security in China—implications for WTO accession; ADP/2002/114: Rural poor and smallholders in western China under WTO—a regional and community level analysis; ADP/2004/044: Economic analysis of technical barriers limiting China's agricultural trade

CONTACT: Dr Chen Chunlai: chunlai.chen@anu.edu.au

Using economic analysis and modelling, the project examined policy issues at the regional, village and household levels.

The researchers investigated future policy options, especially public investment policies, to help western China achieve both economic growth and poverty reduction. They found that the rapid rise of coastal China will potentially provide opportunities for smallholders in the western provinces to either migrate to coastal areas or to engage in non-farm activities in their own communities if institutional and policy barriers that hinder market integration between the two regions can be removed. ■



FLOWER POWER BEGINS TO BLOOM IN THE PACIFIC

ACIAR scoping studies in the Pacific show that local markets hold the best growth potential for high-value horticultural crops such as cut flowers and vegetables

BY ROBIN TAYLOR

Improving household incomes and food security through more productive and diverse farming systems is an important priority for ACIAR, as is helping producers identify market opportunities.

In some Asian and African countries, flower cultivation (floriculture) has become a profitable activity for smallholder farmers. But in the Pacific the industry is in its infancy.

For people living in southern Australia, ginger flowers, heliconias, anthuriums and orchids are exotic blooms that make spectacular floral displays. However, in the Pacific, where these flowers thrive, people take them for granted and are only just starting to realise their commercial potential.

The results of a recent ACIAR scoping study, which examined the potential for floriculture in Fiji and Papua New Guinea, showed that local markets, rather than export markets, hold the best growth potential.

Study coordinator Kyle Stice, of Fiji-based consultants Koko Siga, says the local non-tourist market for flowers has expanded rapidly since the establishment of wholesale flower markets in Nadi (in 1999) and Suva (in 2001).

"Our data show that the market has increased

about tenfold in the past eight years and there is still a shortfall of flowers," Ms Stice says. Anthurium sales through the Suva market have increased from about 20,000 stems in 2001 to more than 60,000 stems in 2006, with a corresponding increase in value from FJ\$10,000 to FJ\$46,000.

More than 1,000 people are directly involved in Fiji's floriculture industry, most of them women, including 200 semi-commercial cut-flower growers and a few small commercial growers.

While the main market is traditionally flowers for weddings and funerals, a new market is emerging for cut flowers in the workplace and homes.

"The establishment of the wholesale markets has given small florists and informal flower-arranging businesses access to a consistent supply of high-quality, inexpensive flowers which, in turn, gave them confidence to boldly market their products," Ms Stice says. "The result has been unprecedented growth in demand."

ORCHIDS' PRIDE OF PLACE

Fiji's most popular cut flowers are dendrobium orchids, which take pride of place in wreaths, bouquets and flower arrangements. A commercial operation, South Sea Orchids, introduced commercial orchid growing to

Fiji in the early 1980s and now has about 120 out-growers who supply the company with blooms.

Many of these growers are women from poor rural households, who can earn a reasonable livelihood while still working at home. Raising the plants involves about 50 days work a year, so the out-growers can seek other work or still look after young children. Many of the women who began as cut-flower growers are now supplying potted plants and flower arrangements to a range of customers.

The survey also investigated the potential for export, but the results indicated that Fiji does not have a comparative advantage for anthuriums and orchids over other producers, especially in South-East Asia.

The results of the ACIAR study were presented to the local growers, enabling them to refocus their businesses. One recommendation from the study was to expand the line of floriculture products on offer to include guzmanias, a unique flowering plant from the pineapple family. This recommendation was taken up by the private sector and more than 16,000 improved variety plants were imported into Fiji from Holland earlier this year and distributed to growers.



PHOTOS: KYLE STICE KOKO SIGA

(Left) The establishment of wholesale flower markets in Fiji has given people access to a consistent supply of high quality, inexpensive flowers.

SHARING FLORICULTURE KNOWLEDGE

The results of the ACIAR study have attracted interest from other Pacific countries. In September 2008 representatives of floriculture businesses from seven Pacific island countries saw first-hand the successes and failures of floriculture enterprises in Fiji during a study tour funded by the Technical Centre for Agricultural and Rural Co-operation.

Darwin horticulturist and Rural Women's Award winner Jan Hintze also participated in the study. She pioneered the Northern Territory's multi-million-dollar tropical cut-flower industry in the 1980s and established a market throughout Australia for ginger and heliconia flowers. Although these plants grow in Fiji, they have not been developed there commercially. Ms Hintze was able to give growers a realistic business perspective and to advise on simple practices to improve quality and add value.

Ms Hintze says she was impressed with the enthusiasm shown by the women and also their skill in cultivating plants. "The women come from communities where there is a tradition of growing food gardens. That knowledge is instilled at an early age so they are starting from a good base."

"It just shows everyone where we should be putting our energy and resources," Ms Stice says.

When the study team surveyed hotel demand they found that most hotels had extensive areas of land and could grow their own flowers. The only time they were likely to buy flowers was to supply special events such as weddings or conferences. "Instead of banging our heads against the wall trying to get export markets or hotels to buy our flowers we really need to concentrate on expanding the domestic market," Ms Stice says.



PARTNER COUNTRIES: Fiji, Papua New Guinea, Solomon Islands

PROJECT DESCRIPTIONS: HORT/2006/055:

Developing the ornamentals industry in the Pacific; HORT/2005/077: Integrated crop management package for sustainable smallholder gardens in Solomon Islands

CONTACT: Les Baxter, baxter@aciar.gov.au

Ms Hintze found the areas where practices needed to be improved were postharvest handling, transport and harvesting. She is hoping to run workshops on these topics in Fiji in 2009.

In PNG, the other focus of the ACIAR-funded study, the natural environment is ideal for tropical cut flowers, but opportunities for exporting flowers are limited due to marketing and other constraints. The study found there is potential to establish a commercial indigenous orchid industry, exporting unique hybrid plants and expanding eco-tourism activities. ■

VEGETABLES A GROWING OPPORTUNITY IN THE SOLOMONS

Vegetable production on Solomon Islands is providing another opportunity for smallholders to diversify agricultural production into high-value crops. With a local vegetable market unable to meet demand, an ACIAR project is helping smallholder vegetable growers overcome obstacles to production.

Despite increasing numbers of smallholder farms around Honiara and the growing importance of vegetable farming in the neighbouring islands of Malaita and Makira, local production falls far short of meeting year-round domestic demand.

The first major activity of the new project was a stocktake of the three provinces—Guadalcanal Plains, Malaita and Makira. Despite growing different crops, using different management systems, vegetable farmers from the three islands were found to share common problems, such as pests and diseases.

Overcoming these production constraints became the focus of the ACIAR project led by the World Vegetable Center (AVRDC) and undertaken in partnership with the Ministry of Agriculture and Livestock, Kastom Gaden Association, Don Bosco Rural Training Center, Vois Blong Mere Solomon and Farmset Ltd.

The team recommended seed evaluation and variety assessments, in addition to developing a simple technology package consisting of adaptable varieties, a fertiliser regime and basic pest and disease management.

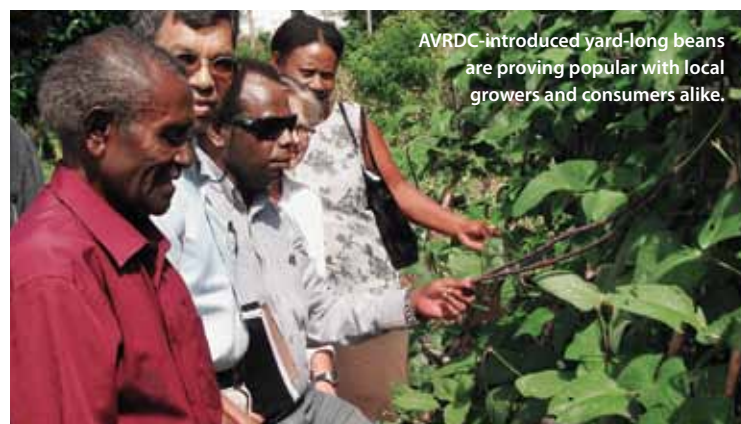
Variety trials in Guadalcanal and Malaita are using seed of improved varieties from the AVRDC, including yard-long beans, hot and bell peppers, cucumber, onion, tomato, bitter gourd and selected indigenous species.

Project manager Dr Manuel Palada and project coordinator Dr Ravindra Joshi of the AVRDC say although the project started only recently, the

effects should be felt quite soon. "We have many variety trials in place and the early results are quite exciting," Dr Joshi says.

Honiara organic grower Mr Joini Tutua has experienced first-hand the high market value of AVRDC-introduced yard-long beans, which are twice as long and much crunchier than local varieties. After one successful crop he has planted a large area to the new variety. The introduced tomatoes, which flower earlier and are firmer than local varieties, are popular with cafés and hotels for juicing.

Another objective is to evaluate low-input crop-management practices, such as drip irrigation, starter fertilisers, organic manures and composts. Following a training workshop on integrated crop, soil and pest management, a soil-analysis service and pest profile are being developed during field visits and variety trials. "A number of other high-value horticultural crops could potentially be grown to improve income for smallholder farmers in the Pacific," Dr Joshi says.



AVRDC-introduced yard-long beans are proving popular with local growers and consumers alike.

"It is giving my family a more reliable future."

– NGUYEN VAN DUNG



PHOTO: BRAD COLLIS

AGRICULTURAL RESEARCH EARNS HIGH RATES OF RETURN ON INVESTMENT

Independent assessments of ACIAR's specialist agricultural R&D solutions show they are delivering significant measurable impacts in the developing world

BY GIO BRAIDOTTI

Most of the world's poorest people live in rural areas. That simple demographic means that improvements to farming capacity can act as a lever to lift agricultural economies and pull people out of poverty.

ACIAR plays a specialist role providing agricultural R&D solutions to some of the world's poorest farmers. To ensure these R&D solutions are delivering sustainable outcomes, the Centre commissions independent impact assessment studies that seek to measure and better understand the benefits realised through this work.

To date, impact assessment studies of 90 projects have demonstrated total benefits of a massive \$6.6 billion. In other words, for every \$1 spent by ACIAR, \$30 worth of benefits are delivered to farmers and economies in partner countries and Australia.

BENEFITS FLOW FROM FRUIT-FLY R&D

As a major pest of fruit and vegetable crops, fruit flies are a significant threat to food security and have been targeted in no fewer than 17 ACIAR projects, spanning 25 years. In total, ACIAR-Asian partnerships have invested \$51 million towards fruit fly R&D, with ACIAR contributing nearly \$23 million.

This long-term investment in pest identification and management provides an ideal opportunity to ask a question fundamental to policy responses in the global food crisis: what are the impacts associated with investing in the production systems and supply chains of smallholder farmers?

The impacts of this ACIAR-supported fruit fly R&D was recently analysed by Bob Lindner and Paul McLeod, from the University of Western Australia. Working independently of ACIAR, they identified the measurable estimated impacts across a range of areas including:

- improved market access for exports;

(Left) Vietnamese farmer Nguyen Van Dung was part of an ACIAR-supported project that uses brewery waste as bait for fruit-fly pests. Some farmers were losing up to 90% of their annual crop to fruit flies but now have vastly improved yields.

- new postharvest treatments for export market access;
- improved biosecurity and reduced risk of pest incursion;
- new field-control measures using a protein bait and spray;
- yield gains;
- new fruit crops for some areas;
- environmental and human health benefits; and
- capacity building through formal training and extension programs.

Overall, the \$51 million investment in fruit-fly R&D returned benefits with a present value of \$259 million. That means a return of about \$5 for every \$1 invested and a remarkable internal rate of return of 33%.

Australia also benefited from the fruit-fly research, with the analysts identifying \$43.3 million worth of biosecurity benefits arising from the use of ACIAR-sponsored innovations in response to exotic fruit fly incursions in Australia during the 1990s.

Biosecurity and market access benefits were significant too for countries such as Tonga, where ACIAR-supported fruit-fly surveillance measures made it possible to negotiate a bilateral quarantine agreement with Japan to export fresh 'Kabocho' squash. This export market has been described as the mainstay of the Tongan economy.

CAPACITY BUILDING IMPORTANT

ACIAR CEO Peter Core says that what often proves crucial in the high rate of return on ACIAR-funded work is the commitment to capacity building, especially through follow-up activities and an emphasis on extension and training. These factors contribute to a rate of returns that tends to increase substantially over time, well after completion of the research activity.

For instance, the 2008 update on estimates previously done in 2001 on pig breeding and feeding projects in Vietnam: total benefits increased from a net present value of nearly \$500 million to nearly \$2 billion, providing an updated benefit-to-cost return of more than 250:1 and an internal rate of return of 74%.

"The capacity building included is an important component of the original project has been crucial in sustaining and extending the impact of the research," Mr Core says. "Without the enhanced skills of the research team, the productivity gains for the pig industry would have diminished soon after the project was completed." ■



PEANUT GROWING MANUAL LAUNCHED

A new manual on growing peanuts was recently launched in Lae, Papua New Guinea. *Growing peanuts in Papua New Guinea: a best management practice manual* is aimed at the wide spectrum of industry stakeholders interested in growing and marketing peanuts in PNG. Peanuts are regaining popularity in PNG and they are now seen as an important cash crop for many smallholder farmers and commercial operators.

Pictured above at the launch of the new manual are (from left) Mike Hughes, extension agronomist, Queensland Department of Primary Industries and Fisheries, the Hon. Tim Mulherin MP, Queensland's Minister for Primary Industries and Fisheries, Cathy Pianga, ACIAR's acting country manager, PNG, Dr Raghunath Ghodake, director-general of PNG's National Agricultural Research Institute (NARI) and Dr Sergie Bang, NARI's director of research.



NEW IMPACT ASSESSMENTS

Recent publications in the Impact Assessment Series (IAS) examine fruit-fly R&D, pig breeding and feeding projects in Vietnam, Indian cattle productivity and peanut-cropping systems projects, fisheries-related projects in Indonesia, and increasing production of goats in the Philippines through better internal parasite control.

ACIAR also published *Guidelines for assessing the impacts of ACIAR's research activities* to provide a common approach for the assessment of its work. In 2008-09, ACIAR expects to release a further five IAS reports.

In addition to its annual program of independent impact assessments, ACIAR published adoption studies of research outcomes for all projects three years after their completion. During 2008-09 ACIAR will publish adoption studies for projects concluded in 2003-04.

More information: Recent reports in the Impact Assessment Series and adoption studies can be downloaded free of charge at www.aciar.gov.au/publication/term/25





Mr Smith (centre) with ACIAR's Dr Kuhu Chaterjee (left) and Dr Christian Roth (right) at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India.

Foreign Minister visits ICRISAT

The Australian Foreign Minister, Mr Stephen Smith, visited the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) while in India in September.

Mr Smith met with staff working on a new ACIAR project using biotechnology to speed up the development of more robust post-rainy sorghum varieties. Sorghum is an important crop in India and other parts of the developing world, including areas of Sub-Saharan Africa.

Scientists will use marker assisted selection to identify individual plants whose genetic makeup offers the ability to use water more efficiently, providing plant breeders with reliable stock from which to breed new 'drought tolerant' varieties to help meet the growing demand for grain and fodder.

Mr Smith emphasised the importance of this research as part of the need to protect the world's food crops from the adverse impact of climate change.

McMullan in Papua New Guinea

Parliamentary Secretary for International Development Assistance, Mr Bob McMullan, visited Australian-supported agricultural development projects in East New Britain in November.

He met with key partners such as the National Agricultural Research Institute, the Cocoa Coconut Institute and the Papua New Guinea Oil Palm Research Association.

Discussion centred around food security, income-generating opportunities, including alternative indigenous tree crops such as galip nuts, the threat of pests and diseases such as cocoa pod borer, and the impact of HIV and AIDS on the community.

New work in Iraq

Australia will provide \$4.7 million for agricultural R&D over the next three years to encourage farmers in northern Iraq to adopt conservation cropping methods in dryland agriculture.

The Foreign Minister, Mr Stephen Smith, made the announcement while at the United Nations in New York on 24 September as part of discussions with Iraqi Foreign Minister Zebari. The project, jointly funded by ACIAR and AusAID, is part of Australia's commitment to strengthening agricultural management in Iraq.

The International Centre for Agricultural Research in the Dry Areas (ICARDA) will head the project on the ground in coordination with a number of leading Australian and Iraqi

government and university institutions. Given the security situation in Iraq the project will be based at ICARDA in Aleppo, Syria, with the implementation of the project in Iraq to be managed by Iraqi institutions.

The project will also include the introduction of new crop varieties and machinery for Iraqi farmers, and provide training for more than 90 Iraqi scientists, continuing Australia's work to build the longer-term capacity of Iraq's scientific community for agricultural research and innovation.

Report from food crisis task force

The final report from the Crawford Fund World Food Crisis Task Force, *A food secure world: how Australia can help*, was released on 11 November. The report covers the causes and impacts of the world food price crisis and identifies policy options, especially in relation to Australia's aid program.

"We recommend that the Australian Government increase the proportion of aid directed at rural development, and within that fraction increase the share assigned to agricultural research and extension, which has proved to have quite outstanding returns on investment," said task force leader Mr James Ingram AO.

"This needs to be done in tandem with an effort to build a cadre of food security policy-makers in the developing world—so that they can formulate for themselves appropriate policies and develop and introduce into their farming systems new or adapted technologies suited to their individual circumstances."

Mr Ingram said throughout the analysis five themes recurred:

- left unchecked the food crisis will get worse with climate change;
- Australia must develop a knowledge base in semi-arid and tropical agriculture and in human and animal health and nutrition in the tropics;
- education, especially of women and girls, is pivotal to success in developing countries;
- investment in rural R&D must be sharply focused on smallholder farmers and also biotechnology with application in the poorest environments; and
- a greater proportion of Australian aid needs to be directed to areas of extreme poverty in Sub-Saharan Africa and the Asia-Pacific Rim.

The report was written by Dr Gabrielle Persley and Dr Denis Blight with significant input from Mr Ingram and general oversight and review by the Crawford Fund task force. **For details visit www.crawfordfund.org/events/foodtaskforce.htm**

Project leaders win World Bank grant

Professor Ivan Kennedy and Dr Michael Rose from the University of Sydney and Dr Phan Thi Cong from the Institute of Agricultural Sciences for Southern Vietnam recently received a major innovation award from the World Bank in Washington DC.

Awarded for their ACIAR-funded project 'Sustaining Nitrogen Efficient Rice Production', the US\$200,000 innovation award was

TRAINING

John Allwright
Fellows visit ACIAR

Thirty-two John Allwright Fellows who began their studies in 2008 travelled to Canberra in September for a week-long visit to ACIAR, including a course in scientific writing. The week concluded with the Fellows having an opportunity to present their research topics to ACIAR staff. The Fellowships are available to developing-country scientists involved in ACIAR projects to undertake postgraduate studies at Australian universities.

Sonny Domingo, from the Philippines, is studying how vegetable supply chains operate by determining how best to track signals that indicate changes in the chain. "The aim is to develop the tools to assess the possible impacts of proposed interventions," Sonny says. "This will help decision-makers decide which options will have the highest possibility of success."

The research will also help farmers supplying products to markets. "It is good for farmers to realise—before they decide on things to grow—what levels of return to expect."

Sonny sees the Fellowship as a

valuable chapter in his professional life. "This will open up more opportunities for me when I return home, by providing additional skills and knowledge." The home fires burn strongly for Sonny, with his wife and four daughters remaining in the Philippines while he studies in Australia. Each night he mixes study with calls home, and is looking forward to returning for field studies.

The burning of home fires is also forefront in the mind of Jesse Abiuda-Mitir, but for a very different reason. Jesse, from Papua New Guinea, is examining a major problem in many areas of the country: the shortage of fuel wood. This leaves people to burn whatever is at hand as a replacement, with plastics a common substitute for wood in fuelling cooking fires.

Jesse is keen to develop communication strategies that address this and similar problems relating to the use of forest resources. PNG faces a major challenge in ensuring the sustainable use of forests, particularly for fuel wood. This problem is compounded by what Jesse describes as the information gap between forest researchers and end-users.

"Scientific information is not communicated to people. I want to help myself and my country by reaching out to communities," Jesse says. She compares the situation to that in Vietnam, where extension policies are in place, but understands the unique challenge of PNG: a number of languages, remote locations and no single means of information dissemination.

"Many people go to NGOs to get information," she says. The difficulty, according to Jesse, is that no one medium reaches most or all of the people. "The internet is OK in the cities, but not in remote areas. Radio is good, but in what language—pidgin, English or regional dialects?"

To help solve this problem Jesse is examining "how forest resource owners use this information and how forest resource managers can develop communication strategies for use by their end-users. If we don't put our finger on the problem how can we address that?"

Helping developing country scientists understand this and a range of other problems, and design sustainable solutions, is what the John Allwright Fellowships are about.

won in the World Bank's Global Development Marketplace on 26 September 2008 from 1,800 applicants.

The grant will allow the team to further their work in Vietnam on the use of inoculant biofertilisers to lower rice farmers' costs by allowing crops to be grown with much less nitrogen fertiliser and potentially reducing emissions of the greenhouse gas nitrous oxide.

Their aim is to establish an integrated production-supply-extension chain for reliable biofertilisers to reduce chemical contamination and increase yields.

For details of the new publication *Efficient nutrient use in rice production in Vietnam achieved using inoculant fertilisers* see page 30.



Professor Ivan Kennedy (right) and his colleague Dr Phan Thi Cong accept their award at the World Bank in Washington DC from Juergen Voegele (left), director, agriculture and rural development, World Bank.



Dr Cong explains their project to the 11th President of the World Bank, Robert Zoellick. Only three of the 100 projects from which the 22 winners were selected were chosen for special viewing.



Some of the John Allwright Fellows in Canberra, September 2008, during a week-long visit to ACIAR. Jesse Abiuda-Mitir is pictured far right in the back row.

COCOA PARTNER TO STUDY RESEARCH ADOPTION

One of ACIAR's cocoa-development partners in Eastern Indonesia, Mr Rafiuddin Palinrungi, will begin a PhD in agricultural economics at the University of Sydney in 2009, after being awarded a 2008 John Allwright Fellowship.

Rafiuddin, or 'Rafi' as he is known within the SADI program in Sulawesi, is a Jakarta-based operations analyst with the International Finance Corporation (IFC). The IFC is a key partner in SADI (the Smallholder Agribusiness Development Initiative), which is endeavouring to make farming in Eastern Indonesia more sustainable by introducing heightened business perspectives to crop production and marketing (see page 8).

The ACIAR-SADI partnership brings together government research institutions and end-user companies—initially in peanut and cocoa production—so there is a more direct link between the introduction of on-farm technologies and the product quality and supply chain needs of processors. It is hoped that this will create a more direct coupling between the improvements farmers make and the reward of higher prices.

Rafi says he will be undertaking his PhD in the university's geography faculty because a major part of his thesis will be showing how technology transfer is more readily achieved when it is built into a social framework.

"The focus of my research for the John Allwright Fellowship is to find out how effective multinational companies are at providing technical assistance to cocoa farmers and how this relates to adoption rates of new technology," Rafi says. "Many technologies are introduced to farmers, but the question is, 'Do farmers implement these?' My research will seek to find out how farmers make decisions about implementing technology and how a multinational company, in a vertically integrated supply chain, can positively influence technology adoption.

"We think this will show the need for more consideration to social aspects in research programs. In other words, if a company brings technical knowledge it also needs to bring a social understanding of how farmers will respond."

PHOTO: BRAD COLLIS



Rafiuddin Palinrungi, operations analyst – business enabling environment, at the International Finance Corporation.

Latest Fellows announced

A record 101 applications were received for the six available 2009 John Allwright Fellowships. The candidates were assessed against the strategic fit of their proposed study with ACIAR's program, and how their study boosts both the capacity of their home institution and the ACIAR project in which they are engaged.

The 2009 Fellows, and their associated ACIAR projects, are:

- **Mr Ghani Akbar**—project LWR/2002/034: Refinement and adoption of permanent raised bed technology for the irrigated maize-wheat cropping system in Pakistan;
- **Mr Tarunamulia**—project FIS/2002/076: Land capability assessment and classification for sustainable pond-based aquaculture systems in Indonesia;
- **Ms Istringasih**—ACIAR-Smallholder Agribusiness Development Initiative Component 3 – Institutional Development Indonesia;
- **Mr Deane Woruba**—project PC/2006/063: Integrated pest management for Finschhafen disorder of oil palm in Papua New Guinea;
- **Ms Veronica Bue**—project ASEM/2006/127: Commercial sector/smallholder partnerships for improving incomes in the oil palm and cocoa industries in Papua New Guinea; and
- **Mr Philip Tuivavalagi**—project PC/2004/063: Integrated pest management in a sustainable production system for Brassica crops in Fiji and Samoa.

John Dillon Memorial Fellowships

Ten candidates have been selected for the 2009 John Dillon Memorial Fellowships. The scheme serves the memory of John Dillon by

providing career development opportunities for five to six weeks for outstanding young agricultural scientists or economists who are involved in current or recently completed ACIAR projects.

The 10 Fellows will visit Australia in February and March 2009 to attend a leadership course at Mt Eliza Centre for Executive Education, and for training in professional communication and research management at ACIAR.

The successful applicants are:

- **Dr Babar Bajwa**—manager (technical), Pakistan Horticulture Development and Export Board, Lahore, Pakistan;
- **Mr Chea Sareth**—deputy head, Socio-Economics and Science Division, Cambodian Agricultural Research and Development Institute, Phnom Penh, Cambodia;
- **Mr Oupakone Alounsavath**—director, Planning and Cooperation Department of Forestry, Ministry of Agriculture and Forestry, Vientiane, Lao PDR;
- **Dr Marsetyo**—senior lecturer, Department of Animal Science, University of Tadulako, Sulawesi Tengah, Indonesia;
- **Ms Wahida Maghraby**—coordinator, Collaborative Research Division, Indonesian Centre for Agricultural Social Economics and Policy Studies, Bogor, Indonesia;
- **Mr Handoko Widagdo**—acting country director, World Education, Jakarta, Indonesia;
- **Mr Adalfredo Ferriera**—director of research and special services, Ministry of Agriculture and Fisheries, Dili, East Timor;
- **Mr Nelson Simbiken**—senior research scientist, Coffee Industry Corporation, Goroka, Papua New Guinea;
- **Mr William Kerua**—lecturer, PNG University of Technology, Lae, Papua New Guinea; and
- **Mr Don Yakuma**—program coordinator – forestry, OK Tedi Development Foundation, Tabubil, PNG.

First John Fryer scholarships announced

Two young scientists from the Forest Science Institute of Vietnam received the inaugural awards from the John Fryer Forestry Scholarship Fund in Hanoi on 22 August 2008.

Mr Doan Ngoc Dao and Mr Doan Dinh Tam were presented with the first instalment of their grants of approximately \$2,000 by the then Australian Ambassador to Vietnam, His Excellency Mr Bill Tweddell.

The Fund was established in 2007 following the sudden passing away of Dr John Fryer, who was the ACIAR research program manager for forestry from 1996 until 2004.

He passed away while living in Hanoi in May 2007. John particularly enjoyed working in Vietnam and the fund was established by his friends to build on his legacy by assisting Vietnamese forest scientists in their PhD studies in forestry research.

Mr Doan Ngoc Dao is studying the variation and inheritance of growth characteristics and wood properties of *Acacia mangium*, while Mr Doan Dinh Tam's PhD is on technical measures for planting *Schima sallichii* in mountainous provinces of North-West Vietnam.

Aquaculture course hatches its 100th graduate

A training course on grouper aquaculture, first developed as an extension activity to support an ACIAR project, has graduated its 100th trainee. The trainees have come from 21 countries, including Australia, Brunei Darussalam, Colombia, China – Hong Kong SAR, India, Indonesia, Malaysia, Maldives, Marshall Islands, Myanmar, Oman, Palau, Philippines, Qatar, Saudi Arabia, Singapore, Sri Lanka, Trinidad

and Tobago, Iran, Thailand, and Vietnam.

"The course provides much-needed experience in managing this high-value industry which is relieving pressure on wild capture fishing of grouper species," said ACIAR's Research Program Manager for Fisheries Barney Smith. "It has been held since 2002, firstly at the Research Institute for Mariculture at Gondol, Bali, and since 2005 at the Brackishwater Aquaculture Development Centre at Situbondo in East Java."

Backyard grouper hatchery technology, initiated by the Research Institute for Mariculture and facilitated through several ACIAR projects, has been widely adopted in Indonesia. In Buleleng Regency in northern Bali, where most of the small-scale hatcheries are located, there are now 324 small-scale hatcheries producing milkfish and 40 hatcheries producing grouper. More than 5,000 local people are directly employed in the hatchery business, with many others indirectly employed through input suppliers, transport and other activities.



(Left) participants in the 2008 grouper hatchery production training course feed brine shrimp to larval groupers.

Increasingly, the hatchery technology is being applied in other countries, in part through the grouper hatchery production training course, and is also being applied to other marine finfish. "Its simplicity, flexibility and economic

NEW APPOINTMENTS

Dr Richard Markham, ACIAR's new Pacific Crops Research Program manager, has worked in international R&D for the past 30 years, and for past five years as a program director for the CGIAR centre, Bioversity International. He led a large international scientific team encompassing a range of tropical and subtropical fruit, field and tree crops. Earlier in his career Richard worked with the International Institute of Tropical Agriculture (IITA) and from 1995 to 2001 led the CGIAR system-wide integrated pest management program, both in field and horticultural crops

Richard's research management responsibilities will cover germplasm conservation, crop protection, production, postharvest and marketing issues. He will be based in Suva, Fiji, and will visit PNG and the other Pacific countries on a regular basis.



Dr Richard Markham

Forestry intern at ACIAR

Silvia Irawan, from Indonesia, who is studying for a PhD at the Crawford School at the Australian National University, spent two months on an internship at ACIAR in Canberra.

Silvia undertook a desk study identifying the research issues associated with the implementation of a system of payments for Reduced Emissions from Deforestation and Degradation (REDD) in PNG. Silvia is in Australia on an AusAID-funded Australian Leadership Awards Scholarship

Silvia Irawan



viability are key factors that have facilitated its uptake and spread, including the ability to switch between fish species or between fish and shrimp," Mr Smith said.

For further details of training courses visit www.enaca.org.

NEW PUBLICATIONS

CORPORATE PUBLICATIONS

• **ACIAR Corporate Plan 2008–12** Outlines the challenges and the critical success factors for ACIAR, along with linkages to strategies to meet these challenges. *CP14, 30pp.*

• **ACIAR Annual Report 2007–08** Outlines ACIAR's performance including a review of project activities by each partner country and the centre's financial statements. *AR 2007-08, 151pp.*

• **Country Profiles: China; Cambodia, Lao PDR and Thailand; Indonesia; Pacific Islands; Papua New Guinea; the Philippines; South Asia; Vietnam** These eight ACIAR Country Profiles are a snapshot of the collaborative research carried out between developing country partners and Australia in 2008.

• **Indonesian, Lao, Vietnamese and Khmer translations of extracts from ACIAR's Annual Operational Plan 2008–09**

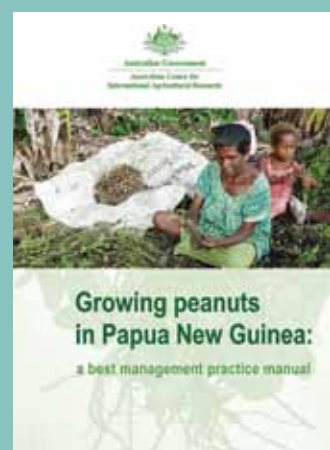
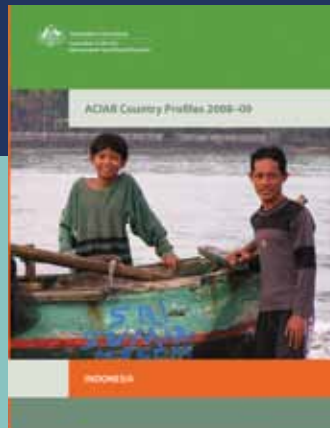
MONOGRAPHS

• **Measuring plant-associated nitrogen fixation in agricultural systems**

A state-of-the-art reference on the various methods and practical applications for measuring nitrogen fixation in the field. *M. Unkovich, D. Herridge, M. Peoples, G. Cadisch, B. Boddey, K. Giller, B. Alves and P. Chalk, 2008, ACIAR Monograph 136, 258 pp.*

• **Sea cucumber fisheries: a manager's toolbox** In response to the dire condition of many sea cucumber fisheries today, ACIAR convened the 'Papua New Guinea, Pacific Islands and Northern Australia Sea Cucumber Fisheries Management Workshop', held at Motupore Island Research Centre, PNG, in March 2006. This booklet is a direct outcome of that workshop. *K. Friedman, S. Purcell, J. Bell and C. Hair, 2008, ACIAR Monograph 135, 36pp.*

• **Growing peanuts in Papua New Guinea: a best management practice manual** Peanut growing is regaining popularity in Papua New Guinea, where peanuts are now seen as an important cash crop for many smallholder farmers and commercial operators. This is a best management production manual aimed at the wide spectrum of industry stakeholders interested in growing and marketing peanuts in Papua New Guinea. *M. Hughes, R.C.N. Rachaputi, L. Kuniata and A. Ramakrishna, 2008, ACIAR Monograph 134, 77pp.*



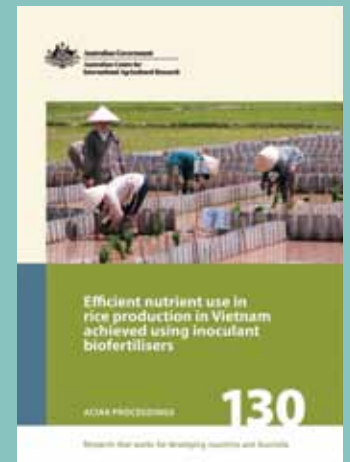
PROCEEDINGS

• **Efficient nutrient use in rice production in Vietnam achieved using inoculant fertilisers**

A summary of research in Vietnam that showed the significant benefits provided by the biofertiliser BioGro on rice growth and yield. Technological aspects and commercial assessments of the application of BioGro are included. *I.R. Kennedy, A.T.M.A. Choudhury, M.L. Kecskés and M.T. Rose (eds) 2008, ACIAR Proceedings 130, 137 pp.*

• **Management of classical swine fever and foot-and-mouth disease in Lao PDR**

A compilation of research papers presented at a workshop in Vientiane on foot-and-mouth disease and classical swine fever, which continue to be a problem for livestock producers. The outcomes from collaborative research in Lao PDR were shared with partners from throughout South-East Asia, and scientists provided up-to-date information on the disease situation in their respective countries. *J.V. Conlan, S.D. Blacksell, C.J. Morrissy and A. Colling (eds) 2008, ACIAR Proceedings 128, 98 pp.*



IMPACT ASSESSMENT SERIES

• **Two-stage grain drying in the Philippines** The study found that grain-drying technology was not adopted in the Philippines because the process was unprofitable for the small-scale operators that dominate the industry. It provides some very useful lessons for guiding future investments in research, in particular the need to take local industry and policy conditions into account when developing research activities. *A. Chupungco, E. Dumayas and J. Mullen, ACIAR Impact Assessment Series 59, 52 pp.*

• **Guidelines for assessing the impacts of ACIAR's research activities** A set of guidelines for all independent consultants to use as a basis for future assessments to ensure consistency in the methodological approaches used, the treatment of information collected and presentation of the results. *J. Davis, J. Gordon, D. Pearce and D. Templeton, ACIAR Impact Assessment Series 58, 76pp.*

• **Management of internal parasites in goats in the Philippines** In collaboration with Philippine and international organisations, ACIAR funded a program to develop a management package to effectively control internal parasites and enhance goat production. The study found, via an extensive survey of farmers and local extension groups, that the substantial adoption of changed management practices in the target regions continues to expand. The project has had a significant impact, providing an estimated \$66 million of welfare gains (net present value), a benefit:cost ratio of 10:1 and an internal rate of return of 25%. *N.D. Montes, N.R. Zapata Jr, A.M.P. Alo and J.D. Mullen, 2008, ACIAR Impact Assessment Series 57, 44pp.*

• **A review and impact assessment of ACIAR's fruit-fly research partnerships, 1984–2007** This review of the full set of 17 fruit-fly projects supported by ACIAR, with many partner organisations and countries, showed there has been a significant return on this substantial investment in R&D. The net present value of all benefits is estimated to be \$208.1 million, giving a benefit:cost ratio of over 5:1 and an internal rate of return of 33%. *B. Lindner and P. McLeod, 2008, ACIAR Impact Assessment Series 56, 164 pp.*

• **ACIAR fisheries projects in Indonesia: review and impact assessment** This study reviewed ACIAR-funded fisheries research in Indonesia and provides detailed studies of tuna capture fisheries and shrimp aquaculture. For captured fisheries management the share of returns attributed to ACIAR was assessed to be \$168 million, with a benefit:cost ratio of ACIAR and partner-invested funds of 179:1 and an internal rate of return of 210%. For shrimp aquaculture, the impact of the development of

effective technologies for pond remediation was found to be worth \$547 million, with a benefit:cost ratio of 52:1 and internal rate of return of 26%. *Greg Martin, 2008, ACIAR Impact Assessment Series 55, 76 pp.*

• **Impact of improved management of white grubs in peanut-cropping systems in India** This project looked at the problems caused by various species of white-grub pests in peanut production in India and Australia. Links with the non-government organisation Agricultural Man Ecology Foundation helped ensure adoption of the technology package in a target region of Raichur in India. The present value of the net benefits was estimated at \$6.1 million, with a benefit:cost ratio of 5.7:1 and an internal rate of return of 29%. *M. Monck and D. Pearce, 2008, ACIAR Impact Assessment Series 54, 31pp.*

PROJECT FINAL REPORTS

PNG AND PACIFIC

• **A sea cucumber fisheries management project in PNG: a project feasibility review to ACIAR** *Alistair McIlgorm, Bob Lindner and Jeff Kinch, ACIAR Final Report FIS/2002/110, www.aciar.gov.au/node/9702*

• **Genetic and morphological relationships of mud crabs, genus *Scylla*, from throughout the Indo-Pacific** *P. Keenan, D. Mann, S. Lavery and P. Davie, ACIAR Final Report FIS/1992/017, www.aciar.gov.au/publication/FR2008-39*

• **Horticulture industry development for market-remote communities: Cape York and Samoa** *R. Holmes, R. Goebel, P. Tuivavalagi, J. Daniells and M. Tinifu, ACIAR Final Report HORT/2001/023, www.aciar.gov.au/publication/FR2008-43*

• **Impacts of the policy and institutional environment on ACIAR research in the South Pacific** *B. Warner, E. Stephens and L. Davis, ACIAR Final Report PLIA/2005/150, www.aciar.gov.au/publication/FR2008-45*

SOUTH-EAST ASIA

• **Improving smallholder crop-livestock systems in Eastern Indonesia** *N MacLeod, C. McDonald, J. Corfield, L. Wirajaswadi, R. Rahman, S. Bahar, N. Razak, K. Puspadi, Dahlanuddin, D. Sutaryono, R. Padjung, S. Saenong, L. Hadiawati, Sahardi, Mashur, and D. Proptomo, ACIAR Final Report LPS/2004/005, www.aciar.gov.au/publication/FR2008-40*

• **Impact of migration and off-farm employment on roles of women and appropriate technologies in Asian and Australian mixed farming systems** *T. R. Paris and F. Rola-Rubzen, ACIAR Final Report PLIA/2000/039, www.aciar.gov.au/publication/FR2008-42*

• **Enhancing project impact and science capability through ongoing evaluation**

Steven Vallance, Nguyen Viet Hai and Ian Dreher, ACIAR Final Report PLIA/2002/103, www.aciar.gov.au/publication/FR2008-46

NORTH ASIA

• **Economic and policy constraints affecting the development of small-scale dairy farmers in Pakistan** *David Harris, ACIAR Final Report PLIA/2006/136, www.aciar.gov.au/publication/FR2008-47*

• **Increasing milk production from cattle in Tibet** *John Wilkins and John Piltz, ACIAR Final Report LPS/2002/104, www.aciar.gov.au/publication/FR2008-37*

• **Establishment of beef industries in additional red soils provinces in China** *R. A. Hunter, J. V. Nolan and N. D. MacLeod, ACIAR Final Report PLIA/2006/151, www.aciar.gov.au/publication/FR2008-41*

SOUTHERN AFRICA

• **Developing profitable beef business systems for previously disadvantaged farmers in South Africa** *H. Burrow, E. Matjuda, P. Strydom, B. Nkhane Nengovhela, P. Madzivhandila, D. Motiang, G. Griffith and R. Clark, ACIAR Final Report LPS/1999/036, www.aciar.gov.au/publication/FR2008-44*

ACIAR'S DISTRIBUTION POLICY

ACIAR provides complimentary copies of its publications to developing-country libraries, institutions, researchers and administrators with an involvement in agriculture, 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, aciarn@nationalmailing.com.au.

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

NEW PROJECTS

AH/2003/008	Improved feeding systems for more efficient beef cattle production in Cambodia
AH/2006/159	Best practice health and husbandry of cattle and buffalo in Lao PDR
ASEM/2006/130	Enhancing production and marketing of maize and soybean in north-western Cambodia and production of summer crops in north-eastern Australia
ASEM/2007/096	The policy environment in Papua New Guinea and its impact on the adoption of the outputs of past ACIAR projects
CIM/2005/111	More effective water use by rainfed wheat in China and Australia
CIM/2007/120	Improving post-rainy sorghum varieties to meet the growing grain and fodder demand in India
CIM/2008/027	Development of conservation cropping systems in the drylands of northern Iraq
FIS/2007/116	Improving resilience and adaptive capacity of fisheries-dependent communities in Solomon Islands
FST/2004/057	Enhancing on-farm incomes through improved silvicultural management of teak and paper mulberry plantations in Luang Prabang Province, Lao PDR
LPS/2006/119	Integrated crop and dairy systems in Tibet Autonomous Region, PR China
ADP/2007/090	Scoping study on western China desertification
LWR/2008/015	Developing options to mainstream climate adaptation into farming systems in Cambodia, Laos, Bangladesh and India
AESM/2008/033	An assessment of the <i>Oribius</i> weevil outbreak in Papua New Guinea and its impact on coffee yield and productivity in Simbu and adjacent provinces
CIM/2007/122	Sustainable intensification of rice-maize production systems in Bangladesh

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.

Back cover: Indonesian children on the island of Sumbawa greeting a team of scientists as they pay a visit to smallholders participating in a local ACIAR project.

PHOTO: GIO BRAIDOTTI



ACIAR

Research that works for developing countries and Australia

www.aciar.gov.au

Front cover: A worker, Mr Saharudin, airing and drying freshly harvested peanuts at GarudaFood's processing plant on Lombok, Indonesia.

PHOTO: BRAD COLLIS