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IN RESEARCH FOR DEVELOPMENT

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Global partnerships for the Millennium Development Goals

When the United Nations Millennium Development Goals (MDGs) were first announced in September 2000, a deadline of 2015 was set to halve global poverty. At the time, 15 years seemed long enough. Today we are past the halfway mark and, while progress has been substantial, there is still a way to go.

The twin global crises—dramatic food price rises in 2008 and financial collapses and recession in 2008–09—have made the task more urgent. Last year's global food crisis hit the developing world hard, and the poor the hardest.

Prices for staple foods, particularly rice, rose by as much as 100%. The poor were faced with eating less, or not at all. Ongoing effects of the global financial crisis threaten to entrench that situation, closing off the pathways out of poverty for many.

Achieving the MDGs requires investment in development. In hard financial times the temptation may be to cut back on this investment and focus on issues closer to home. However, doing so could prevent the world meeting the 2015 deadline for the MDGs and lifting many of the 1.2 billion poor out of lives of poverty.

The Australian Government is committed to helping these people through the Australian Aid Program. At the forefront of this program is a commitment to supporting the MDGs, the focal point of global efforts to eradicate poverty. To achieve these goals would be to ensure that every person has access to accepted human rights, freedom from hunger, a basic education and a right to healthcare.

Beyond these arguments are the practicalities involved. Australia's aid program aims to assist developing countries reduce poverty and achieve sustainable development, in line with Australia's national interest. In part this means being a good international citizen and striving for universal rights for all. It also means working towards a stable, peaceful and prosperous Asia–Pacific region, and the same for Africa and beyond. In part this is achieved through contributions to international and multilateral organisations, such as the Consultative Group on International Agricultural Research (CGIAR).

This edition of *Partners* focuses on the MDGs, as well as the joint work of ACIAR with the centres of the CGIAR and other multilateral approaches. This includes work with the International Rice Research Institute to improve the marketability of rice grown by smallholders through eradicating chalkiness, one of the main reasons buyers refuse to buy, or pay little for, smallholder-produced rice.

Other projects reported on include work to capture, store and utilise the rich genetic resources from crops grown throughout the world. Collecting wild seed, cataloguing existing seed stocks from global repositories, and utilising this in breeding are vital to continue the research and development (R&D) to improve staple foods. Without continued development to lift productivity of food staples, shortages such as those of 2008 may become common. Trans-boundary animal diseases, which not only kill livestock but also hamper trade, are also reported on, as are efforts to reduce the spread of avian influenza and increase awareness of biosecurity in the region.

These are examples of how ACIAR works with developing-country partners and the centres of the CGIAR to reduce poverty. As Australia's Parliamentary Secretary for International Development Assistance says on page 4, the centres of CGIAR are world leaders in their fields and their contribution will be vital to the global challenge of lifting agricultural productivity.

The partnerships between ACIAR, the CGIAR centres and developing-country scientists that ACIAR facilitates are practical examples of the eighth of the MDGs: a global partnership for development. Achieving the goal of halving global poverty requires both multilateral and bilateral approaches to development. ACIAR and the Australian aid program will continue to deliver R&D initiatives to help achieve the MDGs so that our region and our world can be free of poverty. ■

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Australia's aid program

Australia's whole-of-government aid strategy is aimed at reducing poverty by putting in place systems, technologies and practices to improve living standards of poor rural communities. Sometimes a modest infrastructure improvement, such as this water pump installed in a village in south-east Cambodia, can make all the difference to a community's agricultural productivity. This particular installation was an AusAID initiative that dove-tailed with ACIAR's support of initiatives to help rice farmers diversify into horticulture.

PHOTO: BRAD COLLIS

By increasing aid to international development-assistance programs, Australia is seeking to reverse the effects of the global food and financial crises on poverty reduction and get back on track to achieving the Millennium Development Goals



BY BOB McMULLAN
Parliamentary Secretary for International Development Assistance

For many people in the developed world US\$1.25 is pocket change, perhaps used towards buying a cup of coffee or a lottery ticket. Yet for 1.4 billion people living in poverty in the developing world US\$1.25 is more than they have to spend each day on food, shelter, clothing, health and education; it is the marker of absolute global poverty.

That is why helping people out of poverty is a priority of the Australian Government, through its international development-assistance program. Increasing aid is the right thing to do and is in Australia's national interest. Helping create greater prosperity in our

region intersects with the challenge faced by many developing countries in the Asia-Pacific region and beyond—creating sustainable development that builds prosperity and stability.

Australia's aid program is delivered through AusAID in the main. However, a unique feature of the Australian program is the specialist role of ACIAR, focusing on agricultural research.

Bilateral engagement has formed the majority of Australia's development assistance for some time. Developing countries have a range of needs, including health, education, governance, human rights, gender and disability, that are addressed through AusAID initiatives.

Food prices are increasing and the world's poorest people are suffering greatly. Coupled with the global financial crisis, the number

of people who live in poverty is increasing. Climate change further complicates the picture. The dependence on agriculture in developing countries means climate change is having an even greater impact in some countries in the region, and beyond.

The global effects of these crises raise challenges to development and poverty reduction. The Australian Government is committed to engaging with the United Nations (UN) and focusing on poverty reduction through the achievement of the Millennium Development Goals (MDGs).

Prior to the global food and financial crises, efforts to reduce poverty were making significant gains. Global efforts have been focused around the MDGs—eight goals agreed by the UN to reduce poverty by half by 2015—and have played a lead role in gains in

is making a difference

Mr Long Ky Meng, a field production officer involved in an agricultural quality-improvement project in Cambodia, shows the more prolific shoots of a new higher-quality rice variety. This particular variety has allowed farmers to increase yields by up to 30% using a third less seed. Yield increases like this, especially in food staples such as rice, not only improve income and food security, but free up land for diversification into other crops.

PHOTO: BRAD COLLIS

8 WAYS TO CHANGE THE WORLD

THE MILLENNIUM DEVELOPMENT GOALS



Eradicate extreme hunger and poverty



Achieve universal primary education



Promote gender equality and empower women



Reduce child mortality



Improve maternal health



Combat HIV/AIDS, malaria and other diseases



Ensure environmental sustainability



Develop a global partnership for development

Icons designed by UNDP Brazil

prosperity. In part this is because the goals are tangible, providing real indicators of success in achieving an end to poverty.

We have come a long way. However, the recent *Millennium Development Goals Report 2009*, released by UN Secretary-General Ban Ki-moon, illustrates how far we have left to go. The report indicates that, overall, progress has been significant, but is too slow for most of the goals to be achieved. While much of Asia has made gains that put it on track to achieve most of the eight goals, Africa and the Pacific are falling behind.

AusAID's recent report *Tracking Development and Governance in the Pacific 2009* confirms that, despite significant gains, the Pacific region is falling behind. In some countries progress has kept pace with the UN timeline of halving poverty by 2015, but other countries are falling

well behind. In part this is due to the impacts of the global recession.

Australia has partnered with New Zealand, the Asian Development Bank and the World Bank to form the Pacific Quadrilateral Development Partners, and to work together to ensure rapid and coordinated responses to immediate financing and structural-reform needs in the region. The aim is to ensure that the region's economies remain stable, and that the poor are protected from the worst effects of this crisis.

Economic growth and stability are critical to reducing poverty. In an interconnected world, economic growth can create genuine opportunities. The opposite also holds true: a global recession can force many back into poverty.

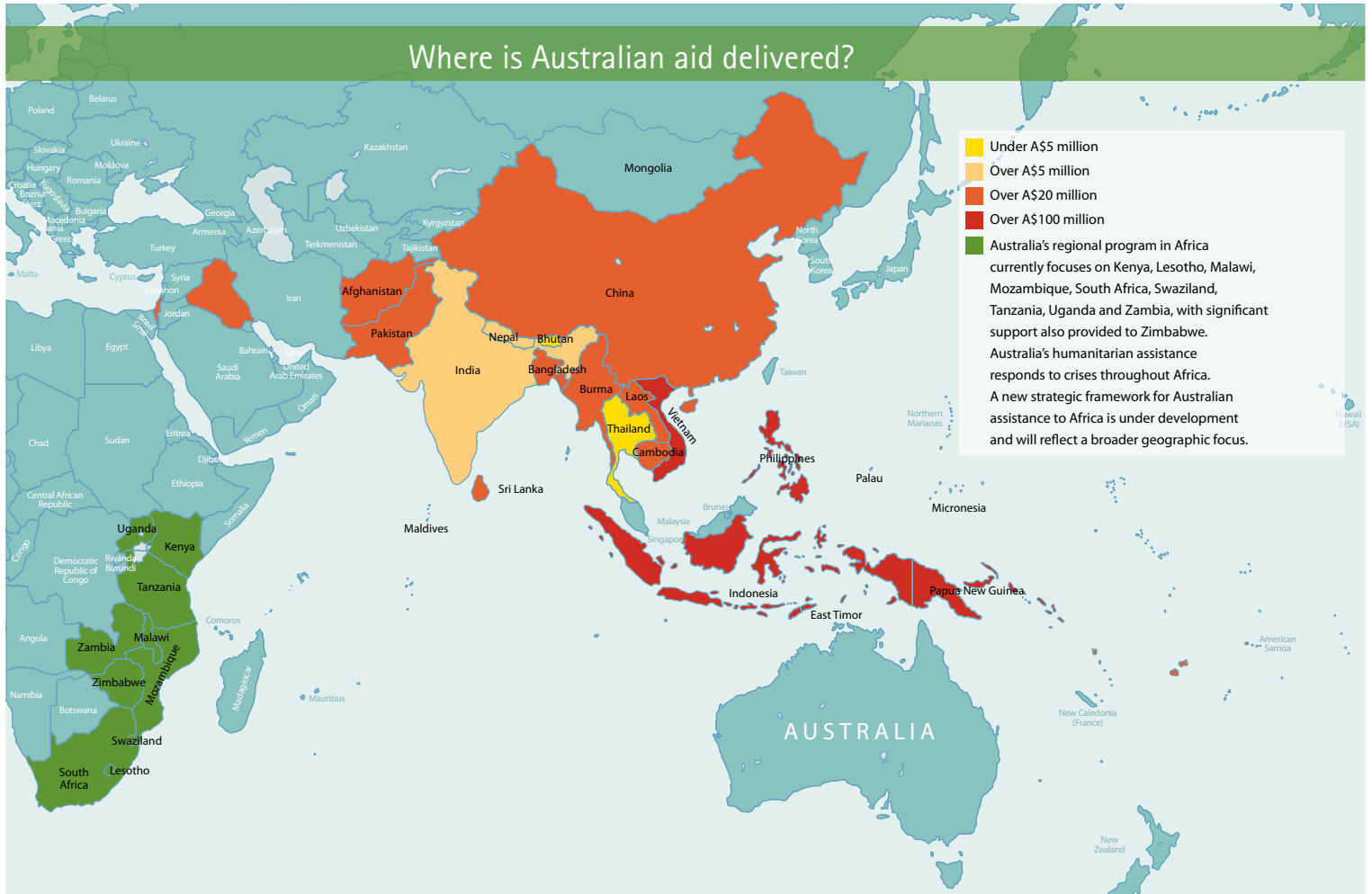
Since the global food crisis of 2008 many

people seeking to buy food with their US\$1.25-a-day income have experienced pain as food prices have risen. The global recession has made it even harder, and for some the reality is they may not eat at all.

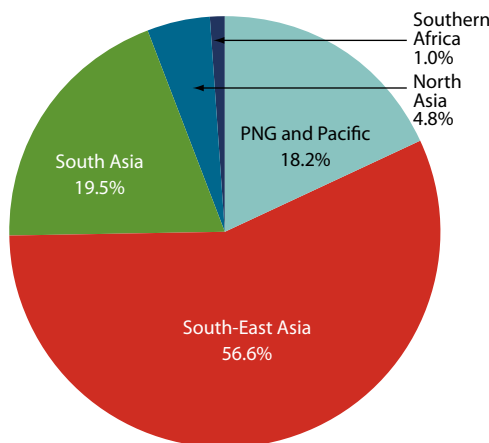
Food security has, as a result of the global food and economic crises, gained greater importance. Imbalances in supply and demand have been behind price rises. Increasing the supply of food is the best way to address this imbalance.

For Australia's international development-assistance program this means making a real contribution to increasing the productivity of agricultural land in developing countries. Achieving gains in productivity requires research expertise—an area where Australia is a world leader.

ACIAR's role is to link this expertise to the



ACIAR's expenditure by region



needs of developing countries. A vital element of ACIAR's work is its engagement with its international counterparts of the Consultative Group on International Agricultural Research (CGIAR).

The research centres that make up the CGIAR are world leaders in their fields. They are vital to the challenge of lifting agricultural productivity. Australia's investment in science and innovation has been increased, doubling between now and the 2012–13 budget, with the aim of increasing productivity growth for food crops, livestock and fisheries.

The beneficiaries of this research will be smallholder farmers, the backbone of agriculture in the developing world. Helping these farmers increase their output is a first step to addressing the food imbalance.

The World Bank reports that half of the world's poor are smallholder farmers, many struggling to produce enough to feed themselves. What they have in common, besides hunger, is a lack of opportunity.

Increasing agricultural productivity among smallholder farmers creates surpluses, which

can then be sold at local markets, becoming a driver of growth. Economic growth is critical both to developing states and to individual opportunity. Australian aid is creating such opportunities.

ACIAR has engaged with the centres of the CGIAR in a number of projects to increase the productivity of staple food crops, including rice in Cambodia, sweetpotato, maize and cassava in East Timor, wheat and maize in Afghanistan and sweetpotato in Solomon Islands.

However, increasing productivity is not solely focused on staple food crops. Many smallholders grow a mix of crops; some are food staples and others are planted as potential income sources, such as cocoa. Helping smallholders increase production of in-demand supplementary crops is a powerful driver of opportunity and economic growth.

As an example, an ACIAR-funded project in Papua New Guinea, Australia's nearest neighbour, is changing lives. The project, led by the University of Sydney, is linking the PNG Cocoa Coconut Institute, the PNG University of Technology and MasterFoods Australia New

PHOTO: BRAD COLLIS



Crop trials in Kenya. ACIAR-supported research is crucial in the ongoing quest to adapt crops to local conditions in developing countries. To this end it has a longstanding relationship with many of the Consultative Group for International Agricultural Research (CGIAR) centres.

PHOTO: BRAD COLLIS



A Cambodian villager harvesting rice: crop yields need to keep pace with population growth.

Zealand to enhance cocoa production.

The cocoa industry in PNG is worth an estimated K168 million (A\$87 million), and is one of three major export industries. More than 70% of the total production comes from about 70,000 smallholder farmers growing cocoa as a supplementary income source. Productivity levels are low, despite a global demand for more cocoa.

Focusing on one of the main causes of yield losses—diseases—ACIAR's project partners introduced simple, yet effective, changes to the management of cocoa crops. The results of these practices have increased production of cocoa beans and, through this gain, changed lives.

In the remote Rai Coast district, a village contracted a boat for the first time to ship its load of cocoa to market. Farmers in Tsitalato village in Bougainville have formed a cooperative to sell their cocoa. In Madang province, villagers in Saidor have used returns from the project to build a community resource centre. Individual farmers now report that they can afford to fund education for their children.

Linkages with an AusAID-funded project to reduce the spread of HIV/AIDS, tuberculosis and malaria have also been developed, as news of the increased productivity resulting from improved cocoa management spreads. Demand for information about cocoa management is providing an opportunity to spread the message about disease control through primary healthcare programs.

These gains show what can be achieved in our own region. They continue the important progress towards the Millennium Development Goals and the global fight against poverty.

Australia will continue to work towards achieving the MDGs through bilateral and multilateral engagement, creating opportunities to improve the lives of the poor.

There is a long way to go to achieve the Millennium Development Goals. There is much work still to do if we are to eradicate absolute poverty. Australia is playing its part to ensure that we live in a region that is prosperous and a world where more of the opportunities we take for granted are available to everyone, wherever they live. ■



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, August 2008.



Goals that matter

Following the declaration of independence by East Timor, donated rice seed created major difficulties for farmers. Inadequate harvests resulted from the mix of poorly adapted varieties that lacked uniform growth rates and maturity. ACIAR was among the first agencies to establish crop trials to put farming on a reliable footing, to increase agronomic capacity, crop quality and crop diversity. This 'Seeds of Life' project in East Timor has become a case study for building in-country research and extension capabilities.

Planting rice in Baucau, East Timor, January 2009.

The role agricultural science can play in achieving the Millennium Development Goals creates a special role for ACIAR in promoting prosperity among developing-world farmers

BY WARREN PAGE

The Millennium Development Goals (MDGs) were first announced in September 2000, with a deadline of 2015. Nine years later, and with only six years remaining until that deadline, progress is being made to eradicate poverty.

Eight goals have been set to focus national and international development efforts on the factors that create and entrench poverty—hunger, exclusion, and a lack of infrastructure and shelter. The MDGs also seek to promote gender equality, education, health and environmental sustainability to create avenues out of poverty for the poor.

Half the world's poor are smallholder farmers. People relying on forests, pastures and

fisheries make up another 8% of the poor, with a further 22% being those living in rural areas without access to land. The remaining 20% of the poor live in urban areas.

The Australian aid program has worked towards achieving the MDGs through programs that support broad-based economic growth and development, in particular in rural development, infrastructure and private-sector development. Accelerating progress towards the goals is a core principle of the Australian aid program.

ACIAR's role has focused on rural development, utilising Australian scientific expertise to work with developing-country partners in agricultural research to create sustainable productivity gains. Only sustained increases in agricultural production can help

create economic growth and, through this, opportunities for the poor to create a better life.

Food security is a key component in creating such opportunities. A lack of sufficient food results in carbohydrate and protein intakes below recommended daily levels. Where there is no surplus of food, smallholders cannot sell the excess to earn income that can be used to educate their children, improve health and boost production.

East Timor is an example of a country where poverty remains both widespread and entrenched. The World Bank estimates that value-added agriculture contributes 26% of GDP, with industry value-adding contributing only 19% to GDP. In developing countries value-added agriculture is the main industry, typically contributing significantly to GDP. About 80%

of East Timor's population is engaged in agriculture, yet only a quarter of GDP comes from agriculture. This low level of contribution to GDP is a measure of the low productivity levels and subsistence agriculture in East Timor. Life expectancy is 61, with only 69% of children completing primary education.

By comparison life expectancy in Indonesia, East Timor's nearest neighbour, is 71, with 99% of children completing primary education. Value-added agriculture contributes only 14% of GDP and industry value-adding contributes 47%, a reflection of Indonesia's more advanced economy.

In East Timor, ACIAR has worked in partnership with several CGIAR centres to improve agricultural productivity. The World Food Program indicates that food insecurity affects more than half the population of East Timor. A survey of subsistence farmers in 2007 by the ACIAR team working on the Seeds of Life project revealed the realities of this situation.

No family of those surveyed had sufficient rice or maize to last a full year. Seven out of 10 families went without maize for four or more months each year. All families surveyed were forced to practice food rationing for between one and six months of each year. Many families reported that they were forced to gather wild food regularly, with the worst affected families consuming the seed needed for planting crops in the following season.

ACIAR's two Seeds of Life projects have linked five CGIAR centres with East Timorese and Australian institutions to test and introduce improved seed varieties of staple crops. The centres are the International Maize and Wheat Improvement Center, the International Center for Tropical Agriculture, the International Rice Research Institute, the International Crops Research Institute for the Semi-Arid Tropics and the International Potato Center. They have selected a number of varieties of sweetpotato, maize, peanuts, cassava and rice for testing.

The success of field trials of several new varieties prompted a follow-on project to continue testing the most suitable varieties and scale up seed production for dissemination to villagers. Every new variety tested has out-yielded traditional varieties, with families reporting yield increases of 17–138%.

Since the second Seeds of Life project began in 2005, 114 of East Timor's 442 sucos (villages) have seen improvements in food security as a result of seed dissemination and field trials. In addition, seven NGOs have distributed seed from the project to farmers, seed producers and Ministry of Agriculture,



(Above) peanut field day in Manufahi district, East Timor, May 2008.



(Left) sweetpotato harvest in Viqueque, East Timor, May 2009.

Forestry and Fisheries collaborators. During the 2008–09 season, 9,877 farmers received at least five kilograms of seeds each, representing a total of 6.8 tonnes of rice, 3.9 tonnes of peanuts and 27,000 sweetpotato cuttings.

An external review held in 2009 interviewed 20 farmers participating in the project. Of those 20 farmers, 11 had sold, on average, one-third of their Seeds of Life crop production. The extra income was used to buy rice, protein and other produce to enrich the family diet. Some of the excess income was used for non-food essential household expenses.

Preliminary research indicates that the Seeds of Life project is helping progress towards other MDGs besides eradicating poverty and hunger. During times of need women take responsibility for foraging and preparing wild foods. This coincides with the peak labour demand for weeding subsistence crops, forcing women to undertake increased labour.

Initial data collected from 199 women interviewed by the project show that improved productivity is reducing the time women spend on wild food collection,

thereby decreasing their labour. These data also demonstrate that both men and women are involved in nearly all activities associated with cultivating food crops, helping progress towards the promotion of gender equality and empowerment of women.

The project is also preserving germplasm from local varieties of staple crops. A small collection of cassava is stored at the University of Timor Leste, with project personnel assisting in maintaining the collection. A germplasm officer is being trained in collecting and conserving seeds, with recent collections undertaken for peanut and cassava varieties. As germplasm increases, duplicate collections will be assembled and CGIAR centres approached to maintain these.

The Seeds of Life project is one example of how ACIAR projects are assisting developing countries to build the skills needed to implement domestic initiatives to achieve the MDGs, and are linking with multilateral development initiatives to help achieve the goals established nine years ago by the United Nations. ■

A TWO-WAY BENEFIT

The partnerships ACIAR has established with international agricultural research centres and networks are bolstering the livelihoods of people in developing countries while also broadening the knowledge of Australian scientists

BY JANET LAWRENCE

Partnerships have been ACIAR's methodology since its creation in 1982. The strength of its operations and the success of its outcomes are testimony to the effectiveness of this model. The idea of research institutions from Australia working as equals with counterpart institutions in developing countries was a pioneering concept at the outset. The traditional view of scientific and technical assistance was overseas experts bringing wisdom to needy regions—and often they came with little experience of prevailing systems in-country and a limited understanding of the wealth of local knowledge that resided with local scientists.

The ACIAR model was instituted to break down such perceptions and its acknowledged success has ensured it remains a focal point of operations today. But the partnership model has taken on new and different forms as the organisation has grown and evolved, and it has created a flow of benefits between all

partner countries and organisations involved.

Although ACIAR has no mandate to conduct research on its own, its program managers give substantial help and guidance in the development of projects, establishment of research partnerships and oversight of research progress. They hold an ongoing responsibility to ensure that worthwhile project outcomes have the greatest likelihood of being put to good use for the benefit of farmers in the developing world. These operation modes are valid for ACIAR's bilateral projects and also for the multilateral projects that establish connections with the international agricultural research centres (IARCs), most of which come under the umbrella of the Consultative Group on International Agricultural Research (CGIAR).

ACIAR is responsible for administering Australia's annual contribution to the IARCs, but it is no mere 'cheque book' relationship. Since the centre assumed this role in the early 1990s a proportion of annual allocation has been dedicated to project-specific funding, which

stipulates partnerships between nominated IARCs and Australian research institutions to work with developing-country counterparts for mutual benefit. Australian scientists have benefited from contributing to this global environment, and at the same time they have gained access to IARC genebanks and databases to help with their own research in Australia.

ACIAR crops research manager Dr Paul Fox says two international centres, the International Maize and Wheat Improvement Center (CIMMYT) and the International Center for Agricultural Research in the Dry Areas (ICARDA), have established highly productive partnerships with Australian cereal and legume research agencies. "In turn, these centres have helped connect Australians with scientists in the inaccessible areas of Iraq and Afghanistan, thus helping Australia to fulfil its development assistance objectives in these two highly sensitive countries," he says.

Another advantage from the CIMMYT/ICARDA linkages comes to Australia's farmers, who have gained from the development of new lines of wheat and legumes that are more productive and able to resist disease and drought.

The work of another centre, WorldFish, has also profited from partnerships involving Australian research institutions. ACIAR has funded many projects in Pacific countries where WorldFish has collaborated with such entities as CSIRO Fisheries (now CSIRO Marine and Atmospheric Research), the Australian Institute of Marine Science and Australian universities, and conducted research into high-interest species such as trochus and sea cucumber.

ACIAR's fisheries research program manager Barney Smith says these partnerships also aim to restore the livelihoods of coastal communities where populations of traditionally fished, commercially valuable species have diminished to the point of unsustainable harvesting.

Mr Smith says the ACIAR fisheries program connects with countries other than those where projects are underway. This happens

Dr Paul Fox: partnerships with the international crop research centres ICARDA and CIMMYT are a two-way benefit for Australia and the developing countries it, in-turn, supports with agricultural expertise.

PHOTO: EVAN COLLIS



through collaboration with the Network of Aquaculture Centres in Asia-Pacific (NACA), an intergovernmental organisation of 18 member countries that promotes rural development through sustainable aquaculture and aquatic resources management. "Connection through the network enables the promotion of outcomes of ACIAR-funded research to a broader regional audience," he says.

NACA has been the anchor organisation for the formation of the Asia-Pacific Marine Finfish Aquaculture Network (APMFAN), which facilitates inter-country exchange about advances in hatchery and grow-out technology for marine finfish aquaculture in the Asia-Pacific region. APMFAN, through its workshops and direct project linkages, also promotes successful experience and shared information to help combat diseases of cultured aquatic animals in hatchery and grow-out facilities.



Operations analyst at the International Finance Corporation Rafiuddin Palinrungi (left) discusses SADI with ACIAR's Peter Home. SADI (the Smallholder Agribusiness Development Initiative) aims to improve rural sector productivity and growth by helping smallholder farmers gain more of a commercial footing.

PHOTO: BRAD COLLIS

ACIAR is also an active partner in the Asia-Pacific Association of Agricultural Research Institutions (APAARI). As a regional coordinating organisation, APAARI's mission is to foster relationships between a wide range of Asia-Pacific research institutions, with the intent of

multiplying their effectiveness by exploiting synergy of resources and capabilities, thus avoiding duplication. This aligns strongly with the Australian Government's policy of promoting across-the-board multilateral approaches to global issues.

This same approach is evident in the AusAID-funded Australia-Indonesia Partnership for Reconstruction and Development and, from ACIAR's viewpoint, one component in particular—the Smallholder Agribusiness Development Initiative (SADI). SADI aims to improve rural-sector productivity and growth in four provinces in Eastern Indonesia—Nusa Tenggara Timur, Nusa Tenggara Barat, South East Sulawesi and South Sulawesi. It is a 10-year program with an initial funding commitment from the Australian Government of A\$38 million for the period July 2006 to December 2009.

ACIAR is implementing one of the three SADI subprograms, 'Support for Market-Driven Adaptive Research'. The work links strongly with the two other subprograms on enhanced smallholder production and marketing (supported by the World Bank) and strengthened private-sector agribusiness development (implemented by the International Finance Corporation). The ACIAR-led subprogram has taken a market and client-driven approach to strengthen province-based agricultural R&D capacity, and to help transfer knowledge to end-users with the aim of transforming subsistence farms into small profitable businesses. The SADI program has a broad product portfolio for study—coffee and cocoa, non-timber forest products, livestock (cattle, goats and pigs), tropical tree fruits (mango, rambutan), passionfruit, citrus, seawater aquaculture and lobster.

ACIAR has also tapped into the talents and resources of non-government organisations. Productive partnerships have emerged to promote the extension and adoption of research. The strong partnership spanning more than a decade between ACIAR and World Vision features at left. ■

ACIAR and World Vision

The soils of Thailand's Maha Sarakham province in the country's north-east suffer from low fertility, salinity and acidity. The rice-based farming systems the local farmers use are therefore unreliable. In March 2008 ACIAR and the World Vision Foundation of Thailand began working with these farmers to improve the reliability of their farming systems and lift income by increasing cattle production through better livestock-management practices.

The project was planned and implemented using the same approach applied in 2001, when ACIAR and World Vision implemented a program, also in Thailand, to foster greater application of the results of earlier ACIAR-funded research.

ACIAR's relationship with World Vision had its beginnings at a Crawford Fund seminar in 1999. There, participants sought to identify common ground between development NGOs and the scientific community in tackling problems of environmentally sustainable food production and food security for the advancement of developing-country rural communities.

ACIAR and World Vision talked further following this seminar and a short time later the two organisations signed a memorandum of understanding as a basis for project partnerships. This led to the implementation, in 2001, of three programs: fish feed production, temperate fruit industry development and vegetable production using fewer agrochemicals. These programs helped World Vision address technical challenges raised by communities from some of the poorest parts of Thailand.

The programs had some significant effects on communities. Changed horticultural practices reduced chemical use without affecting viability. The use of low-cost, homemade fish feeds improved the profitability of fish farming. And high-value, low-chill temperate fruit seedlings were distributed to farmers in the hill areas of northern Thailand.

The latest project in Maha Sarakham province is being led by World Vision. The first year of the project has focused on teaching farmers techniques of row-seeding and pre-rice mungbean cropping before transplantation of the wet-season rice crop seedlings. The project advisory team and experts from the rice research centres have also conducted training sessions.

In the area of cattle production, the farmers have learnt about the introduction of forage grasses, and trials of purple guinea, Nebiar, Mulato and Pangola grasses for forage have begun. The forages are being fed to cattle and processed for use as feed in the dry season.

Mr Collins says participating farmers have been satisfied with the program. "They feel they have learnt much and wish to expand their cultivation areas—to respond to the needs of their own cattle and also to sell for additional income," he says.

He is also enthusiastic about a project workshop attended by World Vision program managers from adjacent areas. "They have gone home eager to take the techniques and practices they learnt about back to their own target communities. This highlights the value of what the project is doing."



BOTANY PARTNERS: The search for germplasm for plant breeders working on improved crop varieties requires a range of scientific disciplines and partnerships, from genetics through to agronomy and botany. ACIAR has been funding seed collection missions over the past decade to help the Consultative Group on International Agricultural Research gene banks preserve the genetic resources that are essential to future, sustainable agriculture. On a 2005 collecting mission in Armenia, Dr Clive Francis, from the Perth-based Centre for Legumes in Mediterranean Agriculture, caught up with internationally renowned botanist Professor Eleonora Gabrielian at the Institute of Botany, Armenia.

Working with the CGIAR

Sir John Crawford's role in the establishment of both ACIAR and the Consultative Group on International Agricultural Research has created close ties between Australia and aid efforts aimed at agricultural production and rural communities

BY WARREN PAGE

A global partnership for development is the eighth of the Millennium Development Goals. The partnership model, drawing together expertise and resources to tackle problems such as low levels of agricultural productivity, mirrors ACIAR's operational structure and that of the Consultative Group on International Agricultural Research (CGIAR).

The links between ACIAR and the CGIAR run beyond the partnership model. That both adopted this model is due in no small part to the late Sir John Crawford, who was active in the establishment of both the CGIAR and ACIAR.

The CGIAR, established in 1971, is a strategic partnership among 64 members who support 15 international centres that work in collaboration with many hundreds of government and civil society organisations as well as private businesses around the world. CGIAR members include 21 developing and 26 industrialised countries, four co-sponsors and 13 other international organisations. Today, more than 8,000 CGIAR scientists and staff are active in

more than 100 countries throughout the world.

The CGIAR centres and scientists provide the scientific R&D base needed to foster sustainable agricultural growth that benefits the poor through stronger food security, better human nutrition and health, higher incomes and improved management of natural resources. The new crop varieties, knowledge and other products resulting from the CGIAR's collaborative research are made widely available to individuals and organisations working for agricultural development throughout the world.

Under Section 5 of ACIAR's founding legislation, one of its functions is "to fund international agricultural research centres". The centres of the CGIAR and selected other non-aligned centres have received Australian Government funding through ACIAR since 1992.

However, Australia's involvement with the CGIAR goes back to its establishment in the early 1970s. Sir John Crawford, an Australian economist and passionate advocate of the role of international research to lift agricultural productivity, chaired the Technical Advisory Committee (TAC) of the CGIAR during its

establishment. Crawford's understanding of the link between increased agricultural productivity and poverty reduction helped shape the CGIAR. Professor Heinz Arndt wrote of Crawford's contribution in *The Economic Record* in 1985: "When Crawford vacated the TAC chair in 1976, he had the satisfaction of having helped to bring into existence a network of 13 research institutes covering all the more important aspects of food production technology in the Third World, including livestock, farming systems and food policy research."

While Crawford's role in the establishment and early days of the CGIAR was important, his advocacy and drive were pivotal to the establishment of ACIAR. A study committee chaired by Crawford produced the report that recommended to the Australian Government the establishment of a centre linking Australian scientific expertise with the needs of developing-country agriculture. ACIAR was the result of that report, which came to be known informally as the Crawford Report.

Almost three decades after its establishment ACIAR and the centres of the CGIAR are

working closely together to boost agricultural productivity.

Engagement between the CGIAR centres, the non-aligned international centres and ACIAR has focused on utilising their expertise to address specific problems holding back productivity in a number of developing countries.

There have been many success stories where the centres of the CGIAR and ACIAR have joined in partnership with developing-country scientists. Among these have been the introduction of improved crop varieties in East Timor, Iraq and Afghanistan, a suite of projects boosting fishing sustainability and productivity in the Pacific, progress towards the achievement of apomixis in rice, and improvements in cropping practices in southern Africa.

ACIAR's partnerships with the CGIAR also help deliver benefits to Australia. Agriculture in Australia cultivates species that are mostly not native to Australia, including wheat, pulses and legumes.

Independent economic assessments commissioned by NSW Agriculture and ACIAR of the value to Australian agriculture contributed by the International Maize and Wheat Improvement Center (CIMMYT) and the International Center for Agricultural Research in the Dry Areas (ICARDA) demonstrate direct and indirect benefits.

Australia's dependence on agricultural crops that are widely grown around the world means it is vulnerable to price fluctuations. Improved crop varieties introduced by research from the CGIAR flow throughout these growing regions, resulting in increased production and, with it, changes in price. When demand is low, price follows; when it is high, as was the case in 2008 with shortages of a number of food staples, prices rise.

CIMMYT's success in delivering improved wheat varieties has benefited both developed and developing world agriculture through increasing global wheat production. However, as supply has risen demand has fallen, taking world prices for wheat down with it. This fall has resulted in a 7.4% drop in the price paid for Australian wheat, resulting in a net loss in welfare to Australia of A\$673 million in the period from 1965 to 2020.

CIMMYT's release of new varieties during that 55-year period included substantial benefits for Australian producers. Many of the benefits derived from CIMMYT in that period accrued to Australian producers in the form of improved varieties. Without those spill-over benefits, the net welfare loss from improved varieties would have been A\$2,099 million,



PHOTO: SHU FUKAI

CLIMATE CHANGE: Climate change, or global warming, is creating an added layer of uncertainty for farmers everywhere. ACIAR is working with the Consultative Group on International Agricultural Research, in particular its international research centres such as IRRI (rice), CIMMYT (wheat and maize), ICRISAT (farming in the semi-arid tropics) and ICARDA (dry region agriculture) to develop adaptation technologies. These cover new crop varieties, improved water management, and research into some of the fundamentals of agricultural security such as genetic diversity. Soil science is also an important part of this broad agenda—the condition of nutrient-depleted and rainfall-depleted soils in areas that need to sustain large populations being one of the most critical elements in the fight against poverty.

PHOTO: BRAD COLLIS



AGRICULTURE'S SEED HUNTER: Australian genetic resource scientist Dr Ken Street, who is based at the arid farming research institute ICARDA, in Syria, has attracted increasing public attention for his seed-collection missions in remote and rugged terrain in the Central Asia/Caucasus region (the birthplace of agriculture). Dr Street has been looking for ancient plant species which, through their 'tough' genetic background, could help deliver more climatically robust modern crops. Dr Street and his work are the subject of an ACIAR-supported documentary, *Seed Hunter*, which first screened in Australia in 2008. ACIAR has supported a number of Dr Street's seed-collection missions.

as global production rose. Because Australian producers were able to keep pace with global improvements rather than fall behind, the welfare loss was reduced to A\$673 million, a saving in welfare benefits of A\$1,425 million.

ICARDA research benefits Australia by A\$13.7 million a year. An assessment of the value of ICARDA research to Australian agriculture found two main sources of

benefits—reductions in costs for producers of barley, durum wheat, chickpeas, faba beans and lentils, along with a net gain on research in those cropping industries. Of the A\$13.7 million per year (based on 2001 dollars and accruing over the 20 years from 2002 to 2022) producers receive A\$12.6 million a year, with consumers of produce from the crops receiving A\$1.1 million a year. ■

TILLING NEW KNOWLEDGE

The need for agricultural R&D is as immense as ever, but over the years the challenges have changed. One constant is the role ACIAR plays in forging the multilateral partnerships that make scientific resources available to those farmers otherwise unable to access them

BY DR GIO BRAIDOTTI

For three years ACIAR has been supporting scientists and farmers working to overcome constraints to crop production in northern Iraq and Syria. Facing a drying climate and declining crop yields, Iraqi farmers in particular are struggling to respond as they work with farming infrastructure that in recent years has come close to collapse. Last year was particularly bad, with drought destroying wheat, barley, lentil and chickpea crops. And there is no end in sight, with the current season again delivering below-average rainfall.

The ACIAR project is testing whether hardier varieties and conservation farming techniques can do in the Middle East what they did for Australian grain growers when first introduced 30 years ago: to increase yields in a dry climate by eliminating the need to plough or till the soil, which causes soil moisture to evaporate.

Sixty kilometres from the Iraqi border, in the environs of Kamishley in Syria, 40 farmers involved with the ACIAR project are among the earliest adopters of 'conservation cropping'.



Dr Colin Piggin in Syria.

PHOTOS: BRAD COLLIS

Some of these farms were included in a recent tour by 15 Iraqi farmers, who were amazed to see row upon row of plants setting seed, when across the border, on cultivated fields, dry conditions were again stunting crop development.

Earlier in the tour, scientists from the International Center for Agricultural Research in the Dry Areas (ICARDA) in Aleppo, Syria, presented evidence to the Iraqi farmers that zero-tillage techniques can make it possible to crop with less water. As expected by ACIAR project leader, Dr Colin Piggin, the farmers simply did not believe it.

He comments that it's just an innate belief of farmers that good farming means a lot of ploughing and soil cultivation.

However, Dr Piggin had anticipated the scepticism, having seen it 30 years earlier among Australian farmers. So as part of the tour, he incorporated visits to other ACIAR project partners outside ICARDA's laboratories. These included research stations, on-farm demonstration sites, manufacturers of affordable zero-till farm machinery and

the Syrian farms, which proved decisive in opening the minds of the Iraqi farmers to new possibilities ... and to hope.

The project, Dr Piggin says, is typical of ACIAR's operating style—a partnership model that excels at maximising the development opportunities presented by the world's agricultural R&D resources. The goal, he says, is to close the nutrition gap, alleviate poverty and promote development by helping the developing world access the most advanced scientific expertise.

ACIAR achieves this mandate primarily by brokering research collaborations of the kind currently in action in Iraq and also by directing funds to the research organisations whose gene banks, breeding programs and agronomic expertise made the 'Green Revolution' possible. These are the centres of the Consultative Group on International Agricultural Research (CGIAR), which include ICARDA.

Since 1992, ACIAR has administered Australia's contribution to the CGIAR that today numbers 15 research centres, with 12 working in areas considered of strategic importance



Barley growers meeting in Syria with ICARDA extension officers to discuss on-farm cropping.



The main crop-trial site at ICARDA in Syria.

to Australian aid efforts and to Australia's own agricultural enterprises and research base, which cover crops, livestock, fisheries, aquaculture and forestry.

This funding has repeatedly proven crucial for Australian farmers. In a recent example, ICARDA provided genetic resources that made it possible for the CSIRO team led by Dr Rana Munns to identify two genes (Nax1 and Nax2) that can provide wheat and durum varieties with greater tolerance to saline soils. The material came through Dr Ken Street, an Australian genetic-resource scientist based at ICARDA whose collection missions for 10 years were supported by ACIAR.

"That is one of the really positive features about ACIAR—they are very collaborative in the way they run projects and that makes it possible to draw the maximum benefits to the most players from agricultural science," Dr Piggin says. "ACIAR is particularly good at building the foundation required for cooperation, both at the international level and at the national level in developed and developing countries."

In Iraq alone, the ACIAR project takes in ICARDA, the University of Western Australia, the University of Adelaide, the Department of Agriculture and Food Western Australia, and three Iraqi institutions: the Directorate of Agriculture and the State Board of Agricultural Research—both part of the Iraqi Ministry of Agriculture—and the University of Mosul.

Dr Denis Blight, who was involved in establishing ACIAR 27 years ago and is now executive director of the Crawford Fund, says ACIAR was always envisaged as a way to enhance cooperation between national research systems in developing countries, the CGIAR centres, and what was then perceived as a vast untapped resource—Australian agricultural science.

"ACIAR's partnerships were never predicated on just the CGIAR," Dr Blight says. "Rather, what was envisaged was a match-making role whenever Australian scientific expertise had something to offer developing-world needs. What emerged are the brokerage skills needed to build, manage and fund joint ventures that can address the enormous need to raise the

productivity of agricultural systems in ever more sustainable ways."

As new challenges to food production have emerged over the years, the range of organisations opting to work with ACIAR has steadily grown.

In projects across the Middle East, Central and South-East Asia, and the Asia-Pacific region, grassroots and farmers' groups such as the Vietnam Women's Union, non-government organisations such as World Vision, philanthropic foundations such as the Bill and Melinda Gates Foundation, and international agencies such as the World Bank are all seizing opportunities to pursue their aid mandates through collaborative research partnerships with ACIAR.

In the process, the research base tapped by ACIAR programs has expanded too, notably in the areas of mitigation of and adaptation to climate change, and the conservation of genetic resources. Sometimes this ongoing need to update R&D capability sees ACIAR participate in the establishment of new research agencies, as happened with the Centre for International Forestry Research (CIFOR).

A long-standing practice of independently assessing project outcomes has seen ACIAR's approach repeatedly vindicated. Benefits found to accrue to developing countries and Australia are often valued well above the amounts invested. And although other countries—notably Canada, Japan and Germany—have since adopted the model, Dr Blight says ACIAR's contribution remains unique and uniquely needed for one crucial reason.

"Australia, alone among countries with advanced agricultural R&D expertise, shares the agro-climatic conditions often found in developing countries," he says. "We are the only donor that has extensive tropical areas, semi-arid regions and poor soils, yet succeeds in producing agricultural surpluses that feed 50 million people beyond Australia's shores."

As Syrian and Iraqi farmers are discovering, that common bond can run deep. For it is in Syria and Iraq that many cereals grown in Australia were first domesticated and cultivated, and it is here that the gene pool is most genetically diverse.

So while Australian and ICARDA agronomists and plant breeders help Middle Eastern farmers crop their drying soils, Middle Eastern gene banks and genetic-resource expertise hold a key to finding the traits needed to meet future food production challenges. Which, for all partners, means first and foremost a common need for greater drought tolerance. ■

Keys to the gene bank

A treasure trove of yield-enhancing traits await crop breeders in the world's gene banks but gaining access will require unprecedented ingenuity and collaboration among curators, geneticists and breeders

BY DR GIO BRAIDOTTI

With farmers worldwide facing a need to double food production by 2050—and to do so with the same amount of land and less water—pressure is mounting on breeders to find a new generation of plant traits capable of boosting yields.

Considerable productivity gains are thought to be possible through breeding. In Australia, for instance, wheat yields in dryland areas have increased 3% annually—a rate that has tripled wheat production over a century. Scientists have attributed 30% of this overall gain to genetic improvements achieved through breeding programs.

Looking to the future, geneticists are attempting to track down the next generation of yield-improving traits, targeting characteristics that can help overcome common production constraints. Top of the list is greater genetic resistance to stresses such as weeds, pests and diseases, combined with tolerance to environmental constraints, especially drought, but also frost and waterlogging.

The consensus among geneticists is that stress-tolerance traits exist within the greater gene pool of cropped species. However, accessing those traits presents a number of problems that are being overcome, in part, with ACIAR's assistance.

Genetic resource scientist Dr Ken Street from the International Center for Agricultural Research in the Dry Areas (ICARDA) explains that, although breeders prefer to work with modern varieties and breeding lines,

gene banks contain two other sources of germplasm that contain much more biodiversity.

These are landraces (early forms of cultivated crop species that, unlike modern varieties, are genetically mixed and out-bred) and the wild relatives of cropped species, which are even more genetically diverse. Screening and testing this material for the needed traits, however, is expensive, time-consuming and requires growing out thousands of lines over several seasons. As a result, these resources have been underused in the past, a state of affairs that scientists are hoping to change.

"The assumption is that most of the modern breeding material has been pretty well looked over by breeders, and people now need new sources of genetic variation," Dr Street says. "Gene banks can provide the required biodiversity, but we need to make it easier for people to access and screen these genetic resources."

For agricultural science, that means three broad areas of innovation are required. ACIAR has been supporting collaborative research efforts on each front, says Dr Paul Fox, ACIAR's research program manager for crop improvement and management.

First, there is a need to collect and conserve crop varieties, landraces and wild relatives that otherwise face extinction. Second, techniques are also needed to make it easier, cheaper and faster to screen all these genetic resources for desirable traits. Finally, there is a need to centralise and integrate information about individual collections, facilitating its use by the broader scientific community.

PROTECTING BIODIVERSITY

Globally, there are an estimated six million specimens contained in more than 1,300 gene banks. Yet crop diversity has been vanishing from fields before it has been collected or dying in substandard gene banks due to chronic under-funding, says Dr Cary Fowler of the Global Crop Diversity Trust.

"These biological resources contain a huge amount of untapped and endangered diversity of inestimable value in helping agriculture cope, especially with climate change and population growth," Dr Fowler says.

More than a decade ago, ACIAR—in conjunction with the Grains Research and Development Corporation (GRDC)—recognised the need to assist conservation efforts. In addition to providing financial support to the gene banks associated with the centres of the Consultative Group on International Agricultural Research (CGIAR), specialised projects were launched in partnership with some of the world's most impoverished gene banks.

Dr Colin Piggin, from ICARDA, points to a 10-year ACIAR project that supported Dr Street's seed-collection missions in Central Asia and the Caucasus. The region is an important centre of origin for crops that are important to Australia, including wheat, barley, chickpea and lentil. However, since the collapse of the Soviet Union, the region's gene banks—including one of the world's oldest, the Vavilov Institute in St Petersburg—have fallen into disrepair.

"ACIAR funded a project to work with these countries to help rehabilitate their gene banks and also undertake joint collection missions with them," Dr Piggin says.



Dr Ken Street

PHOTO: BRAD COLLIS



Dr Cary Fowler

PHOTO: BRAD COLLIS



Dr Michael Mackay

PHOTO: REBECCA THYER

“If you think about the importance of conserving the legacy of biodiversity and retaining access to this material, it is monumentally important—especially for Australia. All our commercial food crops originate outside Australia, with the exception of macadamia nuts. By necessity we need the best gene banks and germplasm-screening technology available.”

Since those early ACIAR projects, the Global Crop Diversity Trust—with support from Australia’s GRDC—has launched the largest-ever initiative to rescue and conserve endangered landraces and wild relatives of crop varieties. As a consequence, gene banks are set to become bigger and much more genetically diverse. That makes retrieving needed and novel traits from the world’s seed collections even more complex, Dr Street says.

CRACKING THE GENE BANK CODE

Working with Dr Michael Mackay, a fellow Australian genetic resource scientist, Dr Street recently demonstrated it is possible to dramatically improve breeder access to genetic traits stored in the world’s gene banks.

A technique called FIGS (Focused Identification of Germplasm Strategy) has already helped pre-breeders identify long-sought-after traits, such as resistance to barley net blotch, powdery mildew, Russian wheat aphid and sunn pest.

“Basically, I am using ecological principles to restrict the number of plants that breeders

have to screen from thousands to hundreds,” Dr Street says.

“The idea is to choose a small set containing the most useful possible genetic variation. FIGS does that by applying to gene banks the same selection pressure exerted on plants by evolution.”

Another approach with huge potential to simplify use of genetic resources is marker-assisted selection (MAS). Dr Fox says markers make it possible to do away with elaborate, expensive and time-consuming field and laboratory tests normally needed to determine whether plants contain genes known to be beneficial. Instead, a sample of DNA taken from plant cells is tested rapidly and directly for the presence of desired genes.

ACIAR is backing the development of markers through a number of projects, including a MAS wheat-breeding project undertaken as a partnership between India and Australia. Dr Fox says the two countries face similar agro-climatic production constraints and often have complementary breeding expertise. The project is bringing together genetic resources from both countries to improve wheat resistance to various stresses, including rust pathogens and drought.

The research is also contributing to an escalating international response to Ug99—a new rust strain capable of devastating many cultivated wheat varieties.

India’s Dr K.V. Prabhu, from the Indo-Australia Marker-Assisted Wheat Breeding Program, says these kinds of partnerships

provide an opportunity to address production concerns in advance and prepare together. “This is a frank partnership on a scientific basis, looking at the strong points that both countries have and using those on a shared basis.”

BIOINFORMATION AND THE GENE BANK PUZZLE

As innovation makes it ever more viable to harness genetic resources in breeding programs, Dr Fox says vast amounts of information are going to be generated. However, in the absence of a centralised database and communication among researchers, this bioinformation may stay fragmented, preventing the realisation of its true value to breeders.

In the early 1990s ACIAR anticipated the need for a centralised database capable of integrating information about genetic resources. Dr Fox says support was provided to a CGIAR centre in Mexico, the International Maize and Wheat Improvement Center (CIMMYT), to kick off the development of such a database. The result was ICIS—the International Crop Information System.

“ICIS makes it possible to collate data about breeding, evaluation and utilisation of genetic resources from diverse worldwide sources,” Dr Fox says. “The open source code software supports applications designed to store and query pedigrees and trait data that are essential for breeders.”

ICIS has already facilitated discoveries in Australia relating to agriculturally valuable genes that went undetected in past breeding programs. The information is being mined from the large datasets generated by routine breeding programs in conjunction with pedigrees accessible through ICIS. For instance, Dr Howard Eagles of the University of Adelaide is tracing the impact of a gene introduced to Australia from India by William Farrer in the 19th century.

“There is now real interest among those wheat breeders who are grappling with breeding for the hot, dry springs we often have in Australia to critically re-evaluate Indian wheat lines,” Dr Eagles says.

Taken together, the R&D push around genetics, gene banks and bioinformation are helping to more fully integrate biodiversity into the agricultural R&D pipeline, creating bridges between gene banks, the pre-breeding community and breeding programs.

Dr Fox says that trying to achieve these goals independently at the national level is simply wasteful. “Solving these problems is best done in partnership, with progress shared among partners, especially developing countries whose genetic resources are making it all possible.” ■



Global players

ACIAR is a conduit for delivering leading researchers and their knowledge to the sharp end of agriculture's struggle to keep food supply ahead of demand

BY BRAD COLLIS & DR GIO BRAIDOTTI

Every year when village rice farmers front up to their local mill their families' futures are on the line. Until the husk is removed from the grain its quality is unknown ... Will it be enough to feed the family for another year? ... Will it be suitable for sale in local or larger markets?

The main determining factor is the degree of 'chalkiness', a visual defect that indicates the presence of immature starch granules, which weaken the grain and make it prone to breaking during milling (polishing). If this happens, the amount of edible or tradeable grain is significantly reduced.

The defect is mainly caused by high temperatures during the rice plant's grain-fill period and, with mean temperatures likely to keep rising as climate change intensifies, there is a pressing need to find an answer.

Melissa Fitzgerald is an Australian scientist at the centre of this Philippines-based research. A specialist in rice quality, she worked initially to lift grain quality for Australian farmers, before transferring her skills to the International Rice Research Institute (IRRI), in the Philippines, five years ago.

Dr Fitzgerald was running the grain-quality laboratory at the NSW Department of Primary Industry's Yanco facility when she was invited

to set up, from scratch, a postharvest—grain quality and nutrition—centre at IRRI.

The offer was compelling for two reasons. It opened the door to making a direct contribution to poverty reduction and it also broadened her scientific scope. "In Australia the rice research was limited to Japonica, whereas IRRI works with just about every variety grown," she says. "Getting my hands into all that genetic diversity was a strong attraction."

Five years on, Dr Fitzgerald's team is starting to make real progress and she is confident IRRI will soon be able to supply breeders with the genetic tools to lower the risk of chalk. This will strengthen the climatic resilience of rice crops and contribute directly to the wellbeing of rice communities.

"In domestic markets, chalk can devalue the grain by up to 25% and in international markets by up to 30% or more," she explains. "But aside from the monetary value, chalk reduces the amount of edible grain a farmer will take home from the mill. So chalk has a huge impact and it is something we've never been able to eliminate by breeding—despite there being a genetic component to the trait."

Although some varieties are less prone to chalk, the trait doesn't reliably cross with conventional breeding (see breakout story). Nonetheless, the varieties that can avoid

chalkiness have shown researchers the path to follow. Dr Fitzgerald says the varieties that don't produce chalk when grown under the same heat-stress conditions as susceptible varieties have a self-regulating mechanism that responds to high temperatures by aborting the production of spikelets (flowers). So when stressed by high temperature the plants produce less grain, rather than partially filled or chalky grain.

For Dr Fitzgerald, there is enormous satisfaction in helping to drive an area of research that stands to make a large and measurable difference to potentially millions of smallholder farmers.

In fact, if a scientist can make a difference at IRRI they are helping nearly 2.5 billion people who depend on rice every day. It is a point noted by Professor Beth Woods, executive director for research and development strategy at Queensland Primary Industries and Fisheries (QPI&F), who was recently appointed chair of the IRRI board.

She sees IRRI at the cutting edge of poverty reduction and views her particular role as ensuring scientists on the ground are effectively equipped and directed.

It is her experience as a research manager and strategist that she injects into the system, and that complements the technical specialists on IRRI's board.



Cambodian farmers planting rice.



Popular Cambodian rice varieties. Rice is two to three years away from being a source of vitamin A.

PHOTOS: BRAD COLLIS

“My day job in Australia is thinking about the strategy and the effectiveness and efficiency of investment in R&D,” Professor Woods says. “QPI&F represents a direct research spend of more than A\$100 million or so a year, so I’m busy thinking about how you manage that—how you ensure you have the infrastructure to support high-priority R&D going forward ... So I’m ‘hands on’ in an R&D management role and that’s what I bring to the international system and to IRRI in particular.”

Professor Woods feels the task facing international agricultural research has just become a lot more complex following the double-hit of last year’s food crisis and the global financial crisis.

Because of the effect on food prices, she says an estimated 100 million people have been pushed back into the poverty they had only recently escaped. It means they are again reliant on commodity foods, such as rice, that don’t provide the nutritional diversity of fruit, vegetables and meat.

This has added to the urgency of incorporating nutrients such as vitamin A, zinc and iron into rice varieties.

Of these, pro-vitamin-A-enhanced rice (dubbed ‘Golden Rice’) is the most advanced. The first commercially available breeding material is now only two to three years away for rice growers

Biotechnology boosts efforts to breed chalk out of rice

To the chagrin of breeders striving to improve rice yields for poor farmers, chalking is one of those traits where selective breeding simply does not work.

Despite scientists being able to detect the occasional non-chalking rice variety, Dr Melissa Fitzgerald says the trait simply does not breed true. “For years breeders were trying to recover the chalking tolerance trait, but they just could not do it by conventional means. Crosses between non-chalking lines typically produce plants with huge amounts of chalk when heat stressed.”

IRRI scientists have come up against this problem before. Previously the occasional landrace was detected that could survive flooding but, similarly, the trait could not be recovered by selective breeding. With flooding of rice lands causing estimated losses of A\$600 million a year, scientists found a way around the problem. At IRRI they mapped the trait against the rice genome, making it possible to develop molecular markers for the pieces of DNA responsible for submergence tolerance.

Dr Fitzgerald says those DNA markers made it possible to finally move the trait from a landrace to higher-yielding varieties. “Using markers, submergence tolerance was moved into popular rice varieties that are grown on millions of hectares. So that is exactly what we want to do with chalk.”

To make marker-assisted breeding possible, Dr Fitzgerald must identify precisely which bits of DNA in a non-chalking rice variety are required to inherit the trait. To detect that DNA, IRRI has selected two rice lines that are genetically similar except for chalking characteristics. This provides the maximum contrast needed to detect chalking genes.

The two lines were then crossed. During sexual reproduction, DNA is exchanged between the two genome types, causing the chalking variety to pick up bits and pieces of DNA from the non-chalking line. The progeny can then be screened for variation in their chalking response.

“From a starting population of 740 mapping lines, we selected 240 lines that can help us locate markers for the non-chalking trait,” Dr Fitzgerald says. “We have grown the lines for four generations and have some really reliable chalk data, including for lines that do not chalk at all at high temperatures.”

Dr Fitzgerald says that the first round of mapping produced five candidate DNA sites, one of which shows promising signs of having a regulatory role in grain filling during heat stress. The IRRI team is working on getting more markers to screen around that region.

“We will then look through gene banks to screen for genetic variation in that region and look at how it affects the non-chalking trait,” Dr Fitzgerald says. “That should place us in a strong position to develop markers that can help breeders select against chalk.”

– GIO BRAIDOTTI



Dr Craig Meisner (second from left) is leading ACIAR's CAVAC activities in Cambodia.



Melissa Fitzgerald, IRRI.

PHOTO: BRAD COLLIS

in the Philippines, but it will be another decade before the nutrient is likely to be commonly found in rice grown in the rest of the world.

It highlights the long timelines needed and the critical role played by the people who must plan and direct these long-term research efforts.

"Fortunately we do now have some technologies that will allow us to meet this challenge. Gene technologies, while neither quick nor cheap, will nonetheless offer us some technical opportunities that we've not had previously ... although when you compare the potential cost of addressing issues such as vitamin A deficiency, and also zinc and iron, through supplements, it's way ahead."

Professor Woods says one of her priorities at both QPI&F and IRRI is keeping infrastructure viable. "If you don't refresh infrastructure you limit what the science can do—and it's a critical question for an organisation like IRRI, which is coming up to its 50th anniversary and has a lot of old equipment and facilities."

Professor Woods is in a prime position to see the direct benefits of multilateral research partnerships and she is committed to activities delivering both development outcomes and domestic outcomes.

"For example, our Queensland scientists who are working on drought tolerance in sorghum are collaborating with IRRI scientists working on the same mechanisms in rice. As more of our science becomes molecular we are less tied to actual species and more interested in understanding the underlying mechanisms, which tend to be common or similar between species. So the work at IRRI on drought tolerance in rice is very relevant to the work in Queensland on sorghum drought tolerance."

Dr Craig Meisner, head of the ACIAR-managed research and extension arm of the AusAID-funded CAVAC (the Cambodia

Agricultural Value Chain Program), is another scientist who embodies the skill set that is deployed in multilateral research partnerships.

Dr Meisner is a US national and an adjunct professor at Cornell University, who worked for 25 years as an agricultural scientist in Bangladesh and now runs a project managed by ACIAR in Cambodia.

In Bangladesh, through the CGIAR system—primarily CIMMYT's Bangladesh outreach station—Dr Meisner took an otherwise fallow dry season and, by using groundwater, helped farmers extend the growing season. The introduction of high-yielding maize, rice and wheat varieties resulted in a food production boom that transformed farms from subsistence poverty-traps into entrepreneurial businesses. In the process, rural economies were developed to service this vastly more complex and intensive farming system where householders have access to irrigation and are able to invest in farm machinery and soil nutrients.

"Bangladesh was a situation where improved productivity could, in fact, result in improved profitability," Dr Meisner says. "That is not always the case—each country is different. But because of the high population density, Bangladesh has an immediate, immense need for food. That domestic demand means that the more productive the farm, the more profitable it is."

In 2009, Dr Meisner moved to Cambodia to the AusAID-funded CAVAC program, which is even more ambitious than his work in Bangladesh.

Dr Meisner was familiar with ACIAR, having partnered ACIAR projects in Bangladesh, and has worked with so many Australians that he considers himself an 'honorary Aussie'. He was attracted to CAVAC by its holistic approach and willingness to embrace the entire food-production chain, going beyond the mandate of individual R&D organisations to include

farm machinery, supply importers, market development, exporters, training and business development.

"I am interested in pursuing a broad R&D approach that follows growers' needs throughout the development arc from subsistence farming to entrepreneurial systems," he says. "The opportunity to work at precisely this holistic level came up when Australia's long-standing agricultural development efforts in Cambodia matured into the CAVAC program. For me, it amounted to the dream job."

In addition to Dr Meisner's component, CAVAC intends to have components looking at irrigation, agribusiness and policy development. Dr Meisner finds this approach "freeing" and sees it as the right synergy to positively lift rural communities in the three participating Cambodian provinces of Kampong Thom, Takeo and Kampot.

"In many ways Cambodia is currently where Bangladesh was in 1980—on the threshold of harnessing the potential of irrigated dry-season cropping options," he says. "There is a dynamism emerging in the country and we are trying to capture the need for knowledge so that farmers can ride that wave."

He says CAVAC amounts to the logical progression of the best that agricultural development has to offer. The goal is to see a dramatic change in the options available to growers so that the opportunity to make more entrepreneurial decisions becomes more widely available.

"Frankly, I think many donors in Cambodia are looking to this as the most innovative agricultural program ever initiated by AusAID. Its potential is quite strong. Because you can work with the whole value chain, you can broaden the scope of what can be achieved. We want it to stand as a model for future projects." ■

SNAILS ADD TO 'SOUL' FOOD SYSTEM

Work to improve the traditional sweetpotato–pig farming systems of West Papua is helping to grow one Indigenous community's 'piggy' bank

BY REBECCA THYER

Small ponds filled with golden snails—an introduced pest in many parts of Asia—are becoming a feature on some of the sweetpotato–pig farms that dot the central highlands of the Indonesian province of West Papua.

The snails, easily reared in small on-farm ponds, have been found to be a good source of essential amino acids, helping farmers to diversify pigs' diets—an outcome of an earlier ACIAR-funded project to improve the region's traditional sweetpotato–pig farming systems.

Researchers working on the project “stumbled” across these pests, recalls project leader Dr Colin Cargill from the South Australian Research and Development Institute (SARDI). “We thought why not try feeding the pigs the snails?” he says.

With the pigs happy to have golden snails in their diet, at least 200 farmers now have small, snail-breeding ponds as a result of the project. “When farmers want them, they simply put a bamboo pole into the pond, the snails attach to it, and then they feed them to their pigs.”

The innovation is one of many Dr Cargill's team has made to pig diets, and through that the lives of the Dani people of the Baliem River Valley. The project started in 2001 and has seen ACIAR bring together SARDI livestock experts and International Potato Center (CIP) specialists, plus collaborators from Indonesian universities and other institutions.

For the Indigenous Dani people, pigs and sweetpotato are not only important nutritionally and economically, they also have strong mythological links. “One Dani man described the link as being ‘A Dani man without pigs is a man without a soul,’” Dr Cargill explains. Pigs are also looked upon as currency and sold when bills need to be paid.

Pig production makes up 85% of Baliem River Valley farmers' livelihoods, with sweetpotato the main dietary input. Different varieties of this root vegetable also form the main diet of the Dani people. This interconnected system is why both potato and livestock experts are needed to improve production, and with that reduce malnutrition and disease outbreaks.

As a livestock specialist, Dr Cargill has

examined pigs' diets and, after testing various combinations, has devised one that makes use of available inputs and suits small-scale production. Although it includes sweetpotato (cooked to remove anti-nutritional factors), it has been diversified with the addition of snails, silage made from the potatoes' tuber, and vines and leaves from trees grown to provide a fence for the animals.

With other work, including improved animal husbandry and new sweetpotato varieties (developed for humans and pigs by Indonesia's Research Institute of Legume and Tuber Crops), production has improved over the past five to six years in the Baliem River Valley. Pigs now grow by 250–300 grams a day, the number produced has tripled, and sweetpotato production has risen by 15%.

Sukendra Mahalaya has worked on the project since 2002. In that time he has seen income from pig sales double, noting that some farmers now own motorbikes and mobile phones. Some can also afford a university education for their children.

Through his PhD at the University of Adelaide, this ACIAR John Allwright Fellow is evaluating the project's impact on poverty and food security. His findings will be applicable to a new ACIAR project, which began earlier this year, and will continue work to improve the farming systems' productivity, with an emphasis on reducing the risk of malnutrition and disease transmission in pigs and people.

The team plans to develop storage and processing technologies for sweetpotato; improve pig husbandry; and diversify cropping and livestock options and, through that, diets.

In 2011, when he has completed his PhD, Mr Mahalaya will move to West Papua to continue working with the Dani people and also another group, the Arfak from the northern highlands. “The Dani and Arfak have many similarities. These two Papuan tribes rely on sweetpotato and pigs to support them and although their cultures may be different, this social capital plays an important role in both tribes' strategies to achieve livelihood outcomes,” he says.

With positive results attracting the attention of other farmers, the team is also training



Golden snails—easy to rear and harvest—are a good source of essential amino acids for pigs.

farmers to be trainers. As Dr Cargill says: “I've spent my whole life working with pigs, but in farmers' eyes, I am not a pig farmer. Trained farmers will be important in disseminating information.”

For Mr Mahalaya, who jokes he is becoming one of the world's only Muslim pig experts, leading the project will be a challenge, but one is he is looking forward to. “I enjoy talking to farmers and I can speak some Papuan. Colin has showed me how to be a good leader, and the Papuan are my people so it is my responsibility to make their future better. I want to achieve regional economic success.” ■

Stopping diseases at the border

Understanding the movement of livestock through Cambodia and Laos is vital to controlling the spread of devastating diseases such as foot-and-mouth and classical swine fever

Diseases show no respect for national borders. Recent outbreaks of H1N1 influenza, beginning in Mexico and spreading to Australia, Asia, the US and Europe, demonstrate how easily and rapidly viruses can spread between countries and affect new areas. The World Bank estimated that the earlier avian influenza (H5N1) outbreak in 2004 cost more than US\$10 billion in affected Asian countries.

In Cambodia and Laos livestock movement is a potential source of disease outbreak. Both countries are at the centre of commercial networks and animal trails through China, Vietnam, Malaysia, Burma and Thailand. The long, shared borders allow easy passage for animals, making control a regional issue.

Two trans-boundary diseases in particular are of concern in the region: foot-and-mouth disease (FMD) and classical swine fever. Both have the potential to cause significant losses and can be spread quickly via the movement of infected animals.

Stopping the spread of disease begins with understanding movement patterns. Two types of disease outbreaks occur in the region: localised outbreaks in an area where disease is known to be a problem, and new outbreaks in previously disease-free areas, caused by the movement of infected animals and animal products. The Southeast Asian Foot and Mouth Disease program estimates that 55% of new FMD outbreaks are the result of animal movement.

Commercial sales of animals are the most important factor in livestock movement, both across borders and within countries. Other factors, such as searching for fodder, wood collection, breeding, using animals for ploughing fields and using animals while travelling to sell other produce, such as pottery, contribute to animal movements in localised areas.

Cambodia and Laos keep some movement records for the main animals farmed in the broader Mekong region—an estimated 85 million cattle, buffaloes and pigs (UN Food and Agriculture Organization (FAO), 2005). Collecting available data formed the initial activity in an ACIAR-funded project to understand livestock

movements and the risks they pose in the spread of trans-boundary animal diseases.

However, these data were not enough to develop the levels of understanding needed to expose the influence of livestock patterns on disease spread. To properly predict the risk of disease outbreaks more information was needed.

“The reasons that animals are moved are complex, so the project team designed data-collection activities to identify patterns of livestock movement. These include tracking tagged animals, examining livestock population dynamics and surveying livestock industry participants,” explains ACIAR’s research program manager for animal health Dr Doug Gray.

“Success in the project really depends on changing the way data are captured and used. We are working with our project partners to not only influence what data are recorded, but to introduce and use web-based and mobile phone reporting of data. It is a significant change that is reaping real rewards as we gain a far more developed picture of livestock movement patterns,” Dr Gray says.

Since mid-2008 project staff in Laos and Cambodia have been using a project website and SMS reporting systems to enter data on livestock movement and market prices. This is based, in part, on an animal-tracking study initiated in the same year to record the movements of tagged cattle and buffaloes through road and border checkpoints in Laos. A pilot study is also underway to determine the feasibility of collecting data on animals that do not pass through such checkpoints. This is focused on collecting data on tagged animals from a slaughterhouse.

A number of industry participants have been interviewed in surveys designed to broaden the understanding of trading networks and the reasons behind farmers transporting animals. Almost all cross-border animal movements are driven by commercial imperatives. What characterises these movements is the rapid changes in patterns. These are the result of traders having very short turnaround times, during which they seek to sell animals before they lose condition.

An example would be if a disease outbreak

occurred in one country in the region. This would likely result in cross-border restrictions on animal movements. A country that exported animals across a now-closed border would see movement patterns reversing. As cross-border trade stopped, traders who had exported animals would respond to the dip in supply by sending animals to larger centres within their own country, including provincial capitals.

Market stimulus sought for biosecurity

In a country where the poultry industry employs more than 10 million people and 13,000 poultry markets are held daily, finding a way to involve farmers and the industry in farm biosecurity is a daunting task.

Yet this is the challenge Dr Ian Patrick faced earlier this year when he began an ACIAR-funded project in Indonesia. Dr Patrick, an agricultural economist from the University of New England in NSW, has set out to introduce cost-effective biosecurity to Indonesia’s small commercial farms; those with anything from 500 to 100,000 birds.

The farms are often contracted to produce broilers, which are picked up by trucks on a farm-to-farm circuit before being delivered to market. If an outbreak of disease occurs—such as the highly pathogenic avian influenza—there is no way to trace where diseased birds have come from. As trucks move from farm to farm, disease can spread quickly.

Dr Patrick says that for many farmers concerned about rising input costs and fluctuating poultry prices, biosecurity has often been a low priority. Some also believe it is a waste of time, given the rest of the market chain must also act if on-farm measures are to be successful.

“We realised we needed industry buy-in because any change in biosecurity will require a change in attitude from contractors, companies, the transport industry and from farmers,” he says. “We also realised farmers needed an economic incentive.”

The hope would be to make enough profit to be able to replace stock once cross-border trade reopened, once again seeing a reversal in movements from exporting animals to importing stock to replace that sold. Under such a scenario the potential for disease to spread could rise as movement patterns shift to meet demand. These shifts can also be rapid as traders respond to market forces.

Data collection on the project has revealed that traders respond rapidly to meet supply and demand, but have very small profit margins. This finding, along with others, will be the subject of analysis once data collection concludes at the end of this year, after which the project's emphasis will change to analysis of the relationships between the main drivers of livestock movement and how these illustrate the risks of disease spreading.

But where to start? Through a colleague, Dr Patrick was introduced to Don Utoyo, the director of the Indonesian Poultry Raisers Forum (FMPI). An umbrella organisation, the FMPI represents Indonesia's drug and vaccine suppliers, farmers, feed millers, breeders and market information suppliers. It is also one of the most effective means for industry to consult with government, since Mr Utoyo is a retired government official.

Working with Mr Utoyo, Dr Patrick has established a subcommittee of the FMPI called the Biosecurity Consultative Group (BCG). "The FMPI had identified biosecurity as a major issue and was keen to work with us, so the BCG was established. It allows us to talk to the industry and for industry to talk to us," he says.

The group has seven members and meets quarterly to discuss national-level issues. Provincial-level issues and project plans are discussed through provincial steering committees, which include similar industry, farmer and government representatives to the BCG.

Mr Utoyo says the BCG is proving a useful means of coordinating biosecurity measures and aid agency support. "We can all talk together and if possible get the same biosecurity messages to politicians."

Poultry production is an important way of life for Indonesians, he says. Although the country has made inroads into improving poultry biosecurity, work by ACIAR to improve biosecurity and develop markets for biosecure products is important for improving animal health and poultry farmers' livelihoods.

But, he echoes Dr Patrick's point, money matters, and conflicting economic factors often

A computer model to predict livestock movements is being developed to collate the data gathered. This will overlay existing knowledge on livestock movement patterns with market prices and the results of the animal-tracking studies conducted during the project. Movement reports, animal-movement maps and market-price maps can be generated by month and species. These should enable the prediction of risk, based on changes in the main drivers of animal movements.

For example, combining surveillance data indicating high disease levels with changes in market prices should indicate where animals are likely to be moved, and from this the risk of disease spreading and subsequent outbreaks can be identified.

The results will be made available through partnerships with the World Organisation for

Animal Health (OIE), the FAO and regional organisations such as the Southeast Asian Foot and Mouth Disease program. The Australian Department of Agriculture, Fisheries and Forestry will also be involved in the dissemination of research outcomes.

Information on disease-control options—including the definition of risk in particular zones, pre-emptive control activities and appropriate interventions in identified livestock movement patterns—will be passed to researchers and policymakers at a regional technical workshop. The potential to hold country-specific workshops in China, Malaysia, Burma, Thailand and Vietnam is being investigated. These activities may also strengthen the implementation of bilateral agreements between Cambodia, Laos and their neighbouring countries in relation to livestock movements. ■

reduce on-farm biosecurity measures.

This is why Dr Patrick is exploring ways for farmers to be paid a premium for audited disease-free birds. He says avian influenza is "the straw that is breaking the camel's back" and he is encouraging farmers to improve biosecurity and alleviate consumer concern. With industry support now established through the BCG, his team is concentrating its efforts on improving biosecurity and developing biosecure product markets in Bali and West Java. These areas were chosen because of their proximity to big cities and tourism, which may provide the market impetus for audited, biosecure products.

One farmer who has already had success with producing a more biosecure product is the leader of GOPAN, the National Association of Poultry Farmer Organizations. "Tri Hadiyanto now has a stall at his house where he sells chicken products from his farm for a premium price," he says. Tri's work to better his on-farm

biosecurity by improving fences, and

developing strict rules about who and what can enter the farm and when, is an example, Dr Patrick says, of how farmers can be financially rewarded for improving biosecurity.

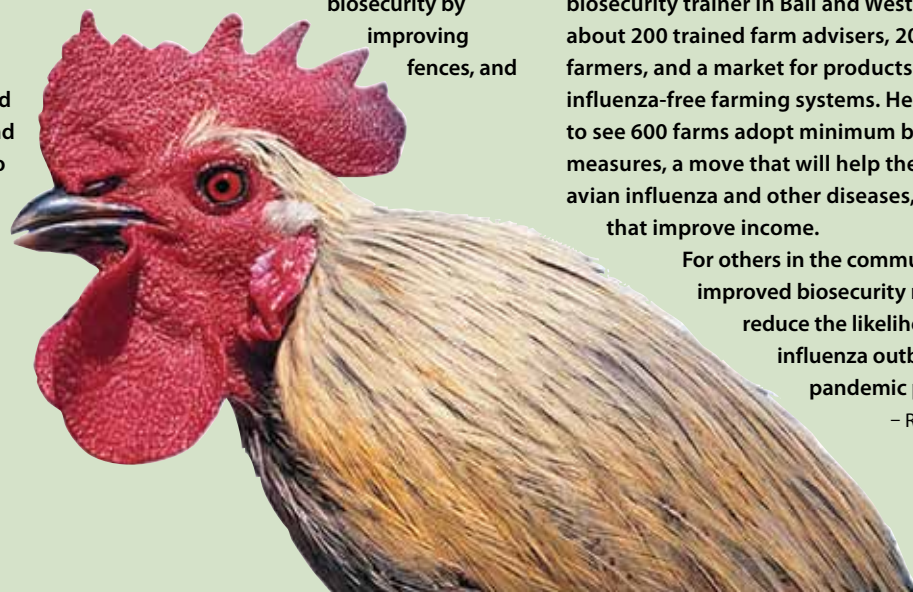
He says defining biosecurity is difficult. "For the purposes of our project, we say farm biosecurity includes any management activity undertaken to keep diseases out of the flock."

An auditing process is being developed through the Poultry Biosecurity Centre (PBUI). Started by the ACIAR project team, the centre works under the auspices of the BCG and will provide a national-level repository and resource for poultry biosecurity advice, information and training. It is also training farmers, advisers and auditors on biosecurity measures. "With the support of the local government agencies it will provide the 'stamp' to say that a farm is biosecure," Dr Patrick says.

PBUI's Dr Dewa Dharma says by the project's end, in 2012, the centre will have a master biosecurity trainer in Bali and West Java, about 200 trained farm advisers, 200 trained farmers, and a market for products from avian-influenza-free farming systems. He expects to see 600 farms adopt minimum biosecurity measures, a move that will help them control avian influenza and other diseases, and with that improve income.

For others in the community, improved biosecurity measures will reduce the likelihood of avian influenza outbreaks and pandemic possibilities.

– REBECCA THYER





Sweetpotato for sale in a market in Solomon Islands.

A sweeter crop

Training farmers to run trials of new sweetpotato varieties and farming systems is paving the way to sustainable gains for Pacific rural economies

BY WARREN PAGE

Samson Sonia and Anna Vathogi are farmers in Binu-Tetere, in Solomon Islands. They, like other farmers, thought that low yields for their sweetpotato crops were simply part and parcel of smallholder farming in the Guadalcanal Plains and beyond.

What Anna and Samson did not realise was that these low yields were not normal, but were caused by viral diseases. This knowledge came about through an International Potato Center (CIP) project, funded by ACIAR, examining the use of improved sweetpotato varieties and management changes to sweetpotato farming systems.

Sweetpotato is a staple food crop in much of the Pacific, including parts of Papua New Guinea, where an estimated 2.87 million tonnes are grown each year. In Solomon Islands, sweetpotato is grown on more than half of all arable land, with production in 2004 totalling 280,000 tonnes, representing 65% of all staple food crops grown.

Improving the sweetpotato farming system practised by smallholders has the potential to change lives. Samson and Anna aspire to produce surpluses to sell to local markets. It was this aspiration that saw them get involved with the CIP-ACIAR project. Project leader Fernando Ezeta and his colleagues wanted local farmers willing to attend Farmer Field Schools, designed

to introduce new varieties and improvements to the system used to grow sweetpotato.

And it was not just Anna and Samson and their fellow farmers who would be learning in the Farmer Field Schools. Fernando and the other scientists have seen the project as a learning exercise for all involved.

"This is a research project in which scientists and farmers learn together in a complementary way," he says. "Disease-free planting material can be obtained from the lab and introduced to farmers, but how long that material remains healthy and maintains its high productivity potential is not known. The project is prepared to test several alternatives to design a sustainable seed-supply system for the low-

input farming systems in the Pacific islands.”

Through the Farmer Field Schools a number of alternatives have been tested to refine the sweetpotato cropping system and make it more robust. Without the identification and understanding of such improvements the possibility of newly introduced sweetpotato varieties slowly declining over time was likely.

The 14 farmers selected for the initial Farmer Field School worked with project scientists to test a range of system options over 22 weeks. These included decisions on whether to remove shoot tips or keep them intact, fertiliser studies, the types of cuttings to use, as well as variety evaluation.

Participating farmers are trialling the results of these experiments in their own fields prior to extending the results to many other farmers at Malaita and Avu-Avu through further field schools.

Schoolchildren are also learning from the project. Scaling up of planting material is underway at King George's Secondary School and the Technical Mission Farm, in Honiara. Informal agreements have been put in place to use the facilities at the two schools to scale up planting material prior to dissemination.

The farmers have been attentive students too. Field school programs have done more than prove that new varieties such as those being bulked up at King George's Secondary School will be productive. Samson and Anna now understand that the sweetpotato system can be efficient enough to produce surpluses that help turn commercial aspirations into reality.

Other farmers will soon benefit from this understanding. Following the initial Farmer Field Schools coordinated by CIP from January through to June 2009, knowledge gained was integral to the Training of Trainers program. After this success, plans are being developed to extend the existing Farmer Field Schools program to areas in Bina, Malaita, as well as the Weather Coast of Guadalcanal during the latter part of 2009.

The project has also opened up possibilities that may extend outside Solomon Islands. “The project is contributing to the maintenance of local cultivars and introduction of improved cultivars, including orange-fleshed sweetpotato, and developing a training program on basic sweetpotato production technology through the Farmer Field Schools,” Fernando says.

As a result of this work, the design of a sustainable seed-supply system for the low-input farming systems in the Pacific islands is emerging as a genuine possibility. ■

Tapping into a global network

When viewed in isolation, ACIAR projects deliver a range of benefits to targeted end users, such as farmers growing sweetpotato in Solomon Islands. However, that view does not do justice to the reach of expertise tapped by an ACIAR project and flow-on of benefits beyond the project's completion.

The International Potato Center (CIP)–ACIAR sweetpotato project in Solomon Islands and Papua New Guinea has drawn on past research in East Africa, Cuba, the Philippines, China and beyond, together with the skills of Indonesian-based scientists, to deliver benefits to farmers in Solomon Islands.

At the centre of the research are pathogen-tested varieties of sweetpotato for use in improved Pacific farming systems. Some of these varieties originated in PNG and Solomon Islands and have been tested in field trials in the Philippines and China. These have helped refine the use of igloo-style screen houses in trials and field-testing of varieties in low or no-input systems.

CIP work in Cuba to breed varieties with slimmer stems and deeper roots that are harder for pests to reach has informed varietal choices. Field-testing of sweetpotato systems has also been undertaken in East Timor. Germplasm used in varietal testing in the project has come from CIP in Indonesia.

A survey conducted during the project to describe the seed-supply system in Solomon Islands has helped to develop baseline information. That evaluation was based on an earlier survey developed by CIP for use in eastern Africa, and then fine-tuned through CIP's headquarters in Peru.

The accumulation of knowledge through field trials, varietal breeding and experimentation provides an edge to research that ACIAR can utilise, and makes CIP an ideal organisation to lead the project. Rather than run the project through its Lima headquarters, the centre's Indonesia office is the hub of the project, providing opportunities for interactions with Indonesian scientists.

It is not just Indonesian scientists who benefit. Through the ACIAR-funded project, flow-on benefits accrue to other CIP research. In Solomon Islands, training in the use of NCM-ELISA kits (virus-detection techniques by serology), distributed by CIP, was conducted for staff from NARI-Bubia.

A visual inspection and serological survey for detecting viruses was conducted in Guadalcanal Plain and Malaita provinces in Solomon Islands. Training of collaborators on using NCM-ELISA kits was done in PNG. During these activities two viruses were detected in both countries, providing the first information on viruses infecting sweetpotato.

As a result of this information and the ACIAR project, CIP will increase its role in the region. The centre will supply the sweetpotato varieties that combine orange flesh and high dry-matter content from CIP to the Secretariat of the Pacific Community (SPC) based in Suva, Fiji, before introducing these to Solomon Islands and PNG. SPC will have these varieties available to disseminate elsewhere in the Pacific. This work is being done in association with HarvestPlus, a CGIAR initiative breeding better crops for improved nutrition, providing a further avenue for wider dissemination.

The lessons emerging from Farmer Field Schools in the project, based on past CIP experience in South-East Asia, will flow on to other projects in several Asian countries. This is the unseen aspect of ACIAR-funded research: the flow-on benefits that emerge from one project and become inputs into further research, which is then disseminated throughout the developing world through multilateral research projects and initiatives.

Orange-fleshed sweetpotato seed garden run by Peter Warito and a women farmers' group, Star Harbour, Makira, eastern Solomon Islands, May 2008



Raising the living standards of Indonesian farm families

To mark ACIAR's 25 years in Indonesia, journalists have visited ACIAR-funded projects in Java. Among them was ABC rural reporter **Sarina Locke***, who tells in her own words of her journey through Indonesia and of a side trip to West Timor with her mother, Dr Russ Locke, a scientist once involved in an Australian-funded aid project



Citrus grower Pak Budi (left) with Pekutan village secretary Ahmad Junaedi. In 35 years of farming citrus Pak Budi has pulled and replanted trees three times because of citrus greening disease. He is now working with ACIAR researchers in Indonesia to find better controls for the psyllid insects that cause the disease.

PHOTO: ADI RACHMATULLAH



*Sarina Locke is ABC Rural reporter for the ACT and NSW Southern Tablelands. She travelled to Indonesia with the assistance of the not-for-profit Crawford Fund, which promotes international agricultural research and development.

On first impression Java is highly fertile. It has an abundance of food growing quickly in rich volcanic soils during the long, soaking monsoons. But looks can be deceiving. Citrus trees grown between wet paddy fields have in the past been a good cash crop, but the fruit has become bitter and the trees are dying due to citrus greening (citrus huanglongbing), which poses a danger to Australia if the insect that carries the bacteria makes its way to our shores.

Banana trees grow like weeds, and a healthy snack hangs within arms' reach of the villagers. But fungal and bacterial wilt diseases have spread rapidly in recent years.

For protein, Indonesians, like Australians, are developing a taste for duck dishes. Ducks are farmed either at the back of village houses, or by herdsmen moving them between rice-growing districts. But avian influenza (H5N1) has arrived in the past five years and is now endemic in the country.

Javanese rice farmers work their paddies to produce three crops a year and, for the first time in many years, 2008 saw Indonesia self-sufficient in rice. But underlying this self-sufficiency is the ongoing need for rice varieties with adequate resistance to pests and disease.

Shrimp farming is a highly productive way to

use brackish water throughout the archipelago. Farmed shrimps, sold to Japan, the US and Europe, contributed almost US\$1 billion to the economy in 2004. But ensuring clean water flows between ponds hasn't been a high priority, leading to diseases spreading freely between farms.

AUSTRALIA'S CONTRIBUTION

For all these challenges, Australia is there with research and development projects. Without assistance, the question of food security will become pressing in this massive, densely populated country. Half the Indonesian population still survives on less than US\$2 a day.

Indonesian agencies are working with ACIAR on 40 different projects. This year ACIAR will spend A\$11 million on seven main areas to tackle diseases and lift farm productivity.

University of Adelaide-trained Dr Luthfi, a social adaptive researcher for ACIAR's agricultural projects, says ACIAR now focuses on high-value commodities for which there is a strong market demand. There are three areas of particular interest.

"The first aims to reduce the farmers' vulnerability, so we are developing tropical pulse, peanut, mungbean and rice technology that can be disseminated further," he says. "The second theme is promoting benefits from high-

value products such as timber forest products, coffee, mangoes, citrus, passionfruit, lobster and mariculture; and the third theme is increasing demand for animal protein."

COMMITMENT TO MAKING A DIFFERENCE

As we travel to different projects across Java, be it on citrus disease, bird flu testing or shrimp production in ponds, the researchers are warmly welcomed.

Both Australian and Indonesian ACIAR staff show an impressive commitment and belief they are making a difference to village life, if not immediately then certainly over time.

ACIAR's Indonesia country manager Julien de Meyer agrees there is an amazing thirst for knowledge, and he has seen this in West Papua, in the remote eastern islands of Indonesia. The farmers there are being encouraged to grow the orange sweetpotato to ensure beta-carotene and vitamin A enrich their diet.

The project leader took his computer to West Papua to show the sweetpotato planting trials. The villagers loved the computer and sat around, wearing not a stitch, fascinated by the technology. While it was entertaining for the illiterate farmers, they needed to see diagrams of growing techniques they could work with.

"It comes back to my point that you can't



bring in high-tech technologies," Mr de Meyer says. "You need to bring it back a notch and bring the knowledge that they can understand, and then they can extend within their families or within their communities."

FOOD SECURITY IN INDONESIA

For the first time in a quarter of a century, Indonesia has produced enough of its staple food—rice—to feed the country's population. It's a huge effort for a nation where 15% live below Indonesia's own measurement of the poverty line.



Professor Achmad Suryana, Indonesia's head of food security.

PHOTO: ADI RACHMATULLAH

In contrast, Australia in good years has a surplus and exports about 60% of its agricultural production.

"The Indonesian population is more than 230 million right now, which means that 35 million are living below the poverty line," says Professor Achmad Suryana, Indonesia's head of food security.

Indonesia defines poverty as below US\$1.30 a day, as per a ruling by the Asian Development Bank for Asian countries.

As the Director-General of Food Security, Professor Suryana works in an office in a large complex of high-rise buildings that make up the Department of Agriculture, in the hectic capital Jakarta. He says the Government wants to improve nutrition for the country's poorest people.

"Most of them are still eating less than the food requirement for living healthy and productive lives." So they're still malnourished? "Yes," he says.

Professor Suryana has seen the work of Australia's aid—through ACIAR—up close when he was head of research and development

Technicians testing ducks for the highly pathogenic bird flu H5N1 for an ACIAR-funded project in Java that is examining the role nomadic ducks play in spreading the virus.

PHOTO: ADI RACHMATULLAH



Shrimp farming can be worth \$1 billion to Indonesia, disease free. ACIAR's project is teaching extension staff best management practices.

PHOTO: ADI RACHMATULLAH

in Indonesia is now developing links with agribusiness and has some projects in extension.

GROWING PRAWNS IN INDONESIAN PONDS

Helping Indonesia reclaim its position as a leading producer of farmed prawns is one example.

In the mid-1990s, Indonesia was a leading producer of large tiger prawns or shrimp, turning out 120,000 tonnes a year. But in 1998 white spot viral disease swept in.

In the flat lands of coastal Central Java, rice farmers have tentatively begun farming prawns, or shrimp, again in some ponds.

Professor Ketut Sugama develops clean prawn parent broodstock in the Department of Fisheries. "Once affected by white spot, mostly 100% (are) killed," he says.

for more than four years. "ACIAR helped us a lot in terms of R&D, first of all through the empowerment of our research capacity and our researchers."

CAPACITY BUILDING

Julien de Meyer says ACIAR has been in Indonesia with agricultural aid projects for 25 years. Over that time an enormous wealth of education has been amassed by the Indonesian scientific partners, he says.

He points to the people they have trained and continue to sponsor, which they call 'capacity building'. "Since 1986, more than 50 Indonesians have completed or are now taking postgraduate courses of study in Australia thanks to the John Allwright Fellowship scheme. All have worked with ACIAR projects," Mr de Meyer says.

The graduates have returned to better jobs and all of them say they were able to use their new knowledge in their institution or work.

"When a disease needs work in both Australia and Indonesia, they share information through the scientific community, by email and through conferences or workshops," Mr de Meyer says.

This cooperative approach typifies ACIAR's approach to working with its partners in countries such as Indonesia.

DEVELOPING THE MARKET: AGRIBUSINESS

The challenges Australia faces in getting good prices and delivering food fresh are worse in Indonesia. That's why Australian agricultural development assistance in Indonesia is undergoing a shift from strictly scientific research into diseases to developing smallholder farmers as agribusiness people.

Included in that aid is a new area for ACIAR, the Smallholder Agribusiness Development Initiative (SADI), which is also funded by AusAID. Away from the area of disease research and extension, SADI aims to link specific produce to the best markets.

That can range from cocoa production in South Sulawesi, to peanut farming on Lombok Island; pigs in West Timor to the \$1 billion shrimp industry in Java and elsewhere.

Mr de Meyer says the work ACIAR is doing

Intensive animal industries evolve in West Timor

I was last in West Timor 15 years ago when my mother, veterinarian Dr Russ Locke, was working on an AusAID-funded project to develop veterinary services in the eastern islands.

When we returned we found there had been rapid changes in agriculture brought about by aid projects and a bustling economy in the regional capital Kupang.

Fifteen years ago Dr Locke worked on a village chicken project to vaccinate chickens for Newcastle disease and encourage village women to keep the birds in coops so they could be fed properly.

"It was based on the women doing all the work because women do look after all the chickens," Dr Locke says.

"The chicken meat and the eggs allow the women to feed their family a bit better and they can sell the eggs to get money to buy oil to do their cooking and perhaps a little bit for education to buy books for their children."

But what she saw when she returned surprised her. It had leapfrogged the village scale to become intensive broiler farming.

"Well, it's hardly going now as a chicken project," she says. "They now buy in day-old chickens from Surabaya for about 18 rupiahs (less than one Australian cent each) and sell them when they're fat for 1000 rupiahs (about 14 cents) in the local market."

They have to vaccinate the caged chickens at one month for Newcastle disease and sell them before they need the second shot.

The locals say the village project in the 1990s helped the villagers understand the importance of vaccination and correct nutrition.

PIG INDUSTRY DEVELOPMENT

The pig industry has expanded rapidly in the eastern islands in the past five years. Now the region has 1.5 million pigs. Driving that growth is new wealth in Kupang, West Timor, and a taste for the smoked barbeque pork called Se'i.

Pig farmer Osias Saban owns a pork restaurant, specialising in Se'i, which he was preparing when we visited. He learnt the smoky barbeque technique from his father, who was a cook for the 'Dutch king' during the Dutch colonial period.

His family has done well in the past five years and they have been able to put three children through university.

Dr Johanis, a lecturer in animal nutrition, says that about 85% of people in Nusa Tenggara Timur grow pigs, and a "party without a pig is not a party".

Alongside this cultural use, some pig producers are making great money. One of the largest pig breeders in West Timor has 100 sows and could breed up to 1,000 piglets a year that he sells to smallholders for fattening for 600,000–700,000 rupiahs, or nearly A\$100 per piglet.

Professor Ketut has selectively bred tiger and white prawn varieties, and supplies the parents and seeds (as the babies are called) to farmers.

Visiting the prawn farms is Australian aquaculture expert Dr Richard Callinan from the University of Sydney, who says white spot virus is still active.

"It came here in the mid-1990s. Before that shrimp farming here was very simple and farmers did very well, including the smallholders," Dr Callinan says. "But by the mid-1990s it had come really out of China and spread to every country that bred shrimp, (but) not Australia.

"Every country except us got white spot. The reason we didn't get it was because of our very strict quarantine laws.

"The disease is being spread by careless

movement of seedstock. Or the broodstock, the big parent animals, are being carried from country to country. They can be healthy looking but they carry the virus, and when they go into ponds or into hatcheries, and they get stressed, they get sick."

AUSTRALIA LENDS A HAND

ACIAR has a project to help promote better pond management in Central Java and Sulawesi. Dr Callinan is there to train extension workers who, in turn, train the shrimp farmer groups.

"We have to keep white spot virus out of the ponds and we have to help the farmers learn to manage their ponds in a very low-stress way for the shrimp. Even though we do our best with biosecurity, in many cases white spot gets into the ponds," he says.

"Prawns can become stressed in a variety of ways: you can overcrowd them, you can underfeed them, but the main problem is the environmental conditions in the ponds—such as dissolved oxygen concentrations, pH, salinity changes, temperature changes—because they're crowded together in unnatural concentrations.

"The virus that they're already carrying proliferates and within a matter of three or four days, the whole pond is lost," Dr Callinan says.

Extension of ACIAR-funded research results is helping alleviate this problem.

Dr Ageng is an expert in extension and communication at the Gadjah Mada University, looking into best management practice (BMP).

"It cannot work if the farmers will not be a disciplined group," Dr Ageng says. "That's why we try to encourage the extensionists to deliver the message on how to build a disciplined farmers' group so they can practice BMP in a wide area."

Shrimp farmers generally rotate shrimp with rice cropping, growing two harvests of shrimp in the wet season, and one crop of rice in the dry season.

Dr Ageng says the profit is quite good for shrimp. He says for one hectare they get rupiah 1.5 million a month (about A\$200 a month), compared with rice being only for their own consumption.

Head farmer Pak Hidayat is enthusiastic about the upcoming shrimp harvest from the pond. "If the farmer can see the increase is up to 25%, and will gradually improve, many farmers will be interested in applying this kind of technology," he says through a translator.

Indonesia has high hopes for its shrimp sector. "What we call it now is the sleeping giant," says Dr Budi Prayitno, the head of the Provincial Planning Board (BAPPEDA) in Central Java. "If we could produce back to 1998 (levels), we could become a rich country."

Dr Budi wants to use the scientific rigour of BMP to control white spot and develop the salty ponds for fish and seaweed as well.

"The first one is prawn, the second is milkfish and now seaweed," he says. "Seaweed is the best species to recover the ponds, because after we use these ponds for several years, with a lot of compost and fish waste, seaweed is a good species to increase the quality of the pond.

"It has very low input, and you could harvest every two weeks without any problems."

The seaweed is for carrageen, used in cosmetics. ■



Dr Maria Geong, head of animal health and public veterinary services in the eastern islands of Indonesia, West Timor, with Dr Ketut Jaya, a university lecturer in animal husbandry and also a large importer of young cross-bred piglets from Bali that he sells to smallholder farmers in West Timor.

PHOTO: SARINA LOCKE

INTENSIFICATION OF PRODUCTION

The pigs appeared healthy and well fed. But these social animals have gone from roaming free in the village to being kept confined to small pens. The broiler chickens, too, are kept in small barns.

Intensification of animal husbandry seems to go hand-in-hand with development, but there's no question the people benefit from increased protein in their diet.

ACIAR has projects helping to identify market potential and on how to control pig diseases.

Dr Johanis conducted a survey in West Timor and found the young tender pigs are destined for restaurants and the older, dark boars with tusks are good for cultural events.

DISEASE CONTROL THROUGH SONG

With the exploding number of restaurants, communities are concerned about the short supply of pigs for cultural events.

Cross-bred pigs are imported from Bali, but disease control is vital. When classical swine fever swept into the eastern islands, it killed thousands of pigs.

Dr Maria Geong gained her PhD at Murdoch University in Western Australia on an Australian scholarship. She is now head of animal health and public veterinary services in West Timor.

She says 80% of the region's pigs are infected with classical swine fever. The disease is chronic and an infected sow can infect all the piglets. She has support from ACIAR to study the epidemiology of the disease, and has successfully vaccinated pigs on Alor Island, where there have been no more cases. She has proved the disease can be controlled and even eradicated from Nusa Tenggara Timur (NTT).

Australia is free from classical swine fever, and Dr Geong is hoping it can stay securely free, if they can rid the NTT region of the disease.

She is also trying to protect the island from porcine reproductive and respiratory syndrome.

Dr Geong has even written some children's songs about identifying pig diseases to raise awareness among illiterate villagers.

– SARINA LOCKE



The following is an edited extract from a speech given by the outgoing CEO of ACIAR, Mr Peter Core, to the Australian Institute of International Affairs.

ACIAR—Australian foreign policy: its interaction

As the outgoing ACIAR CEO, I hesitate to comment directly on the linkages between ACIAR programs and our foreign policy interests even though I have worked at this intersection for the past seven years. I am not grounded in a foreign policy discipline but I know there is a substantive body of thinking behind the discipline of international relations. I come from agriculture, nevertheless I can observe and, as a career civil servant, I have responded to the foreign policy priorities of the day.

At the macro level, it is in Australia's interest to narrow the income gap between Australia and its partner countries and in countries between those dependent on agriculture and those working in other sectors. It is in our long-term interests. Even from a narrow perspective, rising living standards in the region will be of direct benefit to Australian agriculture—to say nothing of the broader commercial benefits of growing interdependence.

Most will have picked up on the foreign policy nuances between the present Australian Government and its predecessor. One of these is engagement with Africa. The recent Africa Day speech by Foreign Minister Smith on 25 May 2009 reflects this new commitment. You only have to reflect on the recent G8 Leaders Statement on Global Food Security to recognise the importance of agriculture to Africa.

In our case, ACIAR has been asked by the Government to re-engage with Africa. I am hoping that by the end of this year, a \$20 million initiative over the next four years, focusing on maize-based cropping systems in eastern and southern Africa, will have commenced. The initiative will engage with CIMMYT—the International Maize and Wheat Improvement Center—from its hub in Nairobi, working with national research systems in six African countries alongside two Australian research agencies. African counterparts will come to Australia, train, get formal qualifications built around this specific maize initiative, and obtain first-hand experience with our agronomic practices.

When reflecting on African agriculture and food security it is important to recognise the assessed latent production potential in many

parts of that continent. A range of studies illustrate the significant and persistent yield gaps in cropping and livestock industries that can be rectified with good adaptive science and capacity-building initiatives. All of us will win and I am sure that the Australian maize industry, based primarily in Queensland, will also benefit from this research. I am also confident that Australia's relationships and stature as a middle-sized economy will be enhanced through effective delivery of agricultural results in a hungry continent.

There are other examples of where ACIAR programs are being shaped by Australian foreign policy priorities. Importantly, the conduct and objectivity of the research has always been respected by our political masters within the directional guidelines from the Minister of the day, and that is a reflection of our robust governmental systems.

But I would not be true to myself if I did not think there was more—much more—to ACIAR than engagement at the macro level of international relations. There is much more that ACIAR does at the micro level of foreign policy. ACIAR today has about 200 substantive current research initiatives with partner countries. Each one of these projects has three or four Australians working over several years with counterparts. Over the period of engagement, life-long friendships are formed. These Australian research providers are the true foot soldiers. They are 'doing well by doing good' because they believe in their profession as scientists and the importance of expanding global food production on a sustainable basis.

Embedded in what I think of as everyday foreign policy is the vital importance of institution building in the partner country. ACIAR has been operating for 27 years and there is now a fairly vibrant, or at least emergent, network of agricultural research providers in most of the countries where we work. Not all, but for the most part, these research institutions are home grown—with helping hands from ACIAR and AusAID. The influence of such institutions in their respective societies can be more widespread than simply their core agricultural mandates.

Another way of thinking about ACIAR's contribution in a foreign policy context is summed up in a conversation I had with one of Australia's ambassadors in the region. He said about ACIAR: "It's one of those engagements that puts ballast in the relationship. Difficulties come, but they go more quickly when there is long-term ballast in the relationship."

An example in this context is East Timor. Our biggest single project (A\$10 million over five years) is in East Timor: the 'Seeds of Life' project. It is a wonderful project making a real difference in basic food security. In addition to strengthening household security, sweetpotatoes introduced through the project are now being sold in the markets, generating income. We know this because the skin colour of the potato is a great marker of the improved variety. But when my successors look back, one of the significant achievements that we will see is a firmly established East Timorese agricultural research capability.

It is not talked about today in those terms but this institution building will be reflected in the ongoing contemporary relationships of the two countries—Australia and East Timor—just as Australia's work in Cambodia during the 1990s has helped restore that country's rice production systems. That engagement was catalytic in establishing and staffing CARDI—the Cambodian Agricultural Research and Development Institute—with Cambodians with postgraduate qualifications from Australian universities gained working on ACIAR-funded projects.

As I look back at 36 years of public service, what I put weight on is the sustainability of institutional quality. Such quality institutions don't just turn up; they require long-term commitment and nurturing because it is quality institutions and their partnerships that form a vital ingredient of macro-level international relations.

ACIAR: A DAUNTING CHALLENGE

By its nature research is a long-term enterprise and many of our most important research breakthroughs have been unforeseen in their inception. It is the nature of the research endeavour. But there are some things that we can be more certain about as time unfolds:

- our current global population of 6.7 billion people will reach 9 billion during this century, with an additional 750 million people born each year
- the majority of the world's population will live in urban areas, many in mega-cities
- the demand for food will more than double and diversify as incomes rise and consumers spend more on better, higher-value foods
- this higher demand will put pressure on natural resources and accentuate water scarcity, soil degradation and biodiversity loss.

These issues confront us today and it will only be by concerted action that we will avoid being overwhelmed by them. Irrigated agriculture has been a big driver of higher output and key water basins in the region are now under significant pressure by users. When taken with the likelihood of increased climate variability, demands will put increasing pressure on our global natural resource systems. It is not just the vital agenda of 'more crop per drop' but the rapidly growing demands for water from cities, industry and the environment. It is also about the emerging question mark over contribution of the Tibetan Plateau to the vital river systems of South and North Asia that is being challenged by climate change.

But I do not despair when I can look in the recent past at:

- new rice cultivars for Africa with resistance to local pests and diseases that continue the high yields of Asian rice
- the more than 50 varieties of recently developed drought-tolerant maize
- the flood-tolerant version of a rice variety grown on six million hectares in Bangladesh
- the widespread adoption of resource-conserving zero-till technology in the vital rice/wheat systems of South Asia
- the successful biological control of the cassava mealy bug and green mite, both devastating pests of a root crop that is vital for food security in Africa
- the work now underway on Ug99, a black stem rust first found in Ugandan wheat in 1999 that has the potential to reduce grain yields by up to 70% if not conquered soon by the incorporation of resistance material from the international genebanks.

As I conclude my talk here today, I am basically an optimist with provisos. I do not think we are going to be overwhelmed provided we stay focused, think longer term and provide funding growth to international agricultural research. There has been plenty of

INTRODUCING NICK AUSTIN

Dr Nick Austin is ACIAR's new chief executive officer. His appointment was announced by the Minister for Foreign Affairs Stephen Smith on 21 July 2009.

Minister Smith welcomed Dr Austin's appointment to manage Australia's premier international agricultural research body, at a time of change and challenge for agriculture.

"Agriculture in developing countries faces the global challenges of climate change, food security and an international economic downturn. ACIAR is well-placed to play a key role in helping partner countries achieve sustainable, resilient and productive farming systems to respond to these challenges," Minister Smith said.

Dr Austin will manage an increase in ACIAR's operations as it returns to commissioning projects in Africa, expands its research on climate change and enhances its activities in the Pacific region, while maintaining its current operations.

"I have been aware of ACIAR's reputation for excellence in scientific research for development for a number of years and I am excited about building on that foundation," Dr Austin said. "There are a number of challenges

in the developing world that ACIAR can help address as part of Australia's aid program."

Dr Austin paid tribute to Peter Core, who retired as CEO of ACIAR after seven years. "Peter Core has set a standard for ACIAR that will be challenging to follow. He has overseen a significant increase in ACIAR's budget allocation, and enhanced the centre's

reputation both in Australia and the region."

Dr Austin has held a range of senior positions in both the NSW and Victorian public service in the agricultural area. Educated at the University of Melbourne and University of Sydney, Dr Austin holds a Doctor of Philosophy, a Master of Sustainable Management and a Bachelor of Engineering (Agriculture) with Honours.

In addition, Dr Austin has served on the Agricultural Ministerial Advisory Council and been a member of the Standing Committee on Gene Technology and the National Biosecurity Committee. Dr Austin's background in agricultural and natural resource research and policy and his significant experience in scientific program management complements ACIAR's international development program.



Dr Nick Austin

recent political focus at the global level:

- the recent G8 Leaders Statement on Global Food Security
- the 2008 G8 Leaders Statement from Tokyo
- the report of the High Level Task Force set up by the UN Secretary-General.

Here in Australia the Government has taken decisive action to increase funding for 'Food Security through Rural Development' from its international development assistance program. The Government has committed A\$464.3 million in new funding over the next four years "to support increases in food production globally and strengthen the ability of countries in the Asia-Pacific region and Africa to address food insecurity".

Focused political attention is essential, but I am also thinking about the focus of our research endeavour. I remain staggered with the way the international community has transferred attention from the basic staples of production to

virtually every other issue over the past 15 years when overall funding was stagnant. That, in effect, was taking our eye off the ball.

Yes, I remain an optimist with provisos—knowing that by the middle of this century the world will need to more than double its food production from effectively the same landmass with less and more variable water. This means high yields—of the basic staples—in developing countries.

Economic growth matters. The agricultural, fisheries and forestry industries in our partner countries can be significant contributors to sustained, broad-based growth. Many countries have growth spurts but only a few sustain this growth. As partner countries secure their food base, agricultural research and innovation will remain centrepieces of this growth agenda. To quote Minister Smith: "Economic growth remains the most powerful long-term solution to poverty." ■

ACIAR OPERATIONAL PLAN AND BUDGET

ACIAR's Annual Operational Plan (AOP) for 2009–10 is now available online. The AOP sets out how the centre's funding for the coming financial year will be allocated and includes research priorities by country.

A key component of the Australian Government's Official Development Assistance Program is the Overseas Development Assistance – Food Security through Rural Development Initiative. ACIAR's program will support this initiative.

The initiative recognises that agriculture has a central role in achieving food security and facilitating broad-based economic growth. The global recession has had, and will continue to have, an impact on developing countries, making the challenge of achieving rural development more important.

Australia's aid program has established a strategic framework to govern the work of AusAID and ACIAR. The core principles of this framework are:

- accelerating progress towards the Millennium Development Goals
- recognition that although economic growth is the most powerful long-term solution to poverty, economic growth will not, by itself, deliver fair and stable societies
- a strong emphasis on the Asia–Pacific region, while also increasing efforts in Africa and South Asia

- an emphasis on the power of education to promote development
- a commitment to continue to improve effectiveness.

ACIAR's program in 2009–10 is one component of the new initiative. It recognises the importance of lifting productivity on a sustainable basis over the longer term to strengthen broad-based economic growth in rural areas. The centre will continue to target its investment in the poorer countries of the region (such as Lao PDR and Cambodia) and in lagging regions within partner countries.

In addition to ongoing work, ACIAR will focus additional funding on four areas:

- safeguarding food security in the rice-based farming systems of South Asia and South-East Asia
- helping South Asia and South-East Asian crop and livestock production systems respond to climate change
- maximising opportunities for developing high-value agriculture, forestry and fisheries products in the Pacific nations
- contributing to global agricultural productivity through increased support to the Consultative Group on International Agricultural Research (CGIAR).

Additional details of these new programs can be found in the AOP at www.aciar.gov.au/publication/AOP_current

Australia reaffirms its commitment to the MDGs

The Parliamentary Secretary for International Development Assistance, Bob McMullan MP, has highlighted the Australian Government's commitment to the United Nations Millennium Development Goals (MDGs) and their focus on international efforts to reduce global poverty by 2015.

In a display of support for the MDGs, Mr McMullan launched eight icons of the goals posted along 20 metres of windows in Canberra's central business district.

"With the global economic recession forcing more people in developing countries into poverty, Australia is even more determined to stick to its commitment to

achieving the United Nations MDGs," Mr McMullan said.

The goals include:

- halving extreme hunger and poverty
- getting all children into school
- making women more equal
- reducing child mortality
- improving maternal health
- combating HIV/AIDS, malaria and other diseases
- protecting the environment
- working in partnership to make poverty history.

"We have now reached a critical stage, with the global economic recession threatening progress towards MDG targets," Mr McMullan said. "Developing countries in our region need help more than ever. These icons will remind passers-by of the daily efforts being made by Australia's aid program to make life better for those living in relentless

and grinding poverty not of their making."

In the 2009–10 Budget, the Government underlined its ongoing commitment to increase Australia's Official Development Assistance to 0.5% of Gross National Income by 2015–16.

Book guides grassroots landcare approach

ACIAR's latest publication, *Landcare in the Philippines: a practical guide to getting it started and keeping it going*, has been officially launched in the Philippines. The book shares the first-hand experiences of people involved in the highly successful landcare initiative in the southern Philippines in the form of a guide for landcare facilitators, particularly those working with communities in

developing countries.

The guide is the product of the 10-year Philippines–Australia Landcare Project, which has supported the development of this bottom-up farmer-driven approach



in the upland areas of Bohol and four provinces in Mindanao in the southern Philippines.

Australian project leader Noel Vock, of Queensland Primary Industries and Fisheries, says the landcare approach was initiated to help tackle the alarming rate of soil erosion in the region, which was resulting in losses of 50–300 tonnes of soil per hectare every year.

“There are now more than 8,000 farmers involved in landcare in the region, where there has been widespread adoption of conservation farming techniques,” Mr Vock said. “Landcare has now evolved into helping communities in these poor and sometimes isolated areas to address broader livelihood issues such as managing soil fertility, diversifying farming systems, and gaining access to markets.”

Published by ACIAR, in association with the Landcare Foundation of the Philippines, the 140-page book is written by 15 experienced landcare personnel, including two farmers. The book includes more than 70 photos, drawings and stories from landcare farmers and landcare facilitators and staff.

“The guide will help new landcare developers understand and implement landcare principles and processes in their communities. It highlights the collaborative effort central to the

CONTINUED ON PAGE 34

Marcelino Patindol, who spoke at the launch of ACIAR's landcare book—*Landcare in the Philippines: a practical guide to getting it started and keeping it going*—examines some of the crops that have helped turn his farm around.

Farewell to Norman Borlaug: father of the Green Revolution

Nobel Peace Prize winner Dr Norman Borlaug, widely known for his achievements in lifting wheat productivity in the developing world and as the ‘father’ of the Green Revolution, has passed away aged 95.

Dr Borlaug was awarded the Nobel Prize in 1970 for his work developing high-yielding, disease-resistant seed varieties to provide food for those most vulnerable in the developing world. The Green Revolution, as it is known, is thought to have saved hundreds of millions of lives.

Dr Tony Fischer, a former ACIAR research program manager, worked as part of Borlaug's team at the International Maize and Wheat Improvement Center (CIMMYT) during the 1970s. Following are some reflections from Tony about his friend and mentor Norman Borlaug.

Norm was always focused on the impact of his wheat breeding, namely getting improved varieties into farmers' fields and raising their yields and incomes, and reducing hunger. He ran a very tight program that emphasised long hours, hard work and 'hands on' assessment of wheat performance in the field, first in Mexico, but then throughout the world via the novel international testing.

Norm was always close to farmers, a position adopted no doubt in response to his upbringing on a small Iowa farm and well before anthropologists and other academics gave much attention to the importance of on-farm or participatory research for influencing small farmers. Heavy field focus didn't mean he was against science, but he liked to challenge its conventions and fashions. Indeed, he introduced valuable innovations such as the growing of two selection cycles a year in Mexico, the widespread, and ultimately global, use of multi-location yield testing, and the application of wide crossing, reflected in his early embracing of triticale (a product of a wheat–rye cross) for example.

The other unique feature of his



early years in Mexico was the emphasis on the practical training of wheat scientists from Mexico and then from other developing countries. Norm personally dedicated much time to this activity and it inspired an “army of hunger fighters”, who returned to countries where they were later very effective.

Norman Borlaug's commitment to impact meant that as the potential of the Mexican wheats was revealed by testing around the world—especially in South Asia—he became a powerful, courageous and generally effective advocate for radical policy change. He pushed for importing thousands of tonnes of improved seed from across the world, boosting fertiliser supplies, creating floor prices for grain, and promoting agriculture as the way forward instead of heavy industry. His stories of encounters with conservative bureaucrats, Harvard and World Bank economic advisers, and even sceptical prime ministers and other national leaders, were legendary. But with the help of his army, and some supportive local agricultural leaders, he won the day and the revolution in wheat productivity got underway in South Asia, Latin America and the Middle East.

Despair had turned into optimism

regarding productivity increases, and the almost four-fold increase in developing-world wheat yields since 1964 (from 0.8 to 3 t/ha) was undoubtedly catalysed by Borlaug's early successes. To witness the warmth of the welcome Norm would receive from crowds of small farmers and officials alike in the Punjab and Pakistan was as exhilarating as it was undeniable proof of his impact. This impact also reached Australian wheat farmers in the form of more productive varieties, and benefited consumers worldwide in the form of cheaper food.

Announcement of the Nobel Peace Prize was cause for a huge fiesta in the old CIMMYT office at Londres 40 in the Zona Rosa of Mexico City, at which I recall Norm quoting at length from the epic Argentine poem ‘Martin Fierro’ about the virtues of sweat of the brow and hard work. More significantly the Nobel greatly expanded the audience who wanted to hear from him, or criticise him, and inevitably drew him into debate on broader agricultural issues in the developing world. He was well prepared and I don't think his judgement—based as it was on agricultural science and a good dose of common sense—was ever off the mark over the almost 40 years of public life, which he willingly, I believe, embraced after the Prize. He had no illusions about the huge task of feeding the world in the face of an unconquered ‘population monster’.

But more than anything he was always ready to speak out on behalf of the hungry and poor and the role of agricultural science, as he did with moving effect at Grains Week in Adelaide a few years ago on a rare visit to Australia, and as he last did at a wheat rust meeting in March 2009 in his beloved north-west Mexico. His ability to thus challenge and inspire people around him, especially young scientists, will surely be our greatest loss with the passing of Dr Borlaug, one of the 20th century's great humanists.

FROM PAGE 33

landcare approach—working with farmers and others in the community to bring about change from the inside out,” Mr Vock said.

Speaking at the launch in the Philippines, Australian Ambassador Rod Smith said: “Over the years this approach has led to changes in attitudes of farmers and their communities, particularly in adopting new farming systems, improved farm incomes and environmental management and preservation.”

Also at the launch in Manila, Claveria farmer Marcelino Patindol, one of the original landcare

farmers, said the landcare journey had been an incredible one for him and farmers like him.

“We have transformed our farms from barren grassland to a forest of timber and fruit trees. The soil is fertile and spring water is flowing from the forest and serving my farm and my household. I owe this to landcare,” Mr Patindol said.

The Philippines–Australia Landcare Project has been funded by the Australian Government through ACIAR and AusAID, and implemented in partnership with five agencies from the Philippines and two from Australia.

Website update: multimedia

ACIAR's website has expanded to include multimedia capabilities for video and audio.

A new online multimedia cocoa feature on the research partnership between Australian and Indonesian research and extension agencies, cocoa buyer Mars Incorporated, and smallholder cocoa growers in Sulawesi is the first multimedia update to the site.

The cocoa feature reports on researchers from La Trobe University, the University of Sydney and Mars Symbioscience who have been working with farmers to select resistant varieties of cocoa

and test them in farmers' fields across Sulawesi.

The cocoa improvement program is part of the Smallholder Agribusiness Development Initiative (SADI) in eastern Indonesia, under the Australian–Indonesia Partnership. SADI is helping smallholder farmers move from being opportunistic and subsistence-orientated towards being profitable and productive smallholder agricultural businesses.

This work, which was featured in the November 2008 – January 2009 issue of *Partners*, is now featured in film on ACIAR's website (www.aciar.gov.au).



Cocoa farmer Pesianus Lesnusa is one of many Sulawesi cocoa growers taking part in on-farm trials of new cocoa varieties and better management techniques to overcome problems of pests, disease and declining soil fertility.

NEW PUBLICATIONS

MONOGRAPHS

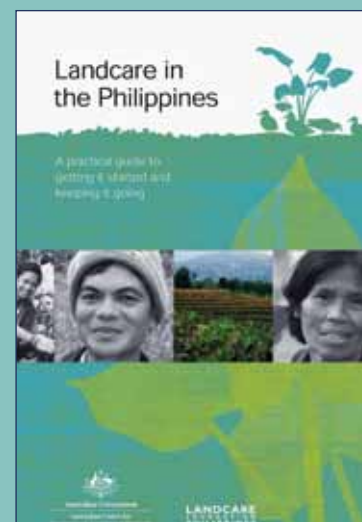
Jorani and the green vegetable bugs

This book, printed in Khmer (hard copy) and English (online), is for primary school children for use in the 'Life Skills' part of the Cambodian School curriculum. It will teach children about integrated pest management (IPM) in crops and the positive impact IPM can have on the environment. *B. Martin and D. White, 2009. Monograph 137 (English) and 137a (Khmer), 48pp.*



Landcare in the Philippines: a practical guide to getting it started and keeping it going

The Australian aid program has been working with the landcare movement in the Philippines for 10 years, encouraging farmers and their communities to take control of their own problems and to implement appropriate solutions. This book provides practical guidelines for all those involved in this important role. *Landcare Foundation of the Philippines Inc, 2009. Monograph 138, 144pp.*



PROJECT FINAL REPORTS

PNG AND PACIFIC

Improving productivity and the participation of youth and women in the Papua

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Analysis of nutritional constraints to cocoa production in Papua New Guinea

M. Webb, S. Berthelsen, G. Curry, D. Yinil, C. Fidelis, ACIAR Final Report SMCN/2006/031, www.aciar.gov.au/FR2009-09

Overcoming magnesium deficiency in oil palm crops on volcanic ash soils of Papua New Guinea M. Webb, S. Berthelsen, P. Nelson, H. van Rees, ACIAR Final Report SMCN/2000/046, www.aciar.gov.au/FR2009-11

Microbial contaminants associated with sago processing and storage in Papua

New Guinea J. Warner, A. Greenhill and M. Fletcher, ACIAR Final Report ASEM/2001/016, www.aciar.gov.au/publication/FR2009-18

Economic performance and management of the Gulf of Papua prawn fishery

T. Kompas and R. Kuk, ACIAR Final Report ASEM/2002/050, www.aciar.gov.au/publication/FR2009-19

Evaluating domestic tuna fisheries projects H. Campbell, R. Kuk, M. Ame, L. Rodwell

and L. Kaula, ACIAR Final Report ASEM/2004/011, www.aciar.gov.au/publication/FR2009-15

Improving sustainability and profitability of village sea cucumber fisheries in

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Back cover: While overarching factors such as climate change continue to put pressure on basic food production, new avenues are opening up for research partnerships that are helping farmers in developing countries improve their circumstances through increased access to markets; even local markets, where this Indonesian boy is taking part of his family's maize harvest. PHOTO: BRAD COLLIS



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