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Lessons from agriculture's past

Success does not always bring with it predictable results. The Green Revolution of the 1950s and 1960s freed millions across the developing world from hunger. It also created avenues out of poverty, on the back of economic growth fuelled by increased agricultural productivity.

At the end of the 1960s and during the early 1970s expectations remained high for lifting the developing world out of poverty. Agricultural research, responsible for the semi-dwarf crop varieties central to the Green Revolution, was predicted to play a vital role in transforming the developing world.

Instead something unexpected happened. Investment in agricultural research began to drop from highs of about 17% of aid investment during the late 1970s to just 6% by 2007.

Success had led to complacency. Aid agendas changed, in part due to the belief that agriculture would continue to grow as research lifted yields. During the period from the late 1970s to the late 2000s many of the gains in crop yields were, literally, eaten up by population growth.

Productivity gains in agriculture have not, historically, remained consistent over time. Global agricultural production must increase by about 0.8% each year to accommodate projected rises in population. In the least developed countries that rate of increase needs to be 1.8%. Pests, diseases and climatic variability impact on yields and also reduce productivity over time so that investment in agriculture must be directed to maintaining yields against these impediments. Lifting yields, therefore, requires investment above and beyond that required for maintenance.

Falling productivity patterns have mirrored a progressive slowing down in the growth rate of total spending on agricultural R&D (Alston et al. 2009, 'Mendel versus Malthus: Research Productivity and Food Prices in the Long Run'). At the same time the role of agricultural productivity in reducing poverty in developing countries was becoming widely accepted.

Something had to give, and it did so in 2007–08 with a sharp spike in the price of staple food crops. The corresponding increase in the numbers of people falling below the

poverty line in developing countries sparked action to increase investment in agricultural research within the aid programs of a number of countries, including Australia.

The food crisis also drew attention to the connections between policies and the implementation of agricultural research outcomes in the developing world. This edition of *Partners* examines some of those connections, from the broad policy environment through the research networks disseminating outcomes to the farmers benefiting from that work.

Increasing agricultural research investment has already begun. The case for doing so was outlined by ACIAR's CEO Dr Nick Austin at the ABARE Outlook conference earlier this year. An edited extract of his speech is included, suggesting a series of mini 'green revolutions'.

In an interview with the head of the World Bank's Development Research Group, linkages between policy, the broader aid picture and Millennium Development Goals are discussed, as is trade policy. The work of two international agricultural research centres is also reported. The Director General of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) outlines that centre's programs, while work to assess the impact of the International Rice Research Institute's (IRRI) research is also covered.

In Indonesia a series of projects is extending the results of research to smallholders, lifting their productivity and income. A key to these successes is an understanding of the needs of farmers, where these intersect with policy and how these connections impact on local environments.

In the 50 years since the Green Revolution agricultural research has lifted gross world food production from 1.84 to 4.38 billion tonnes, an increase of 138%. Yet almost 1.5 billion people still live in absolute poverty.

Lifting those people out of poverty requires investment in research that delivers results within the context of local environments, policies and farmers' needs. The future of agriculture must understand and heed the lessons of the past in order to create a better tomorrow. This edition of *Partners* shows some of the factors vital to agricultural science continuing to play a key part in shaping a better tomorrow.

Partners in Research for Development is the flagship publication of the Australian Centre for International Agricultural Research (ACIAR). *Partners* presents articles that summarise results from ACIAR-sponsored research projects, and puts ACIAR research initiatives into perspective.

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ISSN 1031-1009

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Published by the Australian Centre for International Agricultural Research (ACIAR)
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A shirtless man with a focused expression is pouring rice from his hands into a large white sack. He is wearing a blue and white patterned sarong. The setting is a rustic, open-air wooden structure, possibly a rice mill or storage area, with a corrugated metal roof. The background shows other people and equipment, suggesting a busy rural environment. The lighting is natural, highlighting the textures of the wood and the man's skin.

SCIENCE and FOOD SECURITY

KEY POINTS

- ACIAR CEO addresses the agricultural aid strategies that will best serve poor rural communities in the future.
- 'One size fits all' strategy loses favour as poverty reduction measures look to country and region-specific solutions, market conditions and biophysical constraints.
- The approach advocates for a series of mini 'green revolutions' centred on similar agroecological zones.

Dr Nick Austin, ACIAR CEO, addressed the annual ABARE Outlook conference on the issues of food security and the role of agricultural research and development. This is an edited version of his presentation

A series of mini ‘green revolutions’, each targeting specific needs, may be the best way for agricultural research and development (R&D) to meet challenges posed by the confluence of rising populations, climate change, and competition for land and water resources.

Unlike the Green Revolution of the 1960s, when substantial production gains were possible through plant breeding and improved agronomy, we now need to make gains incrementally by tailoring funding, investment, policy and R&D to a wide spread of countries, communities and markets.

There is no longer the same scope for a ‘one size fits all’ approach to global agricultural development. The best approaches to ending poverty are those that understand the issues present within a country or region and design responses accordingly to create the right packages in the right place at the right time.

And the urgency of achieving this is starting to be recognised again by the world community.

The connection between population growth, food security and social security is now well recognised. Today, the world’s population stands at 6.8 billion and rising. By 2050 it will reach nine billion. Of today’s 6.8 billion, more than one billion live in poverty, lacking food security.

The reasons for this lack include a convergence of factors beyond recent food and financial crises: climate change, decreasing funding for agricultural R&D over past decades and a rapidly growing population. These are balanced by the capacity of agricultural science to deliver step-change improvements in cultivation.

Agricultural R&D is our collective insurance against a plateauing of growth in food production must cease at some point. Dire predictions of mass starvation were made during the middle of last century, at least until the Green Revolution. Scientists, led by Norman Borlaug, contributed to a transformation of agriculture that enabled food production to more than keep pace with population growth.

The financial and food crises of 2008, with attendant rises in food prices, have now led many to refocus on the question of feeding the world.

Food security is once again on the international agenda. Some would suggest that feeding nine billion people requires a new Green Revolution, while others are pessimistic about such prospects.

But agricultural science can continue to match food production to population growth. More than that, it can be a catalyst for lifting many of the world’s estimated 1.4 billion poor people from poverty.

Agricultural science has a tremendous track record of success. During the past 50 years, agricultural R&D has been pivotal in lifting gross world food production by 138%, from 1.84 billion tonnes to 4.38 billion tonnes.

Most extraordinarily, that increase has been achieved as international investment in agricultural research has declined over past decades. The value of aid to agriculture has halved since the mid 1980s. The share of aid to agriculture has declined even more sharply, from 17% in the late 1980s to 6% in 2007. Agricultural research represents only a fraction of this amount.

There is an apparent conundrum when you overlay the steep upward trend in agricultural

productivity against stagnant or declining research investment. The answer lies in the long lag times, sometimes several decades, between investment and impact.

The global disinvestment in agricultural research is startling when one considers how important agricultural production has been as a driver of growth in the developing world. As Professor Peter Timmer observed, “no country has been able to sustain a rapid transition out of poverty without raising productivity in its agricultural sector”.

Broad-based economic growth in developing countries is achieved by focusing on the largest sector—agriculture. In most developing countries 60–80% of the population are employed in, or reliant for their livelihood on, agriculture.

Achieving productivity gains in this sector lifts incomes, reduces poverty and creates opportunities in other sectors, through freeing up labour and generating growth in communities.

The Green Revolution is perhaps the pinnacle of development catalysed by agricultural research. The matches of new varieties and fertiliser and the cultivation of new land in both rainfed and irrigated environments was a perfect package of innovations, at the right time, in the right place.

While it is easy to overlook the policy drivers, and policy environments that enabled such success, the pivotal role of agricultural research cannot be denied.

Since that time, agricultural R&D has endeavoured to replicate these gains. A focus on land, water and fertiliser, in concert with new higher-yielding varieties, represented the low-hanging fruit. It is little wonder that rates



ACIAR's CEO Nick Austin visits aquaculture projects in Indonesia.

of return were so high.

The original successes may have legitimised the assumption that agricultural research can continue to produce these gains well into the future. The reality is that future productivity gains will be far harder to secure.

Rates of agricultural productivity growth are slowing, most markedly in the developed world, where rates have dropped from around 3.5% in the 1980s to about 1.5% today.

To put this in context, agricultural productivity growth of around 1.8% is required simply to maintain pace with population growth.

The multi-decadal lags between investment and return are grounds for concern. Although recent renewed interest in food security has slowed—or in some cases reversed—declines in investment, the flow through to productivity growth is some way off.

The Consultative Group on International Agricultural Research, or CGIAR, is the pre-eminent multilateral body in delivering public-good agricultural innovation. It plays an important role in linking these goods to domestic science, and agriculture, in developing countries. CGIAR centres, such as the International Maize and Wheat Improvement Center (CIMMYT) and the International Rice Research Institute (IRRI) played key roles in the successes of the Green Revolution.

The CGIAR is in many ways a microcosm of the broader trends in agricultural R&D.

Funding to the CGIAR centres stalled during

the 1990s, with funding previously devoted to productivity-based research increasingly being diverted to environmental and social considerations.

Some of the research focus has also shifted from productivity to maintenance of gains, ensuring disease, pests and weeds do not erode the gains already won.

Emerging problems, such as the black stem rust fungus known as Ug99, and other issues of interest often result in donors tying funding to specific projects, rather than providing untied funding. The increasing push for a clear line of sight on dollars invested has also contributed to the desire of donors to tie funds to specific projects.

More broadly, agricultural funding trends have been impacted by other factors too. Private sector funding has, like donor funding, sought a clear line of sight, though with profits in mind.

Changing investment environments, propelled by IP rights and tax incentives, skewed private sector investment towards some spheres of research, particularly where productivity gains can be leveraged against IP to maximise profits.

Where such opportunities are not as clear, for example in soil science or environmental management, public investment is required to fill the gap.

Recent history suggests that where agriculture is delivering sufficient food, and prices for that food are falling, imperatives for agricultural research investment are easily forgotten.

The reality is that neither public investment alone nor private investment alone can deliver the solutions needed for agriculture. In developing countries particularly, with the range of markets, coupled with sometimes fragile policy environments, flexibility is needed.

This may be disappointing to those seeking a 'one size fits all' solution, or to those advocating debt relief as an answer to poverty.

The best approaches to ending poverty are those that truly appreciate the issues present within a country or region and design respond accordingly.

The danger in a single approach to the challenge of ending poverty is implementing solutions that are not the right package in the right place at the right time.

Designing the appropriate response begins with understanding the environment: getting the balance right between public and private investment, utilising research outcomes and domestic policy environments, along with biophysical characteristics and market constraints.

Potential agricultural R&D solutions within developing countries must be designed to interact with the reality of governance and policy environments and market conditions, as well as biophysical constraints.

So a more realistic response may be a series of mini green revolutions, each targeting the specific needs of a country or region. These may be localised to areas within nations, centred on similar agroecological zones. The key characteristic of each mini revolution in agriculture will be

intellectual capital, that is, the knowledge R&D creates, towards the unique dynamics and challenges presented by such environments.

Research will be needed not only into technological solutions but into human and environmental dimensions: value chains, markets, gender, equity, health, nutrition and so on.

Australia has been a world leader in agricultural research for many years. The benefits flowing from this research have applications beyond our shores. Australia shares the range of agricultural environments—and problems—with many areas in Asia, the Pacific and beyond.

ACIAR enhances spillovers between Australian and developing country research by brokering research partnerships across the spectrum of public and private spheres, providing intellectual capital to agricultural researchers in developing countries.

In East Timor, for example, a survey of subsistence farmers by researchers working as part of Australia's aid program found that no family among those surveyed had sufficient food staples of rice or maize to last a full year.

Seven out of 10 families went without maize for 4 or more months each year. All families surveyed were forced to ration food for 1–6 months each year. Many families reported that they gathered wild food regularly, with the worst affected consuming seed needed for planting crops the following season.

Australia is helping to reverse this situation by introducing crop varieties that are better suited to local growing conditions and which yield higher than the varieties currently grown. Working with the centres of the Consultative Group on International Agricultural Research (CGIAR), the Australian aid program, through ACIAR, sourced a number of staple crop varieties suited to the agroecological conditions in East Timor.

Since research began in 2005, 114 of East Timor's 442 villages have seen improvements in food security as a result of seed dissemination and field trials funded by Australia.

Interviews with farmers participating in the project found that more than half had sold, on average, one-third of their increased crop production and used the extra income to buy rice, protein and other produce to enrich the family diet.

ACIAR's role in East Timor is small but important. We have designed projects that take public-good assets, in the form of CGIAR-held seed, and delivered these into farming areas in the country, testing varieties to determine the most successful.

At the same time we are helping rebuild the research capacity of both government and academic sectors, engaging with the public sector in East Timor to ensure it has the infrastructure and capacity to deliver on publicly funded R&D in the future.

Of course this is different to much of the research undertaken in China, for example, where recent work relates to WTO accession and equalising the flow of benefits from trade across the country. This reflects the differences between the agricultural and policy environments in the two countries.

Were ACIAR to reverse these approaches taken in East Timor and China, neither program would have much success.

The steps to the next series of mini green revolutions—be they in Asia, Africa or elsewhere—will begin with targeted approaches to the unique needs of individual countries and localities. Investment in agricultural research will inform, and should flow from, that understanding.

Agricultural R&D can be a powerful driver of development and provider of food security. Ensuring R&D continues to deliver on this promise begins with an understanding that the way ahead is not the broad avenue travelled by the Green Revolution, but rather a series of winding pathways, each with its own challenges and unique solutions. ■

Returns on investment in agricultural R&D

Investment in agricultural research is characterised by consistently high returns. Alston et al. (2000) compiled 289 studies of returns to agricultural research and development and, based on the resulting 1,821 estimates of rates of return, calculated the overall average annual rates of return to be 65%. Based on these high returns, the authors concluded that there has been significant underinvestment in agricultural research.

According to the *World Development Report 2008*, investment in agriculture research has “paid off handsomely”, delivering an average internal rate of return of 43% in 700 development projects evaluated in developing countries.

In an analysis of Australian case studies, Mullen (2007) concluded that returns to agricultural research have been between 15 and 40%. Importantly, Mullen (2007) found no evidence of a decline in rates of return to agricultural investment over time, supporting Alston et al.'s observations about underinvestment.

Recently Harding et al. (2009) undertook a meta-analysis of 37 quantitative impact assessments of Australian Government investment in international agricultural research. They too identified high returns (average benefit:cost ratio of 54) and found evidence that returns have been increasing over time.

Alston (2002) highlighted the profound implications of spillovers from public agricultural R&D and proposed that half of productivity gains in a state or nation may arise from research conducted elsewhere. Spillovers also have major implications for the manner in which research benefits are distributed between countries, as well as between producers and consumers.

Research generates benefits that flow regionally, nationally and internationally. The inability of a party to capture or control the flow of benefits for themselves—or ‘spillovers’ (the extent to which one party benefits from the stock of R&D of another party)—leads to underinvestment by the private sector. In developed countries institutional mechanisms, such as intellectual property (IP) rights, tax incentives and government-industry research collaboration, such as cooperative research centres, are employed to address this private sector underinvestment. Recent analyses call into question the extent to which private sector investment has grown under these mechanisms (Pardey pers comm.). However, the legal and institutional frameworks in developing countries are such that public investment will remain essential for the foreseeable future.

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LESSONS SOUGHT FROM MEASURING INVESTMENT

ACIAR is ensuring transparency in its investments by evaluating the impact of the research it supports.

R&D activities is not easy, globally, stakeholders are demanding more transparency on the returns generated by their investments. ACIAR is no different.

IRRI is one of the many CGIAR centres that ACIAR partners and is the subject of one of the two CGIAR-based impact assessments currently being undertaken by ACIAR. The other is a meta-analysis of CGIAR centre impact assessments. A meta-analysis combines the results of several studies that address a set of related research hypotheses.

From 1995 to 2006 ACIAR's impact assessment program commissioned a series of studies to assess the benefits to Australia of research undertaken by CGIAR centres.

These assessments provide evidence of uptake, adoption and impact, creating accountability on investment decisions.

In addition, while undertaking such studies lessons learnt are discussed to provide input into the selection, design and delivery of future R&D projects, Dr Templeton says. They are also useful for demonstrating the value of ACIAR's role in Australia's international development assistance program—an important function in a world demanding returns on investment.

ACIAR will continue to commission impact assessments of research undertaken by International Agricultural Research Centers (IARC). These assessments will cover the benefits to ACIAR's mandate regions—Papua New Guinea and Pacific island countries, South-East Asia, South Asia, North Asia and Southern Africa. Dr Templeton says the purpose of these studies is to ensure all aspects of ACIAR's investment portfolio are subjected to the same level of evaluation.

Due to ACIAR's commitment to impact research, Dr Templeton was one of 16 impact assessment specialists invited to a Bill and Melinda Gates Foundation (BMGF) initiative to develop a project tracking the release and adoption of improved crop varieties and quantifying the impact of crop genetic improvement research in Africa and South Asia.

The BMGF project aims to: gather new baseline data on improved germplasm; examine existing methods for collecting data and develop new ones; encourage sustainable collection of data; develop ways to encourage the use of data on germplasm uptake and impact in current and future crop improvement research; and increase the knowledge of the impact of crop improvement on hunger, nutrition and gender.

More information: Dr Debbie Templeton, templeton@aciarc.gov.au

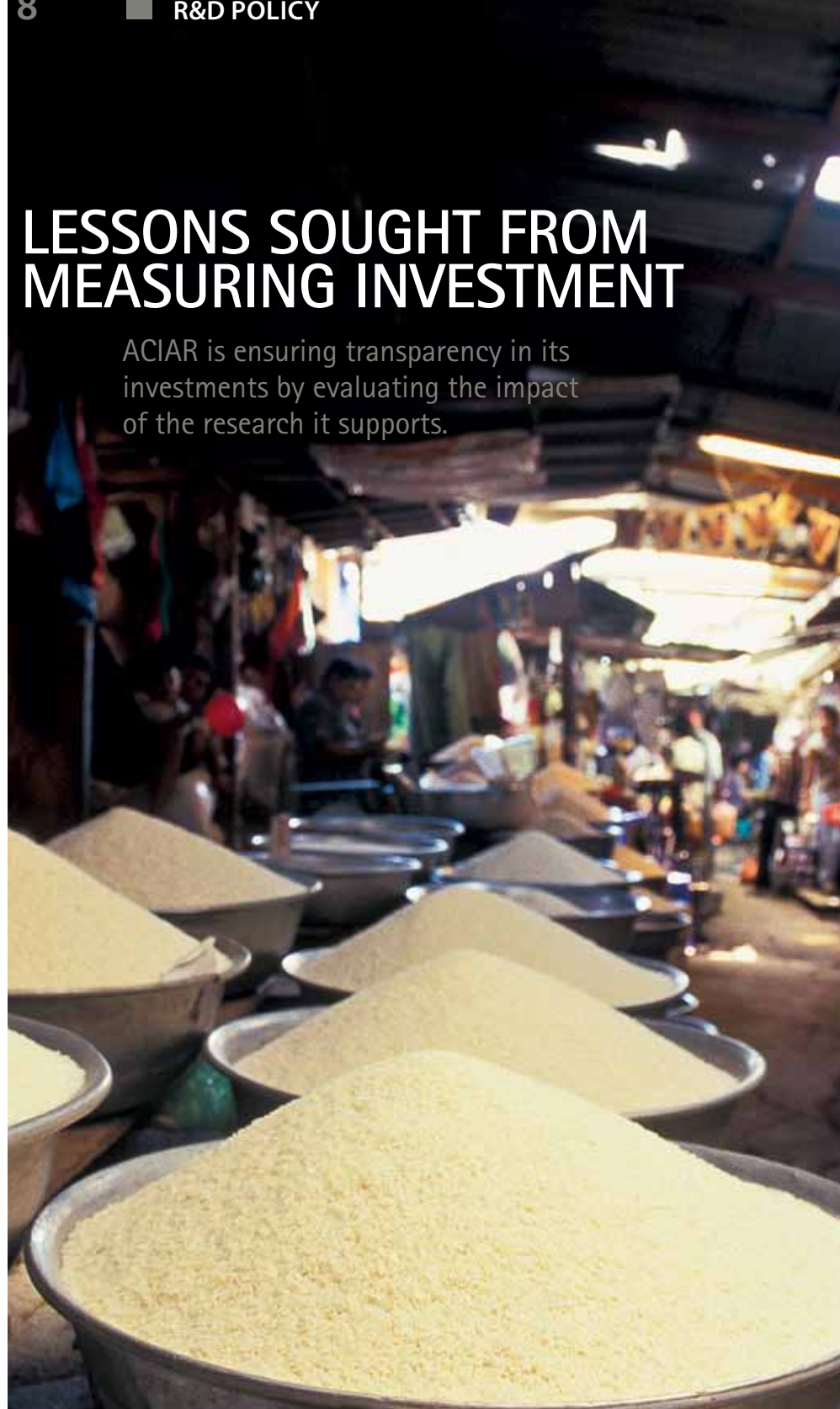


PHOTO: BRAD COULUS

BY KELLIE PENFOLD

For 50 years the International Rice Research Institute (IRRI) has been developing rice varieties for release in Asian countries. Now ACIAR is undertaking a study to measure the impact of IRRI's contribution to rice productivity in the Philippines, Vietnam and Indonesia.

Although the primary aim of the study is to quantify the economic benefits of germplasm improvement, identifying lessons to further

improve the delivery and outcomes of research and agricultural development will be a valuable output of the work.

Dr Debbie Templeton, manager of ACIAR's impact assessment program, says the study will collate available release and adoption data on IRRI's major rice varieties, and then (where data and resources allow) measure production gains in rice-growing regions of the Philippines, Vietnam and Indonesia.

While assessing the impact of agricultural

A CHAMPION FOR SEMI-ARID REGIONS

When it comes to cropping in the semi-arid tropics, home to 800 million of the world's poorest people, the Director General of ICRISAT is rolling out an ambitious R&D program that has important implications for Australian farmers



PHOTO: BRENDON CANT

"We take a broad, multidisciplinary approach to improving the wellbeing of the poor of the semi-arid tropics and our mission is to reduce poverty, increase agricultural productivity, enhance food and nutritional security and protect the environment."

– DR WILLIAM DAR

ICRISAT Director General Dr William Dar spoke on the topic 'Champions of the poor of the semi-arid tropics' at UWA's Institute of Agriculture.

BY BRENDON CANT

With the world's population soaring against the background uncertainties of climate change, the imperative of increasing agricultural production to feed the world, especially its poor, continues to be pressing.

It's a challenge that Dr William Dar, Director General of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), addressed in a lively Institute of Agriculture seminar at the University of Western Australia (UWA).

Dr Dar explained that the semi-arid tropics—home to 800 million of the world's poorest people—are blighted with an unpredictable climate, with low or erratic rainfall, poor soils and inadequate social and physical infrastructure. ICRISAT's agricultural research encompasses crop improvement, agroecosystems, biotechnology and socioeconomics.

ICRISAT, based near Hyderabad in India, is the region's only global R&D organisation for semi-arid agriculture. Dr Dar stressed the importance of the institute's Australian connections at UWA and the Department of Food and Agriculture, WA.

He said these collaborations also had relevance to the future of Australian grain

growers, who face similar challenges to the smallholder farmers in the semi-arid tropics.

ICRISAT's chickpea improvement program is actually being funded by WA farmers through a grant from the Council of Grain Grower Organisations (COGGO). The program is developing chickpea lines tolerant to excess boron and salinity, problems experienced by many Australian growers.

The institute's work on 'super early' chickpeas—which mature in 75 days, can tolerate drought and heat stress, and have improved resistance to *Fusarium* wilt—is vitally important in the face of climate change and the ever-present threat of disease across the semi-arid tropics. More than 2,000 chickpea breeding lines have already been reviewed and COGGO will be funding the second phase of this work, in which further pre-breeding work will be done by ICRISAT and UWA.

ICRISAT recently received a \$6 million grant from the Indian Government for biotechnology research, but Dr Dar has some reservations about genetic modification, arguing that it should only be used when problems cannot be solved through conventional breeding. The 'fruit' of ICRISAT's research—its germplasm—is now used widely across South-East Asia and ICRISAT is currently working with about 70 seed companies.

Dr Dar stressed that climate change was not just a threat to the future, but was happening "here and now", affecting hundreds of millions of people across the semi-arid tropics. The threat underlies much of ICRISAT's work on drought, land degradation, bioenergy and the need for agricultural diversification.

"ICRISAT champions the poor across the semi-arid tropics and strives to empower them to overcome the many challenges they face," Dr Dar said. "Our work in the Sahel, for example, where local growers are establishing planting basins to harvest rainwater and reduce soil erosion, and planting legume crops and trees to improve soil fertility and mitigate drought is both practical and important to their long-term wellbeing."

Similarly, the development of community watersheds has increased yields four-fold and incomes by 77% in India and 45% in South-East Asia. "In fact, they've been so successful they've served as a model for Asia and southern Africa," he said.

"We take a broad, multidisciplinary approach to improving the wellbeing of the poor of the semi-arid tropics and our mission is to reduce poverty, increase agricultural productivity, enhance food and nutritional security, and protect the environment." ■

More information: William Dar, w.dar@cgiar.org



World Bank research is examining issues surrounding adoption of new technologies in Africa.

Poverty action needs a holistic policy mix

The World Bank's Dr Will Martin discusses the role agricultural productivity can play in reducing poverty



Will Martin

Key points:

- The World Bank's rural development program seeks agricultural productivity gains for the world's poorest farmers.
- A coordinated multilateral approach to agricultural research, development and extension to farmers is considered essential.
- The World Bank aims for a flow of new techniques to farmers, along with infrastructure, land tenure and policy improvements.

BY WARREN PAGE

The World Bank is a global leader in shaping thinking on development assistance and aid. Its aim is to help poor people help themselves and their environment by providing resources, knowledge and building capacity and forging partnerships in the public and private sectors.

Within the World Bank, the Development Research Group seeks answers to some of the most pressing questions in development. Dr Will Martin heads the Agriculture and Rural Development research program within this group. He recently spoke to *Partners* magazine about some of the challenges facing agriculture today.

Partners: What is the mandate of the Agriculture and Rural Development research team?

Dr Martin: We have a team of 10 research economists leading policy-oriented research on key issues in agriculture and rural development. Our work is organised into four broad themes:

- agricultural productivity, factor markets and adjustment
- rural infrastructure and governance
- agriculture and the environment
- price incentives, trade and food security.

Under our first theme, we place emphasis on securing the improvements in productivity that are central to lifting people from poverty—how, for instance, might a new ‘green revolution’ be secured in Africa?

We also focus on improvements in land tenure, which can achieve efficiency and equity. Another issue in developing countries is facilitating the movement of workers out of agriculture—by being drawn into other activities, rather than by being driven from the land by poverty and desperation.

Under our infrastructure and governance theme we examine the contribution to poverty reduction arising from rural infrastructure investments such as rural roads and electrification. We are also analysing some of the policy problems that arise in using common-pool resources such as groundwater. Another challenge lies in learning what works when governments decentralise authority and responsibility to the local level through community-based development.

Under our third theme, agriculture and the environment, we are examining the potential opportunities for agriculture to contribute to mitigating carbon emissions, plus the need and scope for adaptation to climate change in India and Tanzania.



PHOTO: BRAD COLLIS

Durian fruit on the way to market in Vietnam's Mekong Delta.

Our final theme of price incentives, trade and food security addresses the distortions to agricultural incentives that affect the performance of the farm sector and the economy more generally—measuring and explaining these developments, and assessing their importance for world prices and their volatility. It also includes research on the role of trade, productivity growth and stockholding in ensuring food security for all.

How critical is policy in shaping the environment for agricultural innovation?

Three-quarters of poor people live in rural areas and the majority depend on farming for their livelihoods. Improvements in agricultural productivity are critically important, not just for raising incomes in farming, but for lowering the cost of food to low-income consumers who spend up to three-quarters of their income on food. Policies on research, development and extension are critical to improving agricultural productivity in developing countries.

The challenge is to ensure a flow of new techniques that enable increases in

productivity. This was achieved in Asia during the Green Revolution but has proved more difficult in Africa, for which we now have a new ‘Green Revolution for Africa’ project.

Once new technologies become available, a second set of challenges emerges. Farmers need to learn about the new approaches, they need finance to implement some of them, they need secure title to land so they can make any necessary investments, they need decent transport to obtain inputs and to get their products out, and they need prices that make it worthwhile.

Policies on land tenure are therefore an important factor. Some key findings include the need to keep the cost of land registration low, and to ensure that the rights of existing stakeholders are adequately protected.

With regards to a ‘green revolution’ in Africa, how hopeful should we be in light of policy environments in Africa?

There are good reasons for optimism if we have the right technologies and a focus on

strengthening African agriculture. At the same time, we need to be innovative and adaptive since many things we've tried in the past have not worked as originally hoped. The Green Revolution transformed agriculture in developing Asia but has had a much more muted effect in Africa. We don't fully understand the difference in outcomes ... although part of the explanation lies in differences in geography, climate, access to irrigation and in the suitability of varieties produced for the African and Asian environments.

One question is whether farmers in Africa have not adopted new varieties—and technologies such as improved fertilisers—because of a reluctance to change, or because these technologies don't work well enough under African conditions.

Some very nuanced results are emerging from our work in this area. In some cases, it appears that the problem is with adoption, but in others it is less clear whether the new varieties and techniques are actually profitable in the current environment—suggesting a need for more work to improve both varieties and the infrastructure and other features of the agricultural environment.

The overall policy environment for agriculture in Africa has improved enormously. The taxation of agriculture that was so prevalent a generation ago has now largely disappeared. There is now a commitment to support agricultural and rural development.

Can broad-scale economic growth be achieved across the developing world without a coordinated multilateral approach?

A coordinated multilateral approach is essential. Agricultural research is a classic 'public good', with three dimensions—global, regional and country. Findings from global or regional research may be applicable across broad agroclimatic zones. The Guinea Savannah zone, for example, covers 600 million hectares in 25 African countries. Within zones there is typically a great deal of commonality in challenges and needs, and it's important to apply relevant

learning as broadly as possible.

Country or region-specific adaption from global public good should be possible. Adapting this to specific country circumstances becomes an important contribution for national and sub-national research agencies.

In terms of national policy on price incentives, a complete sea change has occurred. A generation ago agriculture was often directly taxed, via export taxes and depressed domestic prices, and indirectly taxed, through measures such as overvalued exchange rates and through protection to competing sectors that pulled resources out of agriculture.

Our recent work suggests that the direct taxation of agriculture has almost disappeared, and the indirect taxation of agriculture through overvalued exchange rates and protection to the non-agricultural sector has fallen dramatically. Less reassuring are signs of a move towards agricultural protection in developing countries. Protection of staple foods creates potentially serious problems for poor consumers, who are particularly vulnerable to increases in food prices. The increasing interest in protecting import-competing agriculture—and hence indirectly taxing agricultural exports—also creates serious challenges for agricultural trade reform at the multilateral level, where many developing countries are seeking special safeguard measures that are proving controversial.

What is the role of policy in accelerating progress towards the Millennium Development Goals?

The first of the Millennium Development Goals is to eradicate extreme poverty and hunger, and policy for agriculture must play a major role in achieving this. One requirement is policies to improve agricultural productivity, because of its role in raising farm incomes and in lowering the cost of food to poor consumers. Another is policy to deal with price spikes, like the one in 2007–08, to which poor people are particularly vulnerable because they spend so much of their income on food.

As Amartya Sen, the Indian Nobel Prize winner in economics has pointed out, food security is not about achieving a balance between domestic production and demand, or even of ensuring that enough food is available. Food security means a policy that makes sure that poor and vulnerable people have access to the food they need.

Trade restrictions can play only a limited role in achieving these goals. Raising domestic prices of import-competing foods will increase self-sufficiency in these foods, but appears, in most cases, to raise poverty and food security by reducing the real incomes of poor consumers.

Varying protection to reduce fluctuations in domestic prices can help an individual country reduce price volatility but redistribute risk across countries, rather than diversifying it away. When many countries insulate their markets against changes in world prices, as in 2007–08, the end result is greater volatility in world prices.

When food prices rise, a critical element for policy is to ensure that food is available to the poorest and the most vulnerable. When the source of the food price increase is local—as it frequently is in poor, isolated countries—a key element of policy must be to improve infrastructure and to facilitate trade.

Where food stocks are held turns out to be a critical question and is the subject of current research.

Social safety nets also play an important role, and in the past many people in rural areas have been left out, with safety nets frequently covering only urban people. The avenues for lifting poor rural people from poverty are likely to come from well beyond the farm gate. Improving infrastructure and providing greater access to education and health care are essential.

A key indicator of successful rural development is a sharp reduction in the share of the workforce in agriculture, and we need to pay attention to the many impediments that reduce the ability of people to move from agricultural poverty. ■

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

FARMERS' FIELDS BECOME CLASSROOMS

On-site research is helping a rice specialist better understand how rice growers can increase production potential and, with that, Indonesia's goal of food security

Key points:

- Maintaining food security places rice productivity high in the Indonesian Government's development goals.
- ACIAR makes it possible for the International Rice Research Institute (IRRI) to work with four rice-growing Sulawesi villages.
- Major crop constraints being addressed include limited water, stem borers, weeds, rodents and difficulty managing fertilisers.

BY REBECCA THYER

It may be a 4-hour drive from Makassar in Indonesia's South Sulawesi to the rice fields where rice researcher Dr Donna Casimero is running on-farm trials, but it's a much easier commute than the one she would have faced had she stayed at the Philippines-based International Rice Research Institute (IRRI), which employs her.



PARTNER COUNTRY

Indonesia

PROJECT: SMAR/2007/216: Improving rice productivity in South and South-East Sulawesi

CONTACT: Peter Horne, horne@aciar.gov.au



PHOTOS: BRAD COLLIS

Dr Casimero is part of an IRRI-led project to improve rice productivity in South and South-East Sulawesi. In a first for ACIAR-funded work, operating under the Australia Indonesia Partnership's Smallholder Agribusiness Development Initiative, Dr Casimero has moved countries for the duration of the 3-year project. She operates from an office at the Assessment Institute for Agricultural Technologies, a project partner. Being comparatively close to her trials enables her to better understand the complex challenges faced by farmers in the field.

"Being in Makassar I can get a personal feel for what is happening and what the farmers are going through," says Dr Casimero, who grew up on a rice farm in the Philippines.

This social interaction is proving important. Although intensive crop-management technologies exist, farmer uptake is limited. The project team hopes to change this by working with farmers in their fields to document their experiences with a view to developing a 'technology adoption' model that could also help rice farmers in other parts of Indonesia.

Working in four villages across South Sulawesi and South-East Sulawesi, Dr Casimero is undertaking 'participatory adaptive research'. This involves farmers directly in project planning; a first for the villagers and something

they are keen to continue. "We are working with farmers to find the most appropriate rice production technologies based on the actual problems they have in their fields."

For this to work, a better understanding of farmers' needs was required, so the project's first year was used to assess production constraints.

It was found that in Ujung Tanah and Awolagading, in South Sulawesi's Bone District, the major constraints included limited water, problems with stem borers, weeds and rodents, and difficulty in effectively managing fertilisers.

At Karandu and Bendewuta, in South-East Sulawesi's Konawe District, rodents were the major problem, followed by stem borers and weeds. Nutrient management was also an issue because of the increasing input costs and soil fertility problems associated with too much water at certain times of the year, particularly in Bendewuta.

Dr Casimero says all four villages she is working with face similar problems but differ in which problem is the priority. "The farmers are confronted with the same issues in the field, but how they impact on production is different.

"For example, in South Sulawesi our main focus is how to help farmers use water more efficiently. So the question is, what are the technologies we have that we can test in the

field and make water savings without yield penalties?"

In Bone, the team has tested alternately wetting and drying the rice crop instead of continuous flooding. Using simple water tubes, farmers monitored water levels in the root zone and then decided when to irrigate. Water use in the 2008–09 dry season dropped by 15%, yet yields were maintained. For the two villages in South-East Sulawesi work to improve rodent problems has included teaching farmers about the pest's biology, breeding history and management options. Rats can wipe out an entire crop, says project leader Dr Grant Singleton, a rodent ecologist based in the Philippines at IRRI. "Until pests are managed farmers cannot worry about fertilisers or other inputs."

He says teaching farmers about rats' breeding cycles has proved humorous and informative. "When the seed starts to form, or boot, the rats start to breed. Or, as a farmer said to the group, 'the rats start booting too'. It got a laugh, but it meant we came up with a simple message: rats needed to be managed before they and a crop reach the booting stage."

As well as the challenges farmers face in getting a rice crop to harvest, the team is also addressing postharvest technology. "Often a lot



IRRI's Dr Donna Casimero (former Deputy Director of PhilRice), who has relocated to Makassar to work on an ACIAR project.

of effort goes into production, but farmers can lose up to 20% of a crop by not drying it well. If they could dry it and store it—instead of selling it to a middle man while still in the field—they could get a higher price," Dr Singleton says.

One of the more consistent problems faced by farmers is that of economics. "This is true not just of Indonesia but also many developing countries," Dr Casimero says. Economics can affect technology adoption and also the project team's direction.

For example, in one of the project's villages—Bendewuta—farmers can afford to be more progressive because they own their land and have larger farms. "For them, it is often a matter of providing the right information and the right technology."

Yet, in South Sulawesi's Awolagading and Ujung Tanah villages and South-East Sulawesi's Karandu, most farmers are tenants, or their farms are very small. "Farmers' ability to access technologies, such as good seed or fertiliser, is low as they have limited financial resources," Dr Casimero says. It can often mean farmers have less time to work on their own farms as other jobs are needed to supplement farm incomes.

Dr Singleton says this is one of the reasons

why the project is examining labour-saving technologies. Time demands mean growers often broadcast rice seed instead of planting seedlings. "Planting seedlings is better than broadcasting because less seed is used, and planting in rows allows better weed management."

Because of this, the project is trialling and promoting a drum seeder. "It is basically a plastic drum that releases seed in rows. It is pulled by the farmer and is quicker than planting seedlings, but gives even planting," he says.

Dr Casimero says time is very important to farmers. "These farmers are not only rice farmers. They plant other crops and have other activities to augment their income, so it is important that we try to save on labour."

Following record-high import levels, rice productivity has become an important Indonesian Government goal. In 2007 the country was the world's second-highest rice importer. Consequently, the Indonesian Government has a goal of rice self-sufficiency and aims to do this by boosting rice productivity by 5% from 2008 to 2010. For South and South-East Sulawesi meeting this goal means improving productivity by 10%.

"In South Sulawesi our main focus is how to help farmers use water more efficiently. So the question is, what are the technologies we have that we can test in the field and make water savings without yield penalties?" – DONNA CASIMERO

South Sulawesi is Indonesia's fourth-largest rice-growing province. Yet its average rice yields, and that of South-East Sulawesi, are 2–3 tonnes a hectare, well below the national average of 4.6 t/ha.

For Donna Casimero, there is no better place to improve productivity, understand growers' needs and examine how new technologies might help than in the field. "I am a farmer's daughter—I have the 'feel' for this work. My father is still an active, progressive rice farmer in the Philippines. And being here makes me work more effectively with the farmers."

Learning the local language means she is able to communicate and build trust and rapport with local farmers. "Once you have built up trust, it is like half the work is done," she says.

However, she is finding the learning process goes both ways. "If I am struggling with the language, the farmers correct me. They are also my teachers and treat me like someone who belongs." ■

Research ambition shines in Lombok's peanut fields

A peanut improvement program on the island of Lombok, part of the ACIAR–SADI initiative, aims to make peanuts a productive and profitable local industry

BY BRAD COLLIS

When Dr Agustina Asri Rahmianna arrives in a peanut-growing village in Lombok, Indonesia, word spreads fast and she is soon surrounded by farmers anxious for advice or keen to show her the progress of their crops.

Dr Rahmianna, popularly known as Anna, is a leading researcher with the Indonesian Legume and Tuber Crops Research Institute who is working with the Queensland Department of Employment, Economic Development and Innovation on a peanut improvement program as part of the ACIAR–SADI initiative.

SADI, the Smallholder Agribusiness Development Initiative, is funded as part of the Australia Indonesia Partnership, a collaboration between research providers and private companies aimed at developing a more commercial approach to agricultural development among poor rural communities. It uses 'market pull' as opposed to 'research push' to lift smallholder farming from traditional subsistence levels to a farming approach that is more productive and sustainable because it embodies an income incentive.

In the peanut program on the island of Lombok, Anna and her team are working with Garuda Foods, the main buyer/processor, and selected villages keen to make peanuts a productive and profitable local industry.

Research trials have been introducing

Farmers gather around researcher Dr Agustina Asri Rahmianna (left) to ask advice on crop samples they have brought with them. Peanut project field assistant Fahrurrozi (second from left) is a keen observer. The project exemplifies the importance of researchers, extension staff and farmers all working closely together to achieve lasting results.



PHOTO: BRAD COLLIS



improved sowing efficiency (which improves cultivation and harvesting efficiencies) and also water-use efficiency, which is important because irrigation water is limited once the rice harvest is over. Peanuts are grown in rotation with rice and give farmers an extra crop that can use the soil moisture remaining in paddies.

Improved crop water-use efficiency, along with improvements to the rate and timing of fertiliser applications, plus new knowledge about the use of fungicides to control aflatoxin, are contributing to increased yields and a healthier, higher-quality product.

Garuda Foods pays a premium for quality in its quest to increase the local share of the fresh peanuts market, which at the quality end is dominated by imports.

Aflatoxin has been a major part of Anna's work, which throughout her career has been driven by a passion for research—something soon noticed by Australian scientists when they first began helping Indonesia lift its peanut production in the early 1990s. With the encouragement of Queensland peanut researchers Dr Graeme Wright and Dr Mike Bell, Anna successfully applied to ACIAR for a John Allwright Fellowship that allowed her to undertake a PhD in Australia, which she completed in 1998.

Anna was a young mother, making it a difficult decision, but illustrating the depth of her commitment as an agricultural researcher.

"At first I said no because I had a new baby boy, my second child after my little girl, and it was important for me to be a good mother," she says. "Doing a PhD in Australia would mean being away from my family for five years."

However her husband, Joko Purnomo, is also a researcher and understood the value of the ACIAR scholarship. He persuaded Anna not to

turn down such an opportunity.

"So the next time I saw Graeme Wright I asked if the scholarship was still available. I convinced him I was serious and he gave me a lot of help with the application."

Anna's baby was just 10 months old when she went to Denpasar to attend English classes. Then in the following year when her daughter was three-and-a-half and her son just 18 months she left home for study in Australia.

"It was hard being away from my children but I really enjoyed studying in Australia. The facilities, and especially the library, were so good."

The academic experience further heightened Anna's research ambitions. "Everything about research excites me. Research gives you a freedom for thinking and problem solving."

After finishing her PhD Anna was invited to join the ACIAR-supported peanut initiative in Indonesia and has been involved with the program ever since, concentrating on reducing the damaging, and often deadly, impact of aflatoxin.

"The problem is a combination of issues: partly postharvest management, but also a tendency by farmers to harvest too soon," Anna says. "The time of harvest is influenced more by the market price than by the crop's maturity. If prices are up, farmers will harvest even if the peanuts are not fully ripe and therefore susceptible to fungal attack," Anna explains.

"So the first thing to lower the risk of aflatoxin is to get farmers to harvest at the correct time. However, it is difficult to get farmers, especially the older farmers, to change. They will follow what you say when you are working with them, but go back to their old ways when you leave. So change can't be achieved by researchers alone. It needs



PARTNER COUNTRY

Indonesia

PROJECT: Smallholder Agribusiness Development Initiative (SADI)

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extension support and the participation of processors so new knowledge continues to be reinforced after the researchers have gone.

"That is why linkage programs like the ACIAR-SADI peanuts initiative are so important. They involve everyone ... farmers, processors and researchers."

Anna says she gains a lot of personal satisfaction from her work and can see farmers making considerable advances, but as a researcher she is only too aware of the work still ahead. "There is a lot of research to be done to better control aflatoxin, as well as to help farmers lift to a higher level of peanut quality generally. There is a long way to go before we achieve our ambition to produce export quality peanuts ... but we have made a start." ■



This previously abandoned shrimp pond is able to sustain a polyculture of seaweed, juvenile shrimp and milkfish.

PHOTO: COURTESY FIS/1997/022 PROJECT TEAM

Fisheries R&D nets improved livelihoods for Indonesian farmers

ACIAR's specialist R&D support is helping revitalise Indonesia's ailing aquaculture industry and ensure the sustainability of wild fisheries

BY CARMEN MYLER

The destruction of thousands of shrimp ponds in Aceh during the 2004 tsunami was another blow for Indonesia's struggling small-scale aquaculture farmers. ACIAR's support proved crucial to the rebuilding effort, capitalising on more than a decade spent revitalising Indonesia's fishing and aquaculture industries.

Associate Professor Jes Sammut from the University of New South Wales (UNSW) visited Aceh in 2005 to advise donor agencies on rebuilding the province's brackish-water ponds, or 'tambaks'.

A timely response was essential, and Australian and Indonesian researchers trained through ACIAR projects provided technical guidance that helped agencies respond quickly.

An independent impact assessment report commissioned by ACIAR and undertaken by IDA Economics has formerly examined the impacts of ACIAR fisheries projects run from

1997 to 2008 in Indonesia. It found that without the capability provided by the ACIAR team “it is highly probable that the shrimp farm recovery in Aceh would have been delayed and may have totally failed since the underlying problems of shrimp farming in acid sulfate soils are not well understood outside the ACIAR-funded research”.

Dr Sammut led the project that proved crucial to reconstruction efforts. His team conducted training in soil assessment and remediation for international agencies including the Food and Agriculture Organization of the United Nations, the Asian Development Bank, French Red Cross and various non-government organisations.

Dr Sammut visited agencies involved with rebuilding the ponds and found many engineers were not aware that acid sulfate soils were an issue.

“Acid sulfate soils are sediments that commonly occur in coastal lowlands and cause acidification that can kill shrimp or at least contribute to poor growth rates, and higher pond-management costs,” he says.

Dr Sammut’s team undertook soil mapping to identify whether problem soils were present in the areas where rebuilding of tambaks was planned.

“Indonesian researchers trained through the ACIAR project worked with us to map 470,000 hectares of acid sulfate soils in Aceh, where we also found about 80% of soil in farming areas was sandy,” he says.

“The donor agencies were facing a double whammy. Their efforts to rebuild tambaks in the same areas would have disturbed the acid sulfate soil and there would be engineering issues trying to rebuild in sandy soil.

“We were able to advise them of potential soil problems and how to identify and avoid them where possible, or to manage them in existing ponds through more efficient liming strategies, improved ways of preparing pond bottoms and dykes, water management techniques and fertiliser application.

“In some cases where it is just too costly to remediate we suggested other economically viable commodities and farming methods as an alternative to high-risk shrimp monoculture.”

The scientists had the capacity to act quickly because of their experience in ACIAR projects supporting Indonesian tambak research since 1997.

Aquaculture had been a beacon of hope for thousands of Indonesian farmers since the 1980s when many converted rice paddies into tambaks to produce higher-returning shrimp. Their hopes were dashed, however, as disease devastated

Assessing impacts

The ACIAR fisheries projects in Indonesia: review and impact assessment report is part of a series of ACIAR impact assessments. These examine and report on economic, environmental and social impacts of ACIAR’s R&D investment. From 1983 to the present ACIAR has invested around A\$20 million on 41 research projects targeting Indonesian fisheries.

The report assessed two project areas in detail: smallholder shrimp farming and tuna fisheries. Both assessments showed the investment in research is expected to significantly impact on the livelihoods of Indonesian shrimp farmers and fishers. A further major achievement has been substantial improvement in research, extension and technical capability within Indonesia to identify and address production issues.

CSIRO led a research project from 2005 to 2008 focused on improving catch data collection and analysis, and improved fisheries management capabilities. The project was found to contribute significantly to Indonesia’s membership of a regional tuna management organisation, thus improving export opportunities and the likelihood of more sustainable fisheries.

The report estimates potential benefits of \$168 million are attributable to ACIAR’s R&D investment in tuna fisheries, which is a return of \$180 for every \$1 invested and an internal rate of return of 210%.

With more reliable modelling of the tuna fisheries, Indonesian fisheries management and sustainability is expected to improve. Benefits to Indonesia over the next 20 years are estimated to be close to \$10 million, while countries such as Japan, Korea, Taiwan, Australia and New Zealand also stand to gain. Fishers and consumers will benefit from lower costs and more guaranteed supplies.



PARTNER COUNTRY Indonesia

PUBLICATION: ACIAR fisheries projects in Indonesia: review and impact assessment, Impact Assessment Series 55

WEB ADDRESS: www.aciar.gov.au/publication/IAS55

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shrimp stocks and farmers abandoned their tambaks, leaving them to lie idle.

ACIAR’s initial projects focused on combating disease outbreaks but researchers soon turned their attention to investigating shrimp health, soils and developing mapping techniques to assess land suitability.

On the ground in Aceh the project led by UNSW continues to support a broader effort to revitalise smallholder shrimp farming, with particular emphasis on building technical capacity within Aceh’s Brackishwater Aquaculture Development Centre. It works in partnership with another ACIAR project—the Aceh Aquaculture Rehabilitation Project—which is led by James Cook University and funded by AusAID under the Australia Indonesia Partnership for Reconstruction and Development. Together, the teams are working to develop technical expertise in Indonesia’s Ministry of Marine Affairs and Fisheries and to implement district-level extension teams to bring the research to farmers.

ACIAR’s project teams use demonstration ponds in coastal communities to share their expertise in better management practices, aquatic animal health and seed production.

Across Indonesia, the external assessment of smallholder shrimp farming projects found the major achievement has been the development of technology to locate problem soils—technology that helps governments avoid planning mistakes and farmers to systematically remediate idle tambaks.

The ultimate benefits of the ACIAR R&D investment in smallholder shrimp farming will depend on adoption of the remediation strategies.

In 2006 the Indonesian Government launched an aquaculture revitalisation plan. Given the government’s support for tambak remediation as part of this plan, it is estimated that benefits over the next 20 years will total about A\$227 million in present-value terms. That is a return of \$52 for every \$1 invested by ACIAR and an internal rate of return of 26%. ■



Cambodian farmers transporting native grasses to feed their family's cattle in the traditional feeding system.

RESEARCH NETWORKS THE

The Consultative Group on International Agricultural Research (CGIAR) is a vital cog in research against global food production failing. ACIAR's partnership and networks with the CGIAR extends from the smallholder farms of Cambodia to the US capital, Washington, DC

Key points:

- ACIAR collaborations with the international agricultural research centres of the CGIAR prove their worth in reducing poverty.
- Projects deliver an average rate of return of 43% in 700 CGIAR projects evaluated.
- Worldwide there is a growing trend towards evaluating impacts to better target agricultural aid.

BY KELLIE PENFOLD

A Cambodian family planting a forage 'fodder bank' can make the difference that allows a child to no longer spend 8 hours a day cutting native grasses to feed

their cattle and, instead, attend school.

And if the family faces less production risk and better market access—through improved agronomy and better trade policy via international agricultural collaboration—a pathway out of poverty is created.

Improved cattle production means different things to different farmers. Some want to produce more cattle, some want to reduce their labour so they can take on higher-earning off-farm work, while others want their cattle to be more than just insurance, but a steady, reliable income.

Whatever the personal aspiration, productivity improvement can alleviate risk and supplement the potential for increased household income, which directly influences the level of health and education a family can access.

Agricultural growth is recognised worldwide as a key to reducing poverty, which is why an



KEY TO REAL CHANGE

agriculturally advanced nation such as Australia is committed to the Millennium Development Goals and delivering aid to alleviate poverty in developing countries. Utilising the research capabilities of the Consultative Group on International Agricultural Research (CGIAR) increases the ability of Australia to help the global poor.

Experience has shown that a multi-faceted approach to agricultural research has the greatest impact. This is why the CGIAR has had such a strong influence on the capacity of farmers in developing countries to keep food production ahead of upwardly spiralling populations.

The CGIAR system—with which ACIAR has had long-standing research partnerships—has been crucial to agriculture meeting the challenges of poverty and food security and, wherever possible, start building agricultural economies that extend smallholder farms

from basic food production to income-earning enterprises.

The CGIAR centres give ACIAR access to a global network of researchers that can be assembled into effective research collaborations able to bring a breadth of skill and expertise into development projects.

This is encapsulated in CGIAR's stated mission: "to achieve sustainable food security and reduce poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy and environment".

Established in 1971, the CGIAR comprises 15 centres and has 64 members, including ACIAR, working in collaboration with hundreds of government and non-government organisations, as well as private enterprise. There are more than 8,000 CGIAR scientists and staff in over 100 countries.

A measure of the CGIAR's effectiveness is the

What is a forage fodder bank?

With Cambodian farmers' small landholdings dedicated to growing rice and vegetables, food sources for their cattle are traditionally located off-farm.

A 2008 survey in Prey Chhor, Kampong Cham, Cambodia, found that, on average, households were spending 7.3 hours a day collecting native grasses to be used as supplementary feed for cattle, which are predominantly fed a rice stubble diet.

By the International Center for Tropical Agriculture (CIAT) introducing forage feed banks—where forage grasses (*Panicum maximum* 'Simuang' and *Brachiaria* hybrid 'Mulato') are grown on small areas of, on average, 485 square metres—the survey found that adopters were saving 2 hours a day. The fodder banks are planted in whatever spare ground can be found—alongside houses, on roadsides and in paddock surrounds.

World Development Report 2008, which showed that investment in agriculture has delivered an average rate of return of 43% in 700 projects that were evaluated.

The ACIAR-funded ‘Cattle in Cambodia’ project, now in the third year of its 4-year funding agreement, is one such example. Research partners report that the outcomes for farmers who have lifted productivity through better forage crops have exceeded their “wildest dreams”, due to the spirit of cooperation and the ability to build on the gains of previous projects through the continuity provided by a CGIAR centre.

In partnership with the Laos-based International Center for Tropical Agriculture (CIAT) and in conjunction with the Royal Agricultural University and Department of Animal Health and Production in Cambodia, the Cattle in Cambodia project follows successful projects in Laos and earlier trials in Cambodia with similar aims—that is, to improve feed availability and quality throughout the year while reducing labour.

ACIAR research program manager for animal health Dr Doug Gray says the production systems and social conditions vary greatly between Laos and Cambodia, but lessons learnt in Laos mean change can be effected much faster in Cambodia.

Australian animal nutritionist Dr Darryl Savage, from the University of New England, has been involved on the ground in Cambodia. He says it is an advantage being able to capture knowledge and skills already created on previous CIAT-managed projects.

When this project was launched, Dr Werner Stür and Dr Sorn San—the Cambodian-based leaders of an earlier program funded through other international agencies—were able to come on board immediately through CIAT’s involvement, picking up where earlier work left off.

One of the first techniques employed was to develop collaborative partnerships and a learning alliance of all non-government organisations (including those from religious ministries and business-sponsored projects) and government employees working on cattle production in Cambodia.

This, Dr Savage says, allows everyone to move in the same direction and avoid project duplication, while also giving an indication of the projects likely to be of assistance. “We don’t pay for them to travel to the alliance meetings, so if they can’t afford to get there it is likely they won’t have the resources to help with this project,” he says.

But the most important aspect is that the

alliance provides a measurement of project relevance. “These people have limited time and if the workshops or research we run are not providing them with something they can use with the farmers, they will not participate,” Dr Gray says. “Our research work then becomes driven by the demands of rural development.”

The second important lesson learnt from Laos is to allow farmers to be involved in every level of research, thus making information sharing easier and guaranteeing the production techniques are achievable using local resources.

“That farmer-driven model has been successful in Laos with cattle, buffalo and pigs so it is a method easily adopted in Cambodia, despite the different conditions,” Dr Gray says.

The project has three trial sites: Prey Chhor (established in the earlier work), Tbong Khmum and Kang Meas (the only site where trial pastures are irrigated). In 2003 the CIAT-managed ‘Livelihood and Livestock Systems Project’ introduced forages to Prey Chhor farmers, which could be grown near their homes in ‘banks’ to supplement the rice straw diet of their cattle (usually two to five head), saving them 8 hours’ work a day collecting native grasses.

Project surveys in 2008 found the average Cambodian cattle enterprise was 1 hectare, with four cattle supporting five or six family members.

A sign of the success is that Prey Chhor farmers are already selling cuttings of the forage to farmers from other regions. Other farmers are starting to fully use the forage crops by buying-in cattle for fattening, turning them over more quickly.

“If you can walk away from a project and your work is continued by the farmers then that is success,” Dr Savage says. “Never in our wildest dreams did we anticipate this would happen so quickly or that the level of adoption—often with farmers who have had nothing to do with the trials—would be as great as it has been.”

THE ROLE OF POLICY

The Washington-based International Food Policy Research Institute (IFPRI), a CGIAR centre, seeks to end hunger and poverty through policy solutions.

The two premises of this mission are that:

- sound and appropriate local, national and international reform of public, domestic and trade policies are needed to achieve sustainable food security and nutritional improvement
- the dissemination of results is critical to raising the quality of food-policy debate and formulating sound and appropriate policies.



A forage fodder bank can mean that a child can attend school rather than spending 8 hours a day cutting native grasses.

ACIAR funded two recent projects to help farmers in developing nations capture more income from the opening up of world trade, particularly to China and India.

One explored alternative futures for agricultural knowledge, science and technology through a collaboration between the World Bank, the Australian Bureau of Agricultural and Resource Economics, the Center for Chinese Agricultural Policy and the National Council of Applied Economic Research in China.

The project made an up-to-date analysis of the world food and environmental situation for the current debate on world food prices, security and climate change, with individual assessments for China and India. This information was then provided to the International Assessment of Agricultural Science and Technology for Development (IAASTD) secretariat. ACIAR policy adviser Dr Simon Hearn says the project was influential as it provided factual information that influenced the food security debate.

“You can’t have an informed debate without good research and this research takes place without concern about the political impact of policy—it just spells out the positives and negatives of policy change options,” he says. “Good policy helps gain value from science. For example, if fertiliser subsidies are removed or reduced, farmers might use fertiliser more carefully, benefiting the environment and in some cases enhancing sustainable productivity.”

The true impact of economic and trade policy is well understood through IFPRI projects, such as one that examined the impact



Cambodian farmers have already moved into private enterprise, selling fodder plants to fellow farmers so they can establish their own fodder banks.

of China's membership of the World Trade Organization (WTO) (it became a member in 2001) on rural and smallholders in western China. This ACIAR-funded project was a collaboration between the Chinese Academy of Sciences, the Chinese Academy of Agricultural Sciences and China's Gansu Agricultural University.

More than 70% of China's poor live in the country's western region. The 3-year study found that poor infrastructure and resources in this region were hampering poverty reduction and agricultural growth.

The project analysed policy impacts on several levels—country, regional, township, village and farm household—so policy options could be developed that would help the western region reduce poverty, grow economically and be buffered from adverse shocks under the WTO.

It found coastal China stood to benefit from market opportunities, but lack of infrastructure and barriers to fiscal transactions meant the western region had little to gain.

The report developed a series of policy formulations to target public provisions for smallholders by encouraging investment in infrastructure, health, education and agricultural technology, rather than allowing funds to be swallowed by local bureaucracy.

Dr Hearn says the benefit of working with a CGIAR centre is access to critical mass and existing infrastructure, including human resources, which reduces the time and money used in establishing new projects, meaning more dollars are directed to making an impact.

COLLABORATION BREEDS SEEDS FOR LIFE

The power of international agricultural collaboration is borne out in the Seeds of Life (SoL) program in East Timor, now in its tenth year.

When East Timor was granted independence in 1999 its one million people were left with no infrastructure, no agricultural research facilities, few human resources and no access to quality seed to grow the crops that, today, 150,000 households rely on for food and income.

Among the CGIAR, the International Rice Research Institute (IRRI), the International Center for Tropical Agriculture (CIAT), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the International Maize and Wheat Improvement Center (CIMMYT) and the International Potato Center (CIP) came forth with suitable crop varieties for the Seeds of Life program. The program is within the East Timor Ministry of Agriculture and Fisheries (MAF) and is co-funded by ACIAR and AusAID.

Variety-evaluation trials focus on sweetpotato, maize, rice, peanuts and cassava—all staple crops for preventing malnutrition and with the scope for yield gains to help meet demand. Each international centre supplies potentially suitable varieties for cultivation in East Timor, which are evaluated in replicated on-station trials to identify one or two varieties for on-farm trials.

On-farm trials allow farmers to evaluate the new varieties on their own farms under local conditions. The farmers also compare the taste and cooking characteristics of each with their local varieties prior to making a selection for planting the following year. These trials are established in seven of the 13 districts across

East Timor each year, ensuring the researchers can evaluate suitable varieties across a range of environments.

Seed production of tested and proven high-yielding varieties is now the focus of the program, with more than 15,000 farmers given SoL seed to grow on a larger scale for the 2009–10 season.

MAF has released nine new varieties of the five staple food crops (maize, sweetpotato, peanuts, rice and cassava). To provide the data for these releases, in recent years SoL has conducted more than 30 replicated germplasm-evaluation trials and more than 700 on-farm trials each year.

More than 3,000 participating on-farm trial households have grown at least one of the new varieties, experiencing yield increases on their farms of more than 50% for maize and 80% for sweetpotato. Distribution of seed by non-government organisations and directly by MAF has reached many more farmers.

Rob Williams, the project's Australian team leader, oversees a large staff, including 40 agricultural scientists conducting experiments across a range of species in 17 of the 65 East Timor subdistricts.

"The genetic resources of CGIAR centres are critical to the success of this project," he says. "We have growers who have hosted trials for us and within 2 years are growing the new varieties, which are selected because they offer a higher yield and taste good, as well as working with existing agronomy."

The farmers, Mr Williams says, respond greatly to the improved taste or colour of produce and will often seek varieties on those traits alone. One farmer who had never had contact with SoL found impressive sweetpotatoes at a local market and travelled 50 kilometres to find the source—a SoL trial farmer—from whom he purchased cuttings to grow on his farm.

"Farmers have quickly created an economy around the crops, generating cash by selling product of the new varieties," he says. "Generally, the farmers then put that money towards education and health, which fights poverty."

As to the next phase of SoL, Mr Williams thinks expansion of seed production and work with more temperate crops, such as red beans and European potatoes, would benefit farmers at higher altitudes where farmers successfully grow plums, wheat and barley. He also envisages that distribution of the new varieties will be expanded by establishing community-based seed production groups. ■

More information: www.cgiar.org

Crops and knowledge emerge from tsunami fields

Gavin Tinning, project manager for the ACIAR cropping project in tsunami-affected Aceh, Indonesia, reports on efforts to restore crop production in the region's villages. His most recent visit to the area was in March 2010

Desa Baro is an Indonesian village of 300 people in Aceh's Pidie district, close to the sea on the east coast. When I first visited, some time after the tsunami of December 2004, the scene looked nothing like an Indonesian village. The rice fields were covered in sediment, left unproductive and saline.

After the first attempts to grow rice and soybean had failed, the fields were abandoned. My visit to the district with T. Iskander, of the provincial agricultural service (BPTP), was in April 2007, almost two-and-a-half years after the tsunami.

While many areas recovered relatively quickly from the tsunami's impacts and healthy crops were harvested within a year, Desa Baro was one of many villages still struggling with crop failures—a calamity not previously encountered. It was a reminder that the task of rebuilding after a disaster of such enormity is a long-term program.

Our ACIAR-funded project is now helping in that rebuilding process, and allowing life to move beyond that December day, through increasing the productivity of the farming system. Following that first visit we put together a list of recommendations for the farmers:

- remove the remaining salt by flushing with irrigation water
- add organic matter to build soil fertility
- establish a trial of new varieties of soybeans.

During the most recent visit, Iskandar and I met local farmer Pak Burhan who undertook the role of motivating his fellow farmers. Pak Burhan is a great believer in providing farmers with the capacity to overcome their problems. He convinced his village to increase the trial area for new cropping techniques.

The tidal inundation following the tsunami had left only 45 hectares of arable land in Desa Baro. Many people are not aware that the earthquake that triggered the 2004 tsunami

caused land subsidence, which led to the inundation of crop land.

This meant that high tides now covered previously productive fields. Our project team identified that a tidal gate was needed to protect the Desa Baro fields, so that farming could return to the once fertile fields now covered by sea water.

During that first visit we were told how the previous soybean crops had failed, with empty bean pods and partially developed seeds. These were common symptoms we had found in other post-tsunami legume crops in Aceh.

Four new varieties of soybean were planted in May 2007 to compare with a local variety. We demonstrated the use of *Rhizobium* inoculation and showed farmers some improved crop practices to compare. Farmers were advised to apply compost to improve levels of organic matter in the tsunami-affected soil.

Since that first visit I have heard and seen how the crops planted using our approach have performed well. In fact, they performed so well the farmers invited the Pidie District Regent, Mr Mirza Ismail, to the ceremonial first harvest in August 2007.

Yields reached 3 tonnes per hectare for 'Anjasmoro', a variety that has subsequently performed well in demonstrations along the east coast and is now accepted by Acehnese farmers as one of their best-performing varieties.

Pak Burhan's enthusiasm for the crop trial has been vindicated. An average harvest in pre-tsunami years was less than 1.5 t/ha; now yields are double that.

Pak Burhan has been a champion of the new approaches, emphasising the need for communication and organisation to help farmers recover from the tsunami. He says it is important to transfer the knowledge first before distributing capital aid (such as seed



and fertilisers). Pak Burhan tells us of cases in the past where agricultural inputs missed the target, arriving in the hands of people who had no appropriate knowledge.

The Regent's visit also presented an opportunity for the villagers to highlight the tsunami's impact on the coastline and the need for a tidal gate. The Regent agreed and laid the foundation stone of a new tidal gate structure on the day of his visit to Desa Baro.

With the construction of the tidal gate, an extra 20 ha are now available to Desa Baro's

farmers. The 2009 rice harvest in Desa Baro was 8.5 t/ha, providing a healthy financial return to farmers. *Rhizobium* inoculation, new varieties and greater control of pests at crucial stages of plant growth are now standard practices for local soybean farmers.

Unfortunately it was too wet for soybeans in 2009, but Pak Burhan hopes that Desa Baro will grow a successful crop in 2010, following their latest rice crop. That crop was planted 5 years to the day after the tsunami.

New rice varieties and better management

of fertiliser applications continue to improve rice production. I am pleased to see that the high yields and a good selling price for the 2009 crop have encouraged Pak Burhan and other Desa Baro farmers to plant rice again.

There is still a way to go, but this ACIAR-funded project shows that agricultural aid is not a short-term fix. Five years after that destructive December day Desa Baro is now rebuilding its agriculture, even improving on pre-tsunami production, and looking more and more like any farming village in Indonesia. ■



Pak Burhan inspects a rice crop in Desi Baro, Indonesia.

Livelihoods lift with DIY water supply

From harvesting just one rice crop each year on a tiny patch of land, the East India Plateau's poorest farmers now have the means to create new social and economic opportunities through water-harvesting technology made available by ACIAR

BY MELISSA MARINO AND GIO BRAIDOTTI

The rolling hills of the East India Plateau have long proven a poverty trap for the region's rice farmers. Considered among the poorest in India, these farmers use traditional farming practices, low inputs and monsoonal rains to produce just one rice crop a year, often

harvested from less than 1 hectare of low-lying land. The result is a losing battle to produce enough food to feed even one family.

To close the livelihood gap, men immigrate in search of seasonal work with women taking on roles previously done by men, but struggling with a lack of support and resources, especially labour and access to technical know-how.

On the surface, there appear to be few options to nurture enduring development and spring the poverty trap. But to agricultural scientists experienced in integrated land and water management, the view of these subsistence farms is very different. Scientists like Dr Peter Cornish, from the University of Western Sydney, see potentially productive land going unused



Women and men digging a seepage pit to be used for irrigating vegetables.

PARTNER COUNTRY
India

PROJECT: LWR/2002/100: Water harvesting and better cropping systems for the benefit of small farmers in watersheds of the East India Plateau

CONTACT: Dr Mirko Stauffacher,
stauffacher@aciarc.gov.au

on the higher and sloping parts of the landscape and enough annual rainfall for additional, market-oriented crops . . . if only the water could be made available where it is needed.

Dr Cornish says that the annual monsoon provides 80% of the region's rainfall, which totals about 1,200 millimetres. A massive 60% of the total is lost to run-off.

The solution, he says, is to capture and store rainfall upland and use it to bring that land under cultivation while creating market access for these new crops. There is, however, a trick to the strategy: the need for technology that does not require start-up capital, expensive heavy machinery and ongoing operating costs.

As it turns out, a rural development organisation within India, PRADAN, has been developing do-it-yourself water-harvesting technology to capture run-off and tap shallow underground sources.

"PRADAN had trialled water-harvesting techniques on a small scale but they wanted to run a more scientific evaluation and then improve and apply the technology in different landscapes," Dr Cornish says.

With support from the Indian Council for Agricultural Research and ACIAR, a 4-year project was launched in 2002 that allowed two villages to adopt and test PRADAN's water-harvesting technology. That meant digging water-storage pits in the uplands and building a network of channels to funnel rainfall to the pits. In turn, this increased infiltration of monsoonal rain to the shallow groundwater, which could then be accessed after the monsoon using seepage tanks in lower-lying areas.

Next came the provision of agronomic expertise and the introduction of new crops for use at the upland sites. This was made available to farmers using participatory techniques that saw the farmers—especially women—identify research questions and carry out field trials, always with the support of PRADAN.

Project executive, Ms Kuntalika Kumbhakar, says PRADAN played a major role in ensuring local participation in the project. "We mobilised and organised the community and got the works executed in the field," she says. "The organisation has a knack for being creative and open to new ideas, and working with a sizeable number of families the information spreads."

The participatory model saw women become enthusiastic agents of change, and in response the project was expanded to help develop agronomic know-how. This came to include mentoring on appropriate fertiliser use and weed management through the use of line planting. Another example is the introduction

of short-season rice varieties, an innovation that increases opportunities to plant a second crop in the rice paddy, typically mustard or wheat.

ACIAR research program manager Dr Mirko Stauffacher says that with water-harvesting technology making it possible for the farmers to expand and diversify production of agricultural commodities, the project continued to support the villagers by looking at market access for the surplus produce.

"The project looked at water management very holistically—it was not just about providing people with water for different parts of the landscape, but looking at overall food security and farm profitability," he says. "And the team managed to do that very well, for example, by exploiting opportunities to supply vegetables such as tomatoes and gourds to markets out of season."

Freed from reliance on one annual rice crop, livelihoods within the participating villages improved, driving socioeconomic

changes that are visible to the eye. There are improvements in diet, housing and livestock ownership, and money for incidentals, such as books for children's schooling. But the social changes run even deeper. There are gains in women's prestige within the communities and more cohesive social structures as income opportunities within the villages help prevent the seasonal exodus of men in search for work.

"That had such a positive impact that practices developed in this project have spread beyond the two villages in the absence of any formal extension activity," Dr Stauffacher says. In response, ACIAR is planning a follow-up project specifically geared to facilitate a technology roll-out to other communities.

"What we want to know is how we can help spread benefits across many communities in this area," Dr Stauffacher says. "So basically we are looking to understand how to scale out project outcomes and then, within a couple of years, actually do it." ■

Farmers and project team inspecting a newly dug seepage pit in Pogro watershed.



ACIAR TO BOOST FOOD SECURITY IN AFRICA

Australia is making a major contribution to improve food security in eastern and southern Africa through a new A\$20 million agricultural R&D program to substantially boost production of maize and legumes, and improve market opportunities for farmers. The project was officially announced by the Minister for Foreign Affairs, Stephen Smith.

The maize-legume food security program will operate in five countries—Ethiopia, Kenya, Malawi, Mozambique and Tanzania—with the benefits planned to spill over into other countries in eastern and southern Africa.

Food security is a major concern in this region, where more than half the population of 400 million people live in extreme poverty and about 70% depend on agriculture for their livelihood. Maize is the staple food crop in the region and legumes provide a valuable source of dietary protein.

Demand for maize and legumes is projected to increase substantially over coming years, but production is being held back by rainfall variability and weaknesses in

crop management, varieties and value chains.

To overcome these constraints, a collaborative research program has been established between ACIAR, the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), the International Maize and Wheat Improvement Center (CIMMYT) and national agricultural research systems in each of the five partner countries.

By involving farmers, extension agencies, non-government organisations and agribusinesses, the R&D program aims to lift crop productivity by 30% and also reduce year-to-year yield variation by 30% on about 500,000 farms within 10 years.

The production gains will be made through: testing and introducing conservation agriculture techniques to retain soil moisture; developing drought and disease-tolerant maize and legume varieties; optimising the use of farmer resources; and identifying better input supply and marketing options for smallholders.

The Australian Government has announced support for a \$1.1 million ACIAR research project to assist small-scale cattle producers to improve their access to markets and to increase the availability of beef as a protein source in Botswana.

The smallholder cattle farmers, who produce 80–90% of beef in Botswana, operate in similar environments to cattle producers in dry areas of northern Australia.

A team from Botswana will visit Australia to assist in the design of the project, involving the Australian Beef Cooperative Research Centre, the International Livestock Research Institute (ILRI), and the Agricultural Research Council of the Republic of South Africa.

CIMMYT Board of Trustees visit

The Board of Trustees of the International Maize and Wheat Improvement Center (CIMMYT) visited Australia in April, the first time the Board has done so. The visit provided an opportunity for CIMMYT to meet with Australia's farming, research and international development communities.

Included in the round of discussions was a joint ACIAR–CIMMYT Food Security Roundtable, bringing together key stakeholders in Australia including the Department of Foreign Affairs and Trade, the Department of Agriculture, Fisheries and Forestry, AusAID and CSIRO, together with the Grains Research and Development Corporation, the Crawford Fund, the Natural Resources Commission of NSW, the University of Adelaide and Nuffield Australia. The Roundtable was opened by Australia's Parliamentary Secretary for International Development Assistance, Bob McMullan.

A range of issues confronting agricultural research and threatening food security were



The President of Botswana, Ian Khama (right) is welcomed to ACIAR by Nick Austin, CEO.

Presidential visit to ACIAR

ACIAR hosted the President of the Republic of Botswana, His Excellency Lieutenant General Seretse Khama Ian Khama, on 2 March 2010. The delegation met with ACIAR chief executive officer Dr Nick Austin and key ACIAR research program managers to discuss ACIAR's expanding engagement with Africa.

ACIAR has supported agricultural research projects assisting disadvantaged and emerging farmers in southern Africa since 1983. This engagement is set to grow through the Australian Government's 'Food Security through Rural Development' initiative.

discussed during the Roundtable, including climate change, declining yields and ways to improve collaboration between research organisations around the world.

The Board of Trustees, chaired by Dr Julio Antonio Berdegué, believes that CIMMYT is well placed to meet these challenges.

Dr Berdegué says that the recent global food crisis has led to a reorganisation of the international agricultural research system under the World Bank. But over and above those reforms, CIMMYT is rolling out its own agenda, an ambitious program to double wheat and maize productivity by 2050.

“Gains in productivity of wheat are declining around the world, including in Australia,” Dr Berdegué says. “We are building international consortia that include Australian scientists and investors to look at how we can break the wheat yield barriers. That is something that is already underway.”

New CEO visits ACIAR partners

The importance of Australia’s agricultural research program was highlighted during a series of recent visits by ACIAR’s chief executive officer Dr Nick Austin to Indonesia, Solomon Islands and the Mekong region.

In Jakarta, Dr Austin met with the Minister for Agriculture, H. Suswono, senior staff at agricultural research agencies and Australia’s Ambassador to Indonesia, Bill Farmer. He also visited the Center for International Forestry Research, Bogor Agricultural University and ACIAR projects in Lombok.

The current program, with a budget of A\$11.7 million, supports 59 projects in 11 provinces in eastern Indonesia and in parts of Java and Sumatra.

“The ACIAR research program aims to help boost farmers’ incomes in two ways: by increasing the productivity of crops, livestock

and aquaculture; and by fostering the development of integrated agribusinesses, focusing on high-value commodities for which there is strong market demand,” Dr Austin said.

Dr Austin also travelled to Solomon Islands where he met with senior government stakeholders and visited a forestry project with ACIAR’s research program manager for forestry Dr Russell Haines.

During his visit to the Mekong region Dr Austin travelled to Vietnam, Laos, Cambodia and Thailand, meeting with senior government officials, which also will help identify opportunities for collaborative research on regional issues.

Dr Austin met with representatives from each country’s ministry of agriculture, along with specialist agencies active in the region, including the Asian Development Bank, the Mekong River Commission and the International Center for Tropical Agriculture.

These discussions focused on broad directions for cooperation in research and development, and specific areas where ACIAR may assist in the future. Dr Austin said the meetings allowed a first-hand understanding of the country’s agricultural research and development framework, policy, directions and priorities.

Dr Austin said such trips are “a valuable opportunity to learn more about the agricultural priorities of partner countries, and to promote Australia’s commitment to ensuring food security in the Asia–Pacific region”.

John Dillon Fellows visit

Nine up-and-coming leaders from agricultural organisations in the Asia–Pacific region met with Parliamentary Secretary for International Development Assistance, Bob McMullan, on 16 March 2010.



Nick Austin in Indonesia.

The leaders are recipients of the 2010 John Dillon Memorial Fellowship Awards, provided by ACIAR for short-term leadership development opportunities and to encourage collaboration with Australians working in similar fields.

The scheme is named in recognition of the late Professor John Dillon, who was one of Australia’s leading agricultural economists and a strong advocate of international agricultural research and collaboration.

The Fellows—from Papua New Guinea, Vanuatu, Indonesia, the Philippines, Vietnam and Laos—are making important contributions to agricultural development in their countries. They are associated with ACIAR projects in the fields of horticulture, aquaculture, forestry, animal health and transferring research outcomes to farmers.

Mr McMullan told the Fellows that it is an important time for agricultural research and development so that sufficient food can be provided to people at reasonable prices, particularly with the focus on achieving the Millennium Development Goals.

The Fellows’ 6-week visit to Australia includes management training at Mt Eliza Business School and programs specially tailored to their management training needs. They have placements with various Australian R&D organisations in Hobart, Melbourne, Geelong,

Canberra, Sydney, Armidale, Port Stephens, Brisbane, Sunshine Coast, Townsville and Cairns.

2010 JOHN DILLON FELLOWSHIP RECIPIENTS:

- **Ms Josefina Atienza** – Science Research Specialist, Philippine Council for Agriculture, Forestry and Natural Resources Research and Development, Los Baños, PHILIPPINES
- **Dr Joko Pitono** – Head of Planning and Evaluation Division, Indonesian Centre for Agricultural Technology Assessment and Development, Bogor, INDONESIA
- **Dr Muhammad Taufiq Ratule** – Director, Assessment Institute of Agricultural Technology of Southeast Sulawesi, INDONESIA
- **Dr Le Anh Tuan** – Head of Department of Fish Nutrition and Feeds, Nha Trang University, Nha Trang, VIETNAM
- **Mr Jacob Wani** – Manager for Aquaculture and Inland Fisheries, National Fisheries Authority, Port Moresby, PAPUA NEW GUINEA
- **Dr Nguyen Huu Van** – Head of Department of Animal Husbandry, Hue University of Agriculture and Forestry, VIETNAM
- **Dr Khamphouth Vongxay** – National Animal Health Centre, Department of Livestock and Fisheries Vientiane, LAO PDR



The Parliamentary Secretary for International Development Assistance, Bob McMullan, hosts ACIAR's 2010 John Dillon Fellows at Parliament House, Canberra. (From left) Dr Muhammad Taufiq Ratule, Dr Joko Pitono, Dr Nguyen Huu Van, Dr Le Anh Tuan, Mr Bob McMullan, Ms Josefina Atienza, Dr Khamphouth Vongxay, Dr Latsamy Boupcha, Mr Jacob Wani and Mr Ioan Viji.

■ Dr Latsamy Boupcha – Vice

Dean of Faculty of Forestry,
National University of Laos,
Vientiane, LAO PDR

■ Mr Ioan Viji – Principal Forest Officer, Department of Forests, VANUATU.

Youth Ambassadors to carry the flag

Four Australian Youth Ambassadors for Development (AYADs) left Australia in April 2010 to spend up to 12 months working on ACIAR projects.

They are part of a contingent of 141 AYADs who are travelling to various countries in Asia, the Pacific and, for the first time, Africa.

Marissa Skeels, of Western Australia (WA), will spend 12 months based in Quy Nhon, a coastal city in south central Vietnam working on an ACIAR project helping farmers in the dry and infertile region become more productive. The project involves integrating crop and beef cattle farming systems, improving the use of soil and water for tree crops, and linking farmers to markets. Marissa will evaluate the project components and pass on what she knows about evaluation to the Vietnamese team members.

Anthony Robinson, also from WA, will spend 12 months in Samoa working on an ACIAR project helping farmers to control diamondback moth in brassica crops through integrated pest management. Anthony has a degree in National Resource Management and has held a number of roles, most recently assessing the biosecurity threats to bee pollination. He will share his knowledge on effective insecticides use with Samoan and Fijian farmers.

Nicola Edwards, of New South Wales (NSW), will spend 9 months based in Makassar, on the eastern Indonesia island of Sulawesi. She is working on an ACIAR project helping smallholder coffee growers boost their incomes by meeting the standards of the international coffee market. Nicola speaks Indonesian, has a degree in Indonesian studies and did her honours thesis on the movement towards sustainable agriculture in Indonesia. She will work with producer organisations in the Toraja and Enrekang regions of Sulawesi.

Joshua Philp, of NSW, is to spend 9 months in Gansu on the Loess Plateau in central China working on an ACIAR project that is

improving the livelihood of farmers by developing more efficient crop-livestock farming systems. Joshua has a Bachelor of Animal Science from the University of Western Sydney and is looking forward to the opportunity to apply his knowledge of systems-based research in China.

Two AYADs have opted to continue working overseas.

Sally Bolton has just completed 12 months as communications officer with 'Seeds of Life' in East

Timor. This food security program is helping raise crop yields by introducing improved varieties of staple food crops. Sally worked on a wide range of communications activities including writing, graphic design, web design, media liaison and photography. The Seeds of Life team says Sally developed a great web page and did a fantastic job developing their communications strategy. She now heads to Mexico to work with microfinance organisation CrediComun through the Kiva Fellows program until August, but is very keen to return to East Timor.

Tim Heath worked as an agronomist on an ACIAR project in Tibet as an AYAD in 2009. He is soon to return to Tibet to continue work on the project helping local farmers and agricultural institutes overcome the shortfalls in livestock fodder and grains production. Tim grew up on a broadacre farming property west of Port Lincoln in South Australia (SA), and studied agriculture before working as an agronomist. He has expertise in weed control, which has a big impact on food production in Australia and Tibet. Tim is now an AYAD state representative for SA and a strong advocate of the opportunities the program offers.

Tim Heath (left) with Guoyi Liu, a crop nutrition researcher for the Tibetan Agricultural Research Institute, sampling soil in Quishui County, Tibet.



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Improved productivity, profitability and sustainability of sheep production

in Maharashtra, India, through genetically enhanced prolificacy, growth and

parasite resistance *V. Gupta, P. Ghalsasi, J. Van der Werf, B. Nimbkar, J. Prior, D. Wolfenden,*

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Back cover: Faces of the future. Young farmers on Lombok, Indonesia, are moving into far more technical farming systems than their fathers knew; embracing crop diversity and increasingly sophisticated agronomy and water management to shift the focus from rice and food security to more productive and also more commercial crop options.

Front cover: Lombok peanut farmer Mr H. Syukri.

PHOTOS: BRAD COLLIS