



partners

IN RESEARCH FOR DEVELOPMENT



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Message from the ACIAR Chief Executive Officer

Happy 30th birthday *Partners* magazine!
 Thirty years ago, ACIAR published the first edition of our flagship *Partners* magazine. This birthday edition offers an opportunity to reflect on ACIAR's track record, and more importantly, our future.

This special edition of *Partners* reflects on some of ACIAR's achievements over the last three decades, from Africa through Asia to the Pacific, across many agricultural sectors, fisheries and forestry.

The articles by ACIAR Commissioner Dr Gabrielle Persley and Dr Denis Blight describe some of the key players involved in promoting the idea of an independent agency through which Australia could invest in international agricultural research, in the years leading up to the Fraser government's introduction of the *ACIAR ACT* in 1982. I'm delighted that Gabrielle concludes that ACIAR's founders would be well pleased today.

Other articles in this edition underline the value of just a tiny selection of ACIAR projects. Telling these stories is important, both to ensure that research activities and findings are widely shared, and also to enable our investors, the taxpayers of Australia, to see some of the impacts of Australian aid administered by ACIAR. We are ramping up our communication effort, which necessarily in 2018 means expanding our presence and reach across a range of digital platforms. But I am pleased that a recent review also underlined the ongoing value and appreciation by our stakeholders, of 'traditional' hard-copy publications like *Partners* magazine. We will continue to tell long-form stories about ACIAR's research projects and their impacts in developing countries and Australia.



The first Partners magazine was published at the beginning of 1988, 30 years ago! Happy birthday Partners!

On 26 February 2018, Australia's Foreign Minister the Hon Julie Bishop MP launched ACIAR's new Ten-Year Strategy (2018-2027), which is summarised in the article on page 32. This high-level strategy sets out how ACIAR's research portfolio will continue to build the knowledge



CEO Andrew Campbell

base that supports crucial development objectives: improving food security and reducing poverty; managing natural resources more sustainably and mitigating and adapting to climate change; and improving human nutrition and health. In pursuing these objectives, we will also empower women and girls; develop more inclusive agrifood and forestry market chains; and build scientific and policy capability within our region.

I hope the stories within this anniversary issue of *Partners* magazine help to remind us all - the public, our stakeholders, researchers, policymakers and businesses - of the enduring benefits of improving agricultural productivity and sustainability, and food system resilience across our region.

Andrew Campbell
 March 2018



ACIAR's commissioners, from left to right: Professor Andrew Campbell FAICD, Professor Sandra Harding, Professor Gabrielle Persley AM, Dr Sasha Courville, Ms Catherine Marriott, Mr Don Heatley OAM. Photo: Conor Ashleigh

Message from the ACIAR Commission Chair

I take a great deal of pleasure and pride in serving the interests of ACIAR as its Commission Chair, and most notably on the occasion of the launch of ACIAR's Ten-Year Strategy. I have served as the ACIAR Commission Chair since 2014, after having participated in a number of high-level advocacy roles, including involvement in the Cattle Council of Australia and as Chair of Meat and Livestock Australia.

My role is to offer advice and support to the ACIAR team on a range of international agribusiness issues, and to promote ACIAR activities in the presence of Australian political and business decision makers. In this regard, I have drawn on my long experience in agricultural business in advocating ACIAR's mandate.

Previous industry roles gave me the opportunity to see many countries around the world, both developed and developing, where marketing research and promotion extended reach for livestock and livestock products. The Research *and* Development invested in these products was undertaken for the commercial benefit of the Australian livestock industry.

ACIAR's Research *for* Development attracted me as an opportunity to engage in the direction of research that was, in my opinion, far less commercially orientated and highly supportive of those in the world who are far less fortunate than we in Australia.

It is of considerable interest that it is possible to witness and measure outcomes of ACIAR's Research for Development activities. Standout projects such as 'Seeds of Life' in Timor-Leste, 'Development of rice fish systems in the Ayeyarwady Delta' in Myanmar, and projects to improve mango production in various countries exemplify ACIAR's spirit of international research and cooperation.



Don Heatley OAM

Photo: Conor Ashleigh



Don Heatley, Max Shelton and Dahlanuddin visiting a project site in West Sumbawa

I am immensely pleased that among ACIAR's deliverables is the financial capacity to continue our support in developing countries. We should all be proud of our research expertise and our capacity to deliver program outcomes, as well as our capacity to engage with the private sector to leverage research benefits.

With the release of ACIAR's new Ten-Year Strategy, looking forward it is apt to consider the development of a longer-term approach to program activities. Aligned with the amplified communication activities of the Outreach program, a targeted public approach is required to better convey the ACIAR story. ACIAR will never lose sight of its key role, but will continue to refine its methods of delivery in order to accommodate the changing global financial requirements of support for developing nations.

I am grateful to be involved.

A handwritten signature in black ink, appearing to read 'D. Heatley'.

Don Heatley, March 2018



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IN RESEARCH FOR DEVELOPMENT

Partners in Research for Development is the flagship publication of the Australian Centre for International Agricultural Research (ACIAR). Partners presents articles that summarise results from ACIAR-sponsored research projects and puts ACIAR research initiatives into perspective. Technical enquiries will be passed on to the appropriate researchers for reply. Reprinting of articles, either whole or in part, is welcomed, provided that the source is acknowledged.

This publication is freely available from ACIAR's website at aciar.gov.au. It is also freely available on request from ACIAR. The use of a trade name does not constitute any endorsement of, or discrimination against, any product by ACIAR.

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or via post to

ACIAR Partners Magazine
GPO Box 15714, Canberra ACT 2601, Australia

ISSN 1839-616X (Online)
ISSN 1031-1009 (Print)
ISBN 978-1-925746-10-5 (Print)

Managing Editor: John Hancock, EzyMedia

Copyeditor: Karin Hosking

Lead Authors: Dave Gardiner and Peter Papathanasiou

Production: EzyMedia.com

Cover: Graphical crops, Orissa, India. Women farmers spread rice husks to be dried on a concrete platform. Photo: Rajesh Dhar



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GPO Box 1571, Canberra ACT 2601, Australia

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ACIAR's Ten-Year Strategy Launch

with Foreign Minister the Hon Julie Bishop MP

Parliament House in Canberra, 26 February 2018



It was great to have the Foreign Minister the Hon Julie Bishop MP launch our 10-year Strategy 2018-27 at Parliament House in Canberra. With many important ACIAR stakeholders in attendance, Minister Bishop endorsed its broader focus and highlighted the fantastic results ACIAR has delivered across the Indo-Pacific over the past 36 years. The Chair of the Commission for International Agricultural Research, Mr Don Heatley, thanked the Minister for her support, congratulated ACIAR staff and acknowledged their hard work in developing the strategy.





ACIAR STRATEGIC DIRECTION 2018-2027


All countries in the Indo-Pacific region are grappling with the complex challenges of how to grow more food and reduce poverty using less land, water and energy.


Since 1982 the Australian Centre for International Agricultural Research (ACIAR) has made a significant contribution to meeting these challenges. By leveraging international agricultural partnerships, ACIAR seeks to promote more productive and sustainable agricultural systems for the benefit of developing countries and Australia. We do this by working with partner countries to identify research priorities, tackling those priorities through research partnerships with universities, governments and private firms, and monitoring research outcomes to maximise impact and return on investment.


ACIAR is now refining its strategic direction for the next 10 years. This includes focusing on six high-level objectives that reflect the Australian Government's aid policy and the 2030 Agenda for Sustainable Development.


- 

1 Improving food security and reducing poverty among smallholder farmers and rural communities
- 

2 Managing natural resources and producing food more sustainably, adapting to climate variability and mitigating climate change
- 

3 Enhancing human nutrition and reducing risks to human health
- 

4 Improving gender equity and empowerment of women and girls
- 

5 Fostering more inclusive agrifood and forestry market chains, engaging the private sector where possible
- 

6 Building scientific and policy capability within our partner countries

ACIAR partner countries and country offices



36 PARTNER COUNTRIES: HALF WITH SIGNIFICANT PROGRAMS, HALF WITH SOME PRESENCE

76 STAFF

10 INTERNATIONAL OFFICES

**ACIAR'S
PATHWAY
TO IMPACT**

ACIAR RESEARCH PROGRAMS

We are consolidating our research portfolio and working to increase our multilateral partnerships with International Agricultural Research Centres and co-investment with the Department of Foreign Affairs and Trade and other donors. ACIAR's research portfolio now focuses on 10 programs:



ACIAR RESEARCH PROGRAMS pursuing:



ACIAR STRATEGIC OBJECTIVES contributing to:

SUSTAINABLE DEVELOPMENT GOALS



*International Agricultural Research Centres (IARCs)
**Department of Foreign Affairs and Trade (DFAT)

ACIAR's Ten-Year Strategy at a Glance

1

FRAMING

Framing the research portfolio around building the knowledge base that underpins six high-level objectives: food security and poverty reduction; better management of natural resources and more effective responses to climate change; improved human nutrition and health; empowerment of women and girls; inclusive agrifood and forestry market chains; and building science capacity in our region.

2

ARTICULATING

Articulating and distinguishing more clearly between three distinctive research partnership models: bilateral country partnerships; multilateral research collaborations and co-investment with development partners; each with their own procurement pathways, governance frameworks, quality assurance and risk management.

3

TRANSFORMING

Transforming public relations and stakeholder communication activities into a new, better targeted and better resourced Outreach Program characterised by: a more attractive, interactive and dynamic online presence; more proactive use of mainstream media; and sharpened publications for multiple platforms.

4

STRENGTHENING

Strengthening the Capacity Building Program to: provide a more rounded, career-oriented training experience for existing scholarship holders; create additional fellowships targeted at female future research leaders; build a more comprehensive and dynamic alumni network; provide more opportunities for volunteers and exchanges between Australia and developing countries; and formalise a long-term, synergistic partnership with The Crawford Fund.

5

BUILDING

Building on predominantly project level impact assessment, to design more sophisticated portfolio-level monitoring and evaluation, to enable better analysis and reporting against our objectives, and to inform portfolio management and outreach.

6


REALLOCATING

Reallocating resources to create more capacity for co-investment with research funders and development partners including the private sector, boost outreach, and develop better portfolio-wide monitoring, evaluation, analysis and synthesis capabilities.

Offices in 10 locations will work with partner countries to develop longer term research collaboration 'compacts' setting out mutually agreed priorities. Our partner countries share ACIAR's desire to develop fewer, but larger, research projects.

The focus of ACIAR's capacity-building program is changing to deliver a more rounded, career-oriented experience for international agricultural scientists and researchers. We are creating new programs that build on graduate and post-graduate study, including a leadership program for women. More opportunities will be created for volunteers and a dynamic alumni network will be established.

A new outreach program is underway, communicating ACIAR's many successes. This includes more proactive media engagement, a new website and an enhanced social media presence. It also includes a refreshed publications program to communicate research findings and outcomes and their practical application.

ACIAR is committed to working with our partners as we implement our new strategic direction, building on our record of scientific excellence and on-ground impact through mutually-beneficial research partnerships in our region. 



The value of Australian aid through research: a human story we can understand

Mrs Thao from the Mekong Delta is just one farmer whose life has been improved through an ACIAR's research project. Our research site at her farm on the Mekong Delta is looking at addressing some of the key rice/shrimp farming problems such as water salinity and acid sulphites in the soil. Over the last two years the University of New South Wales and a Vietnamese research team have supported Mrs Thao to improve her crop yields dramatically. Mrs Thao is now helping others to apply her new farming knowledge known as a Bayesian Belief network in her community.

[@ACIARAustralia aciar.gov.au](https://www.aciar.gov.au)

Meet Dr Daniel Walker, ACIAR's new Chief Scientist

By Peter PAPHATHANASIOU

Dr Daniel Walker is ACIAR's new Chief Scientist. Despite only being in the role since November 2017, he's hit the ground running.

KEY POINTS

- Appointed in November 2017, agricultural scientist Dr Daniel Walker is ACIAR's new Chief Scientist.
- Walker outlines his role as Chief Scientist and ACIAR's scientific vision going forward, which includes working effectively across programs and keeping pace with a fast-moving scientific frontier.
- With science at its core, ACIAR's Ten-Year Strategy outlines the organisation's vision for the future.

Daniel Walker invites me into his office, sits me down, folds his hands. With a steady gaze and measured tone, ACIAR's new Chief Scientist exudes the calm self-assuredness of an individual charged with a vital role: overseeing the quality of the organisation's scientific research.

'ACIAR has an important job it's been doing for 35 years,' Walker says. 'We're very good at doing it, but we're not done yet.'

Despite only being in the role a few months, Walker has a clear vision and direction. Last December, he hosted a major stakeholder symposium with all of ACIAR's commissioned organisations.

'The feedback was excellent,' Walker says. 'There's great enthusiasm for having shared strategic conversations, and we've already had follow-up visits.'

Dr Walker completed his PhD at Bangor University in Wales on a knowledge-based systems approach to agroforestry research and extension while working in Nepal, Sri Lanka and Thailand on research funded by what is now the UK's Department for International Development. Moving to Australia in the 1990s, he joined CSIRO Tropical Crops and Pastures. He held numerous positions in CSIRO over the next 23 years, including as Chief of Division of Ecosystem Sciences and, most recently, Research Director for Agriculture and Global Change in CSIRO Agriculture and Food.

Walker outlines ACIAR's significant role in funding new research to foster advances in how countries farm, forest and fish since 1982. 'But ACIAR hasn't just been a funder of research during this time,' he adds. 'We're a research broker, connecting partner countries with researchers via our

Research Program Managers. These people boast strong technical knowledge and vast experience in research management and international development. They're key.'

As Chief Scientist at ACIAR, Walker has the vital responsibility for overseeing the organisation's various research programs. 'We are currently consolidating our thirteen programs into ten. It's a broadly similar structure, but consolidating ensures we're working effectively across programs and taking a more integrated approach.'

Walker points to a whiteboard behind me, covered with inky diagrams and graphs and ideas. He begins to talk about the new challenges ACIAR is facing and how it is evolving in step with a fast-changing world.

'When ACIAR was founded, there was a focus on increasing the productivity rate of agricultural systems to ensure we simply produced enough calories so that people had enough to eat. Now, the scope of our questions has broadened, it's not just about eradicating malnutrition, but instead ensuring sustainable food production. Our science needs to think about the resource base, climate impacts, nutritional outcomes, gender and more as well as productivity.'

Walker is bullish about the role of science and technology in the continuing transformation of agriculture despite the significant challenges facing the world's food system. 'Look at the astonishing contributions of molecular biology and bioinformatics to how much more quickly, profoundly and efficiently we can manipulate crops and livestock. Think about the unprecedented access we have to climate data and the opportunities to increase efficiency of resource use and reduce risk as a result. These are based on science I could barely have imagined when I was an undergraduate student in Edinburgh, and now I'm seeing them play out in the real world as applied technologies creating value.'

With climate change one of the world's most pressing concerns, I ask about its influence in the region. Walker smiles. 'It's a top priority for ACIAR. Climate change is demonstrably beginning to bite in the countries we're dealing with, and agriculture is a major source of greenhouse gas emissions. Food production is vitally important, but it's also important to do it properly, to ensure people have enough to eat without risking the planet for future generations.'

Looking to the future, Walker hands me a glossy booklet: it's ACIAR's Ten-Year Strategy for the period 2018–2027. The vision is both ambitious and impressive, and has science at its core. In a short time, Walker has made it clear to me that he is ideally suited to being a key driver of its success.

'As Chief Scientist, it's my job to understand the science quality across ACIAR's programs to allow the organisation to better explore opportunities to apply new tools and methodologies to our research funding,' he says. 'Only this way – through science – can we ensure that the region continues to thrive.' ■



Transforming the careers of agricultural scientists and policymakers

Developing leadership skills and career development for agricultural scientists and policymakers are two key themes of ACIAR's renewed capacity building program. Under the new Ten-Year Strategy, ACIAR's approach to capacity building launches a number of new initiatives.



Eleanor Dean, General Manager, Outreach and Capacity Building. Photo: Conor Ashleigh

The ten John Dillon Fellows with ACIAR CEO Andrew Campbell at the conclusion of their six-week leadership development program in 2017. Photo: ACIAR

'Our flagship programs the John Allwright and John Dillon Fellowships are being enhanced,' explains ACIAR's General Manager, Outreach and Capacity Building, Eleanor Dean.

'Future post-graduate students completing their Masters and PhD studies as John Allwright fellows will be required to undertake a 'balanced researcher' course, equipping them with so-called "soft skills" such as leadership, communication, financial management and a better understanding of gender issues.

'We are just starting the process of developing this program and plan to start delivering it in the first semester of 2019.

From 2018 the John Dillon Fellowship program will be shortened to four weeks in Australia – following widespread feedback that the six-week program was too long. Participants will start the program in their home country and finish the program on their return. It is also now more integrated, rather than a series of distinct short courses, and has a full-time program leader to help the participants draw together the learnings.

A second round of the John Dillon Fellowship will run in the second half of 2018. It will target small groups of colleagues from the same organisation.

The new program will be similar to the John Dillon Fellowship in its focus on leadership, project and policy development and communication, but will target small groups of colleagues from the same organisation.

'The idea is that by learning and sharing experiences together, it will be easier to take new ideas back to the workplace and implement them by supporting each other to do things differently,' said Ms Dean. 'We still have some work to do designing the new course and the criteria for selecting participants, but look forward to the first annual cohort completing the program before the end of this year.

'We are also excited about another new capacity building initiative underway, targeting women scientists in Asia and the Pacific. This is a long-term project and we are looking closely at the African Women in Agricultural Research and Development (AWARD) fellowships as a model.'

Over two years AWARD includes a mentoring component and training in both leadership and science skills. ACIAR is sponsoring two women scientists from Bangladesh to complete the program. Feedback from these participants will inform how ACIAR may be able to run something similar in Asia and the Pacific.

ACIAR is also developing an Australian researcher program designed to encourage the next generation of agricultural scientists.

'We've already piloted an internship program for Masters of Business Administration students to work on an ACIAR project for a few months and we intend to explore this model further to see if it could be applied to other disciplines,' said Ms Dean. 'This complements our work supporting volunteers to increase the engagement of Australians in agricultural development in our region, while developing innovative approaches and partnerships.'

In partnership with the Crawford Fund, ACIAR also supports the Researchers in Agriculture for International Development network of young scientists who share knowledge and information about opportunities in the sector. A communication strategy targeting Australian agriculture students will also be delivered in 2018.

Ms Dean said ACIAR's relationship with the Crawford Fund continues to go from strength to strength. 'We are working together to find ways to increase the alignment of training needs and capacity building activities across the two organisations. Last year the two organisations entered into our first memorandum of understanding which sets out our plans for working together on mutual goals.

'This is an exciting time to be contributing to ACIAR's ongoing growth as Australia's lead research agency for development,' Ms Dean said. ■



In the national press with reef restoration

ACIAR recently hit national headlines with its restoration research on damaged coral reefs in the Philippines, with results that can benefit the Great Barrier Reef.

KEY POINT

- Techniques are being developed to restore damaged reef by rearing millions of coral larvae and repopulating damaged areas

Coral reefs are the foundation of a healthy reef system, yet are damaged owing to pollution, increased sea water temperature and 'blast fishing' in the Philippines by using cheap explosives to kill marine life. As reported in *Partners* in 2017, Professor Peter Harrison from Southern Cross University is leading the ACIAR project 'Restoring damaged coral reefs using mass coral larval reseedling' (FIS/2014/063), which is developing techniques in the northern Luzon region to raise millions of coral larvae in laboratory conditions then transferring them to reefs to populate damaged areas. Fine mesh tents cover the transferred larvae for several days before being removed to allow coral to re-establish. Experiments have involved

3D printed plastic tiles to provide micro-habitat for coral larvae. In trials, survival of 4.6 million restored juvenile corals is over 46% after one month of monitoring, but with a

high rate of recruitment. The coral rearing methods being developed have potential to be scaled up to larger areas at sea and thus benefit restoration of the Great Barrier Reef.



MEDIA COVERAGE

Overall statistics:

- 179 individual pieces of coverage – 84 online and 95 broadcast clips
- Total online and print reach of 53.7 million
- 'The Project' television program reach estimate 340,000
- The story was published in ten publications with reach of 250,000-plus

COVERAGE HIGHLIGHTS:

- 210 second segment on The Project highly positive. Very good coverage of the project itself.
- Substantial radio pick-up from Radio Release distribution, including ACIAR mentions and grabs from ACIAR CEO Andrew Campbell. Good national coverage via 6PR, 2UE, 2GB, 2CC, 4BC and many of the ABC stations.
- Strong results from media release distribution and follow up, including: Interview with AAP, whose copy was subsequently displayed across most major news sites including news.com.au, yahoo7, The Australia, Herald Sun, Daily Telegraph, Gold Coast Bulletin, SBS News, Weekly Times, NT News, Adelaide Advertiser, Cairns Post, Perth Now, Geelong Advertiser
- Standalone print story in Gold Coast Bulletin (ACIAR mentioned)
- Standalone story on ABC News website (ACIAR mentioned)
- WIN TV News and Southern Cross pickup of the story (shared from The Project) in a wide range of regional media markets including Townsville, Cairns, Mildura, Ballarat, Albury and Port Macquarie.

ACIAR PROJECT: FIS/2014/063:

Restoring damaged coral reefs using mass coral larval reseedling

MORE INFORMATION: Prof. Peter Harrison, Southern Cross University, peter.harrison@scu.edu.au



Empowering women and girls

Respecting the contributions of women and girls to community actions underpins ACIAR's commitment to the Gender Equity Policy and Strategy in all research.

KEY POINTS

- ACIAR's outreach activities aim to support gender equity and women's empowerment.
- Two action plans effect ACIAR's commitments as a corporate agency and for its international research for development.

More than half the world's farmers are women. The empirical evidence is clear that women are disproportionately affected by poverty. Ensuring women have equal access to resources and decision making is a direct route to reducing poverty for all.

Similarly, in wealthy industrialised countries, in both the public and private sectors, hard evidence suggests that organisations that draw equally on the talents of women and men at all levels outperform those that do not.

At the end of 2017 ACIAR launched its Gender Equity Policy and Strategy 2017-2021, which takes a long-term, principles-based approach to gender equity that is applicable to the commissioning and management of research, corporate management and outreach and capacity building. This policy will support ACIAR's gender equity goal over the Ten-Year Strategy 2018-2027.

Gender equity and women's empowerment will be comprehensively integrated into the research portfolio. Developing an understanding of gender and power relations is integral to the production of relevant, robust research. ACIAR will work with commissioned organisations and partners to influence and effect change to ensure that research is undertaken in a manner that advances gender equity and empowers women.

Outreach and capacity-building activities will be designed to support gender equity and women's empowerment. This will be achieved by ensuring capacity building programs are accessible and suitable for both men and women, and new programs are designed to specifically ensure equitable access to opportunities. ACIAR's outreach activities will highlight women's empowerment and aim to deliver equitable representation of both men and women.

ACIAR will ensure our corporate management is responsive to the needs of men and women in ACIAR, supporting a respectful and equitable workplace. Human Resources will take the lead in supporting respect and diversity in the organisational culture of ACIAR. Corporate services will ensure equitable access to information for men and women and strive to develop training and tools relevant to all staff.

Partners magazine will take a closer look at the background and aspirations behind this policy, as well as other facets of gender in development, in a gender-dedicated edition later this year.

See full policy on the ACIAR website www.aciar.gov.au



Joy Hardman, Emily Lamberton and Vinesh Prasad put a gender lens to a coffee value chain at the Pacific Gender Workshop in Fiji in June 2017. Photo: Richard Markham



Gender experts from ACIAR workshop, May 31st 2017: Prof Barbara Pamphilon, Miriam McCormack, Joanne Choe, Assc. Prof Yvonne Underhill-Sem, Dr Jayne Curnow, Dr Lauren Rickards, Dr Siwan Lovett, Dr Evan Christen, Dr Jane Dyson, Prof Margaret Alston, Prof Sharon Bell, Dr Ann-Maree Nobelius, Prof Andrew Campbell, Sally Moyle, Dr Meryl Williams, Assc. Prof Kuntala Lahiri-Dutt, and Dr Brian Cook. Photo: ACIAR.

Reflections on an enduring relationship

By Professor Gabrielle **PERSLEY, AM**

How does a successful and long standing organisation like ACIAR begin? Looking back, I feel it was part vision, part persistence that aligned with political wills when the time was right. The leadership of ACIAR in the early days created both a solid foundation and a robust approach to providing aid through agricultural research that has sustained ACIAR as a key partner in Australia's foreign aid program for over 36 years.

My journey over the past 36 years, from ACIAR's first staff member as the Scientific Adviser, to my appointment last September to the Commission for International Agricultural Research, has been one of passion and pride. It has involved me in almost every aspect of ACIAR, as a research program manager, a project leader, an investment partner, a CG Centre researcher and now a Commissioner.

A CONCEPT

The concept of ACIAR was discussed across aid circles for several years, embraced particularly by people like Sir John Crawford,

Jim Ingram, chief executive of the Australian Development Assistance Bureau (ADAB), Professor Helen Hughes at the Australian National University and Dr Ted Henzel at CSIRO. But it was an idea that needed a champion and the political stars to align, and the impetus was the Commonwealth Heads of Government Meeting (CHOGM) hosted by Australia in late 1981. Prime Minister Malcolm Fraser, in a speech to the Commonwealth Club in Adelaide on 14 February 1981, first floated the agricultural research initiative publicly.

Between the February announcement and the October meeting, much work was done. Jim

Ingram was charged with formalising the initiative and establishing ACIAR, and there was some urgency to make the initiative a reality in time for the formal launch at CHOGM in October 1981.

As the only agricultural scientist working in the Bureau, I joined the Task Force led by Dr John Baker, Head of the Policy Branch, to develop the Cabinet submission, the ACIAR Act and other elements necessary to establish the Centre as a statutory authority.

BIRTH

After the formal announcement of the initiative at CHOGM, there was bipartisan support from the outset, meaning the enabling Act passed smoothly through Parliament on 3 June 1982. With the Act in place, the next job was to take the centre from an idea to reality.

I was seconded to ACIAR as scientific adviser and its first staff member. At the time, I had the main responsibility in developing the first ACIAR strategy and the initial portfolio of projects, ready for approval at the first board of management meeting chaired by Sir John Crawford.

EARLY DAYS

The strong leadership in the initial years is one of the key factors why ACIAR remains today, despite many changes in political leadership and changing priorities in foreign aid policy. ACIAR remains as strong now as it was in its early days, thanks to the leadership of Sir John Crawford and Dr Denis Blight, who was the acting ACIAR Director until leading agricultural scientist Professor Jim McWilliam was formally appointed as Director.

Sir John was an absolute pleasure to work for, and he set exacting standards, while giving you



Gabrielle Persley

the confidence to believe that you could do what he asked, no matter how impossible it seemed to meet his deadlines. With an initial portfolio of ten projects approved at its first board meeting, ACIAR was off to a flying start! Sir John was keen to demonstrate to Prime Minister Fraser that his championing of ACIAR as a CHOGM initiative was justified. Thirty-five years later, the founders of ACIAR should be well pleased with their efforts.

AFTER THE BEGINNING

When the core team of Research Program Coordinators was recruited in 1983, I was appointed as coordinator for the Crop Improvement Program, which I led for six years until 1989. In 1990, I left ACIAR for the international stage, joining the World Bank as biotechnology advisor, remaining a partner with ACIAR for many years.

I later joined the International Livestock Research Institute in Nairobi, Kenya, with the establishment of Biosciences eastern and central Africa (BeCA). I continued my association with ACIAR through the CGIAR research network.

Today I am privileged to maintain my long and deep relationship with ACIAR, now as a Commissioner. I look forward to being part of its continued growth and important work. ■



Humble beginnings

By Dr Denis **BLIGHT**

ACIAR's birth was triggered by a 1976 report by Sir John Crawford proposing an International Research Assistance Foundation¹ on agriculture 'so that developing countries can provide food and the basic elements of decent living standards for their people.'



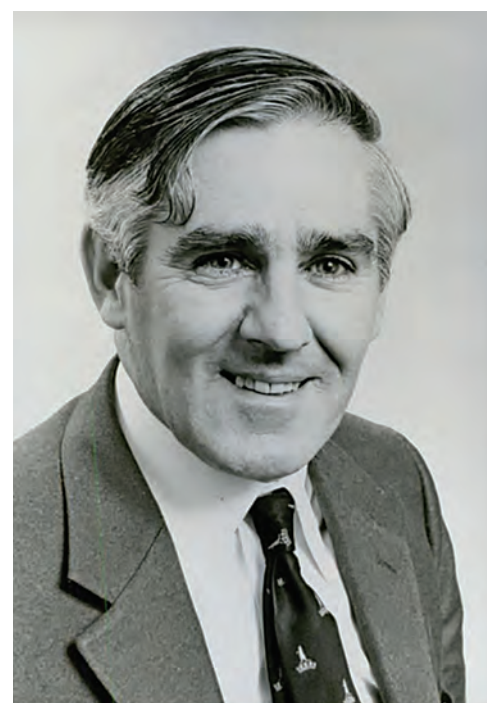
Dr Denis Blight

The proposal prescribed the terms of ACIAR in its 1982 Act: it called for academic freedom and administrative independence within the context of the Australian foreign policy and aid program. Members of a Statutory Board should serve in their personal capacities; the Director of Australian aid should be an ex officio member of the Board. A Director should be responsible for management. It should commission not conduct research, closely collaborate with universities and governmental research agencies and have a symbiotic relationship with universities, CSIRO and private organisations; have an understanding of research needs of

the developing countries and play a catalytic role in the identification of projects to meet those needs; encourage research within the developing countries with a small proportion of its funds allocated to research in Australia or other advanced countries. It should actively link with other international research bodies, provide a clearing house for the dissemination of scientific and technological information for developing countries. The Australian Government should make a commitment to cover the first five years of operation, to be earmarked in foreign aid appropriations.

There was no smooth procession from the report to the creation of ACIAR. The Coalition Government sought to cut growth in the public service and slowed spending on the aid program², converting ADAA to a Bureau within DFAT.

But the recognised need for investment in agriculture as an engine of growth in the developing countries remained; the contribution that research could make to increased food production was clear; and through that, Australia's scientific research capacity could enhance agricultural productivity in the developing world. Crawford had some allies. James Ingram, the chief executive of the aid bureau, intent on enhancing the role of science in the aid program, established



The vision and political will of the Government of the day, led by Prime Minister Fraser and ably supported by his Foreign Minister, The Hon. Tony Street (above), were crucial to the establishment of ACIAR.



Professor Jim McWilliam (centre), foundation director of ACIAR, with ACIAR program and administrative staff, including Eric Craswell (left of Professor McWilliam) at the centre's office at 10 Moore Street, Canberra (circa 1985).

the Consultative Committee on Research for Development, persuaded Crawford to chair it and recruited me, (at the time a young Foreign Affairs officer), as Secretary.

The committee was pivotal. It brought together senior figures in the Australian Public Service and the Australian research community and quickly came to the attention of the Minister for Foreign Affairs. The Secretariat, which included Blight and highly competent international researcher, Dr Gabrielle Persley, became a ginger group within the aid bureaucracy that was focused on bringing Australia's research capacity to bear on agriculture in the developing countries.

When the time came ACIAR was ready to roll with Blight and Persley in key posts. ■

This account mentions only four individuals Crawford, Ingram, Blight and Persley but many others can rightly claim responsibility for the creation of ACIAR, especially through their work in the months leading up to CHOGM in 1981 and in subsequent departmental negotiations and legislative drafting.

ACIAR research in South Africa pays dividends for West Australian farmers

By Peter PAPHATHANASIOU

ACIAR's work worldwide has been bringing benefits to Australian farmers for 36 years. A good example of this is the introduction of grazing-tolerant legumes in South Africa's Eastern Cape where it is rehabilitating ploughed lands, increasing soil fertility, and improving sheep health...all key issues for our farmers back home!

The main constraint to the continued growth of smallholder wool producers in South Africa's Eastern Cape is pasture quantity and quality. Pastures are generally small and do not adequately support animal production. Grazing lands have also been used for other purposes such as maize production. These practices, which involve repeated deep tillage, have led to erosion and a loss of soil structure, and ultimately abandonment of the land as non-arable.

ACIAR's Eastern Cape Arable Lands Project (ECCAL), was born out of the need for cropped arable lands to be returned to permanent grazing. A collaboration between Murdoch University in Perth, the Western Australian state government and the South African Government, ECCAL sought to improve the food base, with legumes considered the most likely solution. The challenge was to match legume species to soil type.

Following the evaluation of both native and non-native legumes, including the potential for application in Australia to combat salinity, the perennial South African legume *Lebeckia* was identified as a salt-tolerant fodder for livestock. Introducing this legume to the Eastern Cape assisted in the rehabilitation of ploughed lands and increased soil fertility, along with large improvements in sheep health and production. Now grown on several Western Australian sheep farms, it is also hoped that the first *Lebeckia* seeds will soon be harvested commercially, ready for more widespread adoption across the marginal fringes of Australia's pastoral belts.

LEGUME IDENTIFICATION

It was initially difficult to see an obvious fit for the commercially available grazing legumes to the climate and soils of the Eastern Cape. Uncertainty surrounded whether the area was in a temperate environment with appreciable summer rain, or a cooler subtropical environment with significant winter rainfall. Local experience told the researchers that global staple legumes from temperate regions and the sub tropics were likely unsuited.



Evaluation of hybrids between *Lebeckia bainesii* and *L. angolensis* near Northam, Western Australia. Photo: Dr Ron Yates.

The team's first experiments in 2006 were a series of legume explorations at three research stations spread over a 500 km north-south range. It soon became evident that several hardy, acid-tolerant species were well suited, but there was significant variation across the latitudes and altitudes. The project moved to small plot trials on community lands in 2008, where grazing was also imposed, and evolved to sites as large as 10 hectares by 2010.

The team observed some spectacular successes, with some legumes beginning to colonise and even dominate some sites despite relatively uncontrolled grazing. *Lepedeza cuneata* was an outstanding success in the northern mountains, while a mixture of arrowleaf clover, biserrula and common vetch produced in excess of six tonnes of biomass over winter, which provided high-value stock feed during a traditional time of animal starvation. Controlled experiments showed a doubling of weight gain for sheep grazing on legumes compared to those feeding on improved grassland.

LOCAL BENEFITS

Given that South Africa and southern Australia share a similar climate and soil composition, the ECCAL project is being shown to have local benefits. This is through the discovery of

perennial legumes such as *Lebeckia*, which has proven adaptable to the deep and infertile sands of Western Australia. Trials have shown that *Lebeckia* is palatable and non-toxic to Australian sheep, will not spread like a weed, fixes nitrogen, and is not vulnerable to existing local pests or diseases. '*Lebeckia* has the potential to turn five million hectares of Australia's marginal pastoral zone into much more productive country by providing grazing and shelter for sheep,' said project leader Professor John Howieson. A semi-commercial harvest of seed from farms with *Lebeckia* trial crops began in December 2017.

Through both helping farmers in developing nations and also delivering spinoff benefits for their Australian counterparts increasingly affected by climate change, ACIAR's ECCAL project represents a major success for Australia's foreign aid program. Given the success of the project, Botswana has approached ACIAR to assist in developing their own proposal based around forage legumes in mixed animal-cropping systems. ●

ACIAR PROJECT: LPS/2004/022: Pasture development for community livestock production in the Eastern Cape Province of South Africa

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Seeds of life

By David GARDINER

A remarkable transformative program in Timor-Leste has given thousands of farmers security in seeds for food crops.

KEY POINT

- Over 65,000 farming families now have access to 19 improved varieties of high-yielding certified seed for food crops.

What started as one project to improve food security in Timor-Leste with higher-yielding crop varieties sprouted into three major projects extending over 16 years with ACIAR funds of more than \$38 million (AUD). The Seeds of Life program, comprising three projects between 2000 and 2016, has benefited thousands of farming families in Timor-Leste by introducing new varieties of major staple food crops and establishing a national certified seed system so village farmers

can continue to access high-quality seed and improve crop production.

Trials of irrigated rice, maize, peanuts, sweet potato, mung bean and climbing bean have brought about varieties that are more tolerant to insect pests and disease as well as being able to withstand periodic drought and reduced soil fertility. Yields of introduced and adopted crop varieties show remarkable increases over local varieties in all 13 of the nation's districts. For example maize yield increases on farmer fields are

50%, peanut 54%, cassava 40%, rice 24% and sweet potato an impressive 130%. Farmers are also rapidly adopting improved mung beans and climbing beans released in 2016.

An estimated 65,000 farming households now have access to improved seed and planting materials, and 19 improved varieties have been released. Certified seed infrastructure has been established, with over 1,200 community seed production groups, 65 community seed houses and three seed laboratories. Almost half the



- 1. Sweet potato harvest in Viqueque, May 2009. Photo: Seeds of Life-Timor.
- 2. Timor-Leste Sweet Potato tasting in 2004 in Maliana.
- 3. Selling maize at a market in Timor-Leste. Photo: CIMMYT.
- 4. Sweet potato grown through the Seeds of Life program in Timor-Leste.
- 5. Timor-Leste Sweet Potato tasting in 2004 in Maliana.



Dr Harry Nesbitt, the project's leader, says that because the project went for so long, it was able to enhance local research and development skills, significantly improve physical infrastructure and establish a sustainable system to utilise the skills and infrastructure after the program terminated, albeit at a reduced level.

The program wrapped up in 2016 with the TimorAg2016 Conference, but ongoing national benefits accrue through a reliable supply of new seed varieties emerging from the research and development program embedded within government and private sectors. 'Importantly, the agronomic research, seed multiplication and distribution system is sustainable, ensuring the legacy of the program lives on,' says Dr Nesbitt. ◆



households in the surveyed districts are growing improved varieties.

Among the program's achievements is the establishment of the Timor-Leste National Seed System for Released Varieties, which provides Timor-Leste farming families with secure access to good quality seed from proven crop varieties. High-yielding certified seed production ensures growers obtain the best crops each year, which farmer groups can access to then locally produce and store community seeds.

ACIAR PROJECTS: CIM/2000/160: Seeds of Life; CIM/2003/014: Seeds of Life 2; CIM/2009/049: Seeds of Life 3
MORE INFORMATION: Dr Harry Nesbitt, University of Western Australia, h.nesbit@bigpond.net.au

Bringing security to Afghanistan

By Rajiv SHARMA

Higher-yielding, disease-resistant wheat and maize varieties are providing greater food security for Afghanistan.

KEY POINTS

- Partnering with CIMMYT, six new wheat varieties have been introduced, with an estimated 600,000 farmers likely to benefit.
- High-yielding wheat varieties have improved production by up to 40%.
- Improved production practices have increased production by up to 20%.

Food security is ‘when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life’ (Food and Agriculture Organization). It has been at the heart of almost all of ACIAR’s work worldwide for decades, exemplified perhaps in efforts to establish security in food when it is missing in every other area of life.

In addition to the common challenges of climate change, soil degradation, lack of resources or education, the highly volatile conditions of working in war-torn Afghanistan require a level of commitment that is integral to ACIAR’s reputation abroad.

In a drought-affected country with one of the highest per capita wheat consumptions in the world, where approximately 80% of the population depends on agriculture and related activities to survive, Afghanistan is reaping the benefits of ACIAR’s ongoing work with modern wheat varieties.

In 2012 an ACIAR project (CIM/2011/026) was implemented by the International Maize and Wheat Improvement Centre (CIMMYT) with funding of \$6.4 m; this builds on several years of research



Naring Bagh and Surkhrood ox seeding. Photo: Haroon

and continues to evaluate the suitability of high-yielding wheat and maize varieties for Afghan conditions and farming systems.

The five-year project aimed at providing high-yielding varieties for the dry conditions and ensuring new wheat varieties are resistant to wheat rust diseases, especially the threatening stem rust strain Ug99 and the widespread yellow (stripe) rust.

LAYING THE GROUNDWORK

Past ACIAR projects laid the foundations for the current research: ‘Stress tolerant wheat and maize for Afghanistan: “Seeds of Strength”’ (SMCN/2002/028), ‘Wheat and maize productivity improvement in Afghanistan’ (CIM/2004/002) and ‘Sustainable wheat and maize production in Afghanistan’ (CIM/2007/065).

In collaboration with the Agricultural Research Institute of Afghanistan (ARIA), the most recent project (CIM/2011/026) organised country-wide yield and disease resistance evaluation trials of wheat and maize lines obtained by CIMMYT in its global breeding programs. The most promising varieties were re-

leased for commercial cultivation, while experiments in crop production management have also helped to improve production practices.

A key achievement has been to strengthen the capacity of ARIA researchers. With ARIA’s facilities damaged during the instability in the 1990s, CIMMYT project staff plan and execute all project experiments together with ARIA researchers. ARIA researchers have also been trained in-country and abroad on research topics relevant to wheat and maize improvement and production.

TRIALS YIELD SUCCESSES


‘Since 2012, the start of the most recent phase of ACIAR-funded work, Afghan partners have developed and released 12 high-yielding and disease-resistant bread wheat varieties, as well as three varieties of durum wheat, two of barley and three of maize,’ says Dr Rajiv Sharma, a senior wheat scientist at CIMMYT, speaking at a partners’ workshop in 2017.

‘A total of 9,000 wheat and maize lines introduced for testing in Afghanistan since 2012 came from the work of breeders from CIMMYT

and from the International Winter Wheat Improvement Program based in Turkey,’ Dr Sharma added.

New wheat varieties released for commercial cultivation have shown average yield superiority ranging from nine to twenty-seven percent over current commercial cultivars under irrigated conditions and from 10 to 40% under rain-fed conditions at research farms. Yields obtained on farmers’ fields ranged from 3.6 to 5.8 tonnes per hectare, compared to farmer practice averages of 2.3 to 3.9 t/ha under irrigated conditions. The figures under rain-fed conditions stood at 0.58 to 1.2 for CIMMYT demonstrations as against 0.38 to 0.8 for farmer practices. Production practices have similarly improved, with line sowing of wheat shown to increase yields by up to 20 per cent in demonstration plots managed by farmers as compared to the standard practice of broadcasting seeds.

The wheat lines tested by the project include varieties enriched in micronutrients such as zinc. If found suitable, the adoption of these lines could improve the nutritional status of Afghan women and men farmers and their children. The project has also delineated wheat agro-climatic zones, characterised Afghanistan’s wheat genetic resource collection, and provided training abroad for 64 Afghan researchers and in-country for 4,000. In direct partnership with farmers, there have also been more than 1,800 farmer field demonstrations, 80 field days, and machinery such as seed drills and mobile seed cleaners introduced.

Results in 2018 are testament to the project’s effectiveness: six new wheat varieties have been released, trials of 39 sets of wheat and maize lines were conducted on ARIA research stations at 12 locations, and 540 farmer field demonstrations were conducted in four provinces. An estimated 600,000 farmers have benefited from the new improved varieties. Capacity-building efforts have enabled ARIA to assume a leadership role in conducting and managing yield evaluation trials, and CIMMYT providing mentoring and technical assistance. 

ACIAR PROJECT: CIM/2011/026:

Sustainable wheat and maize production in Afghanistan

MORE INFORMATION: Dr Rajiv Sharma, CGIAR, rk.sharma@cgiar.org

Sittwe fish dock at dawn.
Woman cooking Mohinga fish soup.

A fishy focus in Myanmar

By David GARDINER and Toby JOHNSON

ACIAR and its partners continue to maintain a strong presence in Myanmar with their work on reducing the degradation of coastal and inland fisheries stocks... and the results are impressive.

Fisheries are the fourth most important source of export earnings for Myanmar, with 5.3 million tonnes produced in 2014–15 and exports over 330,000 tonnes, mainly to China. Myanmar's population of 52 million is dependent on coastal fisheries, which are second only to rice in being important to diet and represent 8% of the country's gross domestic product. The Myanmar fisheries sector is clearly vital for national food security, income generation and export earnings.

Fisheries is one natural resource that particularly requires overarching frameworks and policies. Reductions in fish stocks, damage to critical habitats, environmental pollution, disasters and civil unrest are considerable threats to the sustainability of this industry.

With the reform of Myanmar's rural sector following election of a civilian government in 2011, ACIAR funded research into the country's fisheries

in the guise of two MYFish projects, the first significant intervention to allocate research funding directly to Myanmar's Department of Fisheries.

The MYFish 1 project aimed to improve the capacity of inland aquaculture and coastal fisheries for sustainable management. The project aimed to understand the fisheries sector in the Ayeyarwady Delta, which contains 90% of thriving inland fish ponds, and apply lessons to the Central Dry Zone (CDZ), which lacks inland fisheries.

INCREASED PRODUCTION

Scoping surveys of fisheries, value chains and markets in the Ayeyarwady Delta considered 180 fishery leases in 17 towns, involving over 1,000 households. Small-scale aquaculture pilot studies were conducted in 329 households for a number of fish and crustacean species using six fishery production systems in both regions.

The results of the research and subsequent recommendations led to a 40% increase in net fish production and increased incomes by up to 50% in some areas.

Using results from these successful pilot studies, additional funding obtained by WorldFish and the Department of Fisheries is expected to deliver training in small-scale aquaculture methods to 15,000 rural households, benefiting 60,000 people by 2019.

FISHERIES POLICY FRAMEWORK

The project also aimed to strengthen partnerships between the Department of Fisheries and Myanmar's fishing communities, identifying five priority areas for stock recovery to more sustainable levels. Underlying policy support are some of ACIAR's key development principles—working through partnerships, promoting co-management and striving for greater gender equality. This work with Myanmar's government continues to address overharvesting, maintaining awareness at regional and national policy levels of the importance of coastal fisheries.

The project has led to further research to maximise sustainable small-scale fisheries production in the Ayeyarwady Delta and Central Dry Zone of Myanmar (MYFish 2 project).

Villagers at the San Pya market.



ACIAR PROJECTS: FIS/2011/052: Improving research and development of Myanmar's inland and coastal fisheries; FIS/2015/046: Improving fishery management in support of better governance of Myanmar's inland and delta fisheries

MORE INFORMATION: Dr Gareth Johnstone, WorldFish Center, g.johnstone@cgiar.org

Agroforestry and silviculture to improve livelihoods in Nepal

By Peter PAPHATHANASIOU

Smallholder and community forestry is pivotal to keeping pace with the world's ever growing demand for timber. ACIAR's work in Nepal is enhancing the effectiveness of household agroforestry systems and community forests, generating livelihoods and improving food security.

With more than half of its population living in poverty, Nepal is one of the world's poorest nations. According to the World Health Organization, 13% of the population is undernourished, while 40% of children under five suffer from stunted growth. Despite forty-five percent of Nepal being covered by forests and two-thirds of Nepalese living off agroforestry, the forests are not properly managed. The inability of Nepal's forestry systems to provide food security has also been attributed to low productivity, limited marketing opportunities, and inequitable centralised planning and service delivery.

Since 2013, an ACIAR project, known as EnLiFT, has brought together researchers from two Australian universities, the World Agroforestry Centre in Indonesia, and some Nepalese non-governmental organisations (NGOs) to work with Nepalese farmers and community forest user groups on the science of forestry, known as silviculture. The project's overall aim has been to enhance the capacity of household agroforestry systems and community forests to generate livelihoods and food security in the mid-hills region of Nepal. Now in its fifth and final year, the project has been a major ACIAR success, having achieved all its scheduled outputs.

SUCCESS STORY

Working with 300 participant farms and 30 community forest user groups across six village sites in the districts of Kabhre Palanchok and Lamjung, the EnLiFT project sought to improve agroforestry systems, and also to find practical and profitable alternatives for under-utilised land. Despite considerable obstacles, including a magnitude 7.3 earthquake in May 2015, which was regarded as the worst natural disaster to strike Nepal since 1934; a protracted fuel blockade; and widespread drought in 2015/16, EnLiFT has succeeded on multiple fronts.

First, the project implemented a market chain appraisal of agroforestry products. By training farmers to develop business plans for their products, and promoting nurseries and demonstration plantings, the researchers were able to accurately document the barriers to commercialisation of agroforestry. Second, by opening up dialogue with farmers and local communities, EnLiFT was able to better understand the links between regulation,



Mr. Govinda Paudel (then EnLiFT Project Officer, currently a John Allwright Fellow) teaching women forest users in Kavre District to measure trees to develop women's skills for active and equitable forest management. Photo: Edwin Cedamon



Field day in Kavre District on Active and Equitable Forest Management attended by various government agencies, non-government organisations, community forest user group representatives, district and national media representatives.

institutions, and community forest planning, which in turn improved the relationships with private and public sectors. Third, by running participatory silvicultural demonstration plots and field days, the researchers were able to better assist communities to harvest trees in more active and sustainable ways.

CULTURAL CHANGE

A key impact of the EnLiFT project was to change Nepalese cultural attitudes to silviculture techniques through demonstrations of active management and thinning of community forests.

At the project's outset, there were strong misgivings about scientific forest management by government officials and some community user groups, who felt that cutting trees was detrimental to forests and would lead to extensive public outcry. In Nepal, both politicians and the media are critical of tree cutting. Government forest policies and local institutions are also highly conservative, which makes it difficult for rural people to improve their livelihoods through the commercial utilisation of forests. However, the EnLiFT team's demonstration plots showed that active silviculture practice was possible if participatory processes were used and proper technical and regulatory measures were in place. Ironically, project leader Dr Ian Nuberg claims that the devastating 2015 earthquake actually helped fast track the project because the huge demand for timber for reconstruction opened up access to harvest forest plantations that were previously under strict government control. Most of these forests had been established in the 1980s for the benefit of local communities with support from an Australian aid project, so it is wonderful to see the mature forests now providing significant livelihood benefits to people.

EnLiFT stakeholders are now sharing their positive experiences with other forest users who are interested in improving their own forest management. Significantly, several extension

activities held at the demonstration plots have also opened the door for the active involvement of women in forest management. The growth of high-value, low-maintenance cash crops such as cardamom on the forest floor has made a significant difference to women supporting their families, and also starting their own enterprises. 'It's really heart-warming to see the impact on people's incomes and lives straight away,' said Dr Nuberg.

The EnLiFT team has been hugely successful in demonstrating the value and relative ease of improved silvicultural management to community forest users and government officials. The researchers have now been invited by the

Nepalese government to scale-up activities from plot-level demonstrations to whole-forest management. Such silvicultural promotion and training, as well as the development of equitable small-scale forest entrepreneurship models, will be the focus of follow-on ACIAR project beginning in mid-2018. ■

ACIAR PROJECT: FST/2011/076: Enhancing livelihoods and food security from agroforestry and community forestry in Nepal

MORE INFORMATION: Dr Ian Nuberg, University of Adelaide, ian.nuberg@adelaide.edu.au



Chambu from Forest Action demonstrates to Bhinda Khanal (second from left) and others from Chaubas how to properly measure trees in the Chapani community forest. Recently one hectare of trees in the Chapani community forest were thinned and sold for one million rupees which was divided between the 90 families in Chaubas. This meant each family received roughly AUD\$150, a significant cash injection for these rural communities. The forest has also been a crucial resource for the community when rebuilding their homes after the devastating 2015 Nepal earthquake.

Photo: Conor Ashleigh

Planting a better future with Australian trees

By Chris HARWOOD

Australian trees are grown for wood production in tropical plantations and agroforestry systems worldwide. ACIAR's long and deep support of Australian forestry abroad underpins an impressive legacy of research for development.

KEY POINTS

- Fast-growing eucalypt and acacia species in Southeast Asia are improving livelihoods for smallholder growers.
- Progeny trials from the 1990s now form the backbone of advanced breeding programs in India, Sri Lanka and Vietnam.
- Vietnam is reaping \$300 million (USD) annually from two million hectares of acacia plantations.

Australian plantation species are farmed extensively throughout the world, especially in developing countries where they are preferred to local forest species for fuelwood and manufacturing owing to their rapid growth and adaptability to harsh environments. ACIAR has long invested in the forestry sector of developing countries, brokering research that improves the domestication of Australian trees as a significant component of sustainable forest production systems in Asian economies.

Plantations of fast-growing eucalypt and acacia species produce much of the world's growing demand for wood. On recent estimates, eucalypts alone will provide half the global demand for commercial hardwood timber by 2030. Smallholder growers in the tropics contribute strongly to wood production and enjoy improved livelihoods through wood sales. For example, Vietnamese smallholders own and manage half that country's two million hectares of acacia plantations, and earn an estimated \$300 million (USD) annually. ACIAR's recent project in Vietnam on advanced breeding and deployment methods for tropical acacias (FST/2008/007) contributes to the ongoing evolution of this economy.

Forest economist Neil Byron identifies four 'keys', essential for successful smallholder tree farming: secure land access, a viable production technology, acceptably low risk and effective market demand for the wood. Tree domestication, which combines genetic improvement with mass production of improved planting stock for growers, is a vital part of the second key, and market demand for pulpwood, veneer and sawn timber from Asia's burgeoning economies underpins the growth of eucalypts and acacias by smallholders on short four to eight year rotations.

RESEARCH TAKES ROOT

Two ACIAR projects, the 'SAT' ('Seeds of Australian trees', FST/1993/118) and 'DAT' ('Domestication of Australian trees for reforestation and agroforestry systems in developing countries', FST/1998/096) enabled CSIRO's Australian Tree Seed Centre to establish long-lasting partnerships with scientists in country research agencies. When the SAT project commenced, we already had a good idea from previous studies which species and provenances (geographic varieties within each species) were best for wood production in different countries.

May Duc Kien of the Vietnamese Academy of Forest Sciences inspects a promising eucalypt hybrid clone in a variety trial at Ba Vi, northern Vietnam. Photo: Chris Harwood



The challenge was to help country tree breeders to set up genetically diverse breeding populations for long-term tree improvement, and seed orchards to mass-produce planting stock for growers. CSIRO teams travelled to remote regions of northern Australia, Papua New Guinea and eastern Indonesia to assemble the large, diverse seed collections that form the starting point for breeding, and progeny trials testing hundreds of seed families were established in many countries.

GROWING CAPABILITY

Capacity building was a vital component of the SAT and DAT projects, with frequent advisory visits to countries to provide training in seed collection, handling and seed orchard technology; tree breeding; and co-supervision of post-graduate research. In addition, over 200 trainees attended short-term courses on the science of tree domestication. At least 20 former trainees now hold key positions in national agencies concerned with forest genetics and tree breeding. Through the personal relationships that were established, research collaboration set up under SAT and DAT continues today.

The progeny trials set up in the 1990s in countries such as India, Sri Lanka and Vietnam form the backbone of today's advanced breeding programs. Now, some countries are in their third generation of breeding these important tree species. Breeding trials identify the best trees, which are then used in seed orchards, and also for controlled pollination to produce inter-specific hybrid varieties. These hybrids must be clonally propagated to produce planting stock for plantations.

With ever-growing attention to disease tolerance, Vietnam's Academy of Forest Sciences has developed outstanding acacia and eucalypt

hybrid varieties and the technical infrastructure that gives growers throughout the country clonal planting stock at low cost. As with food crop breeding, tree breeding never stops and must continually address new challenges.

Stephen Midgley, the project leader for SAT and DAT, says: 'The projects provided the genetic foundations for thriving modern plantation industries which now offer livelihoods and employment to millions of people and products needed by today's changing society. I am fortunate to enjoy a great many friendships within the global plantation sector based upon a mutual, long-term interest in the role of Australian species. I derive a great deal of pride from the useful contribution eucalypts, acacias and casuarinas make to local livelihoods and industry. This represents a uniquely Australian contribution to local development and a lasting, meaningful legacy for projects such as ACIAR's SAT and DAT.'

1. Do Huu Son of the Vietnamese Academy of Forest Sciences and Chris Harwood review their selections of candidate acacia hybrid trees they have been making in a young field trial in central Vietnam. Photo: Dr Pham Xuan Dinh

2. Cambodian DAT trainee So Thea fumigating seed with carbon dioxide to prevent insect attack during an attachment to the Australian Tree Seed Centre. Photo: Kron Aken

3. Belachew Gizachew of the Ethiopian Forestry Research Centre receives training in safe tree climbing techniques for seed collection from CSIRO's John Larmour during an attachment in Australia under the SAT program. Photo: Kron Aken

ACIAR PROJECTS: FST/1993/118: Seeds of Australian trees project; FST/1998/096: Domestication of Australian trees for reforestation and agroforestry systems in developing countries

MORE INFORMATION: Stephen Midgley, Salwood Asia Pacific, stephen.midgley@salwood.com; Chris Harwood, Honorary Fellow CSIRO Land and Water, chris.harwood@csiro.au

Lessons from the rice fields

By Dr Christian ROTH and David GARDINER

Asian rice-based cropping countries are adapting to climate change, fast.

KEY POINTS

- A range of initiatives are enabling rice cropping farmers to adapt to climate change through changed seeding and flooding methods.
- Climate Information Centres (CLICs) have potential to reach up to 8,000 farmers in the Indian state of Telangana with knowledge of agricultural climate information.
- Dry seeding of rice has expected gains of \$150 (USD) per hectare.

Many Asian countries are overly exposed to climate change, owing to their strong dependence on agricultural activities highly prone to climate variability, along with the reduced capacity of their governments and private institutions to respond to pending threats. The Asian Development Bank and the Potsdam Institute for Climate Impact Research, in a 2017 report *A Region at Risk*, claim that ‘countries in Asia and the Pacific are at the highest risk of plummeting into deeper poverty—and disaster—if mitigation and adaptation efforts are not quickly and strongly implemented.’ Coastal and low-lying areas are at increased risk of flooding, which in turn increases food production costs. Alarming, ‘rice yields could decline by up to fifty percent by 2100 if no adaptation efforts are made.’

In 2008 ACIAR initiated two significant climate change initiatives. The first targeted farm-level adaptation options in Cambodia, Lao PDR, Bangladesh and India (the ACCA project), and a second project focused on the Mekong Delta in Vietnam (the CLUES project outlined in this issue).

The ACCA project was designed as a four-country project with a total budget of \$8.9 m, including \$5.5 m from ACIAR. The project engaged 21 partner organisations in the target countries, as well as CSIRO in Australia. Since these two projects, climate change issues have been a component of many ACIAR projects.

Cambodia, Lao PDR, Bangladesh and India were selected because they are particularly vulnerable to long-term seasonal climate variability. These countries risk losing valuable agricultural land or livelihoods through the effects of increased flooding in lowland areas, more extreme weather events and shifts in seasonal weather patterns.

Dr Christian Roth led the ACCA project that aimed to address the insidious threats posed by these changes. Focusing on rice-based cropping systems, solutions were explored through pilot studies and on-station trials for different issues in each target country—adapting exist-

ing methods to assess adaptation strategies, developing research capacity, evaluating crop and natural resource management, and informing policies and programs for implementing climate adaptation activities from local to national scales.

ENHANCING CAPACITY TO ADAPT

The work in the Indian state of Telangana piloted studies to assess drought risk, the impact of minimal climate information to guide farmer decisions, rapid rural change with significant social complexity, and perceived constraints of agricultural labour.

To empower rice farmers with rich, relevant and free information, a holistic approach to better measure and predict weather conditions combined information from the Rainfall Visualiser tool developed during the project (which charts historical rainfall and provides a predictor of the next season’s rainfall), agriculture-based weather advisory teams, farmer climate clubs and Climate Information Centres (CLICs). These CLICs have been adopted by state and federal government programs and United Nations initiatives for drought mitigation, with potential to reach 8,000 farming households in Telangana.

In south-west Bangladesh, encroaching salinity and lack of irrigation are major constraints to agricultural intensification and adaptation. There is also social complexity around community decision-making and adopting alternative livelihood options like shrimp farming.

Much of the focus in Bangladesh was on developing the APSIM-ORYZA cropping systems model from high-quality datasets, by incorporating a new rice crop and salinity response module, and to explore alternative rice cropping scenarios. Along with social research from villages to determine the capacity of farmers to adapt to changing climate, the project found opportunities to manage and adapt to salinity at the farmer level.



A farmer direct seeding rice into a dry soil, using the modified seeder built in Savannakhet by the Savannakhet Provincial Agriculture and Forestry Office. Photo: Christian Roth (CSIRO)



TOP: Women transplanting rice in Warangal, Telangana. Photo: Christian Roth (CSIRO)



LEFT: A group of farmers evaluating the emergence of direct seeded rice in Phin Neua (Champone district), beginning of wet season, 2013. Photo: Christian Roth (CSIRO)

Cambodia benefited from a 'response farming' approach in lowland rice areas in the south-west of the country, whereby farmers gained access to a suite of management options to make the most of the cropping monsoon period. These included decisions on the timing of crop establishment, varieties of different duration and tolerance to water stress, double cropping, mechanising rice seeding, and the timing of pest and fertiliser application.

'The concept of response farming (observing the early season and rainfall forecasts and, using decision-support tools, deciding what to grow) is a useful way for farmers to understand and manage climate variability, which builds their capacity to cope with climate change,' says Dr Roth.

Dry seeding of rice was the main adaptation strategy explored in the Savannakhet province of Lao PDR, where using a direct seeder results in much faster planting, reduced exposure to early season drought, and reduced labour and costs. The estimated gains compared with traditional

transplanted rice are in the order of \$150 (USD) per hectare.

STRATEGIC AND POLICY BENEFITS

From local to national levels, the project has instilled a more strategic approach to assessing climate risks and building capacity to implement adaptation plans. Farmers participating in discussions yielded important information about how households farm their rice and the labour shortages they face.

Looking to the future, the projects hope to increase local capacity to observe, interpret and act on weather observations. Research also tested a policy and planning tool, *Impredicative Loop Analysis*, which compares the relationships and trade-offs between key social and biophysical aspects of climate adaptation. Social and demographic characteristics of farmers are compared to their farming economic situation (e.g. land quality and availability of family labour) to

determine whether they can maintain a viable farming system or should seek other employment options to exit from farming.

Dr Roth sees gradual implementation as key to continuing success. 'A key message from ACIAR's climate change adaptation work is that incremental adaptation, such as better varieties, good rice agronomy, improved nutrient management, tailored farm practices, and access to information are likely to buffer communities from detrimental impacts of climate changes predicted by 2030. Research and policy efforts aimed at improving rice productivity will most likely be sufficient to achieve this.' ■

ACIAR PROJECT: LWR/2008/019: Developing multi-scale climate change adaptation strategies for farming communities in Cambodia, Lao PDR, Bangladesh and India

MORE INFORMATION: Dr Christian Roth, CSIRO, Christian.roth@csiro.au

A \$2 billion 'white gold' industry at risk

By David GARDINER

ACIAR's 25 years in Vietnam exemplifies its reputation for long-term commitment and resounding results. Supporting Vietnam's Mekong Delta farmers to meet sea-level challenges has given rise to new climate policy, new rice varieties, new technologies and new students.

KEY POINTS

- Vietnam's rice cropping systems are benefiting from adaptive strategies against climate-induced flooding and salinity.
- New rice varieties have been bred to tolerate environmental extremes.
- Climate-smart agricultural practices reduce water use and greenhouse gas emissions.

The Mekong Delta in south-western Vietnam is the country's main rice growing region, comprising over four million hectares of flood plains and hills, two-thirds of which are used for agriculture. The region produces over 23 million tonnes, or more than 50%, of Vietnam's rice. Over 6 million tonnes of rice are exported annually, bringing more than US\$2 billion to Vietnam's economy.

With over 25 years in Vietnam and recently signing up for another 10 years, ACIAR's commitment to agricultural research in the Mekong Delta is deep and welcomed in this globally important region.

Agro-hydrological changes are threatening farming and social systems in the region and consequently food security across Southeast Asia. Coastal flood plains in the Mekong region are susceptible to rising sea levels that may be associated with climate change. These areas are especially vulnerable to changing environmental conditions and altered hydrology that affects rice growing.

While Vietnamese farmers are constantly adapting to these changing conditions, recent and predicted significant agro-hydrological events are forcing a broad re-evaluation of farming practic-

es. Key challenges to this include availability of suitable cultivars, soil nutrient management options, the lack of knowledge of the potential threats from acid sulfate soil, and planning tools.

Dr Reiner Wassmann, coordinator of climate change research for the International Rice Research Institute (IRRI), is acutely aware of the impacts of climate change in the Mekong Delta region. Leading the ACIAR-funded \$3.8m project, 'Climate change affecting land use in the Mekong Delta' (CLUES project), his team set out to improve the adaptive capacity of rice-based farming systems for effectively



ACIAR experimental rice plot in the Mekong Delta.

PHOTO: YANA LANGHORST

managing impacts associated with climate change.

The scope of the project was based on six themes: environmental impact and vulnerability assessment, specifically using spatial data to assess flooding and salinity risks; improving locally adapted and elite lines of rice varieties against salinity and prolonged submergence; refining the options to manage rice cropping systems using decision support tools to better understand the responses of cropping systems to altered hydrology; examining farmers' decision making capacity and ability to adapt to climate change through their actions; measuring greenhouse gas emissions in rice systems; and a land use planning case study in the coastal Bac Lieu Province using geographic information systems.

Four provinces in the Mekong Delta region—An Giang, Can Tho, Hau Giang, and Bac Lieu—benefited from the project.

RISING TIDE

Rising sea levels have caused salt-water intrusion further up-river and into rice paddies, hurting the rice industry. Using spatial data, the project maps the risks of sea-level rise to predict future flooding. The project is also working on salt-tolerant and high-yielding rice varieties through the marker-assisted backcrossing plant breeding technique.

A total of 300 traditional and improved rice varieties were screened



Cambodian smallholder farmers in rice fields.

for survival and recovery potential, and new breeding lines were developed. Four rice lines were submitted for varietal release across the four target provinces in 2014. These included varieties for short growth duration, submergence and salinity-tolerance, and high yield. A total of five tonnes of seed of improved breeding varieties, comprising either four or eight varieties for each province, was distributed to the four provinces. Reduced phosphorus requirements for all varieties without affecting yield have also

enabled farmers to increase their net incomes. In addition to breeding work, climate-smart agricultural practices and technologies, such as alternate wetting and drying to reduce greenhouse gas emissions, were implemented and are now influencing new climate change policies.

An inexpensive alternate wetting and drying technique was assessed by 100 farmers in Bac Lieu province. The 'drain and re-flood', or alternate wetting and drying approach reduces water use by 30 to 50% and

reduces methane emissions from rice paddies by up to 50% compared to conventional continuous flooding. In all, 1,418 farmers were trained in the technique across 30 hectares of demonstration sites.

The CLUES project also trained 3,960 farmers (3,260 men and 700 women) on participatory rice varietal selection, and raised awareness of climate change for 2,979 local farmers and local government staff (including 862 females) through participatory discussions.

'The interdisciplinary approach adopted by the CLUES project—encompassing hydrology, plant breeding, crop management and socio-economic approaches—yielded a range of tangible results on future risks stemming from sea level rise as well as possible response strategies in terms of adaptation and mitigation in rice-based systems of the delta,' says Dr Wassmann.

The CLUES project has yielded useful results to benefit farmers in the Mekong Delta region and other coastal areas to improve rice production. Vietnam's 'white gold' industry now has a stronger chance of improving even when faced with climate change. ■



Mr Djung surveys the ACIAR experimental rice plot in the Mekong Delta.

PHOTO - YANA LANGHORST

ACIAR PROJECT: SMCN/2009/021: Climate change affecting land use in the Mekong Delta; adaptation of rice-based cropping systems (CLUES)

MORE INFORMATION: Reiner Wassmann, IRRI, r.wassmann@cgiar.org

In a variable climate, good science pays

By David **GARDINER** and Mulugetta **MEKURIA**

Smart maize-legume cropping systems in eastern and southern African countries counter seasonal losses.

KEY POINTS

- Increased productivity of maize-based smallholder farming systems has seen yields up to four times more than conventional farming methods.
- Over 235,000 small farming households have benefited from adopting conservation agriculture methods.
- Farmers can more easily access rural financing for business loans and greenhouse gas emissions.

Climate variability significantly affects cropping productivity around the world, but perhaps nowhere more so than in eastern and southern African countries. Compounding this, low agricultural productivity and research capacity have historically led to chronic food insecurity.

Responding to this critical situation, ACIAR's work over the past eight years in the region has made impressive progress on food availability and nutrition.

ACIAR supports the Sustainable Intensification of Maize-Legume

Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA) program that is turning around the livelihoods of farmers

faced with the stress of poor seasons. Originally launched in 2010 and now in its second phase, the \$18.6 million (AUD) ACIAR funded program aims to sustainably increase productivity of selected maize-based smallholder farming systems in each target country by 30% by 2023, reaching at least 650,000 farming households.

The intensification and stabilisation of rainfed maize-legume cropping systems offer considerable promise for boosting productivity, improving food and nutrition security and helping reverse the decline in soil fertility. The SIMLESA program is supported by ACIAR and managed by the International Maize and Wheat Improvement Center (CIMMYT) in collaboration with the Association for Strengthening Agricultural Research in East and Central Africa (ASARECA) and the national agricultural research systems of Ethiopia, Kenya, Malawi, Mozambique and Tanzania. Additional partners include the International Center for Research for the Semi-Arid Tropics (ICRISAT), the Agricultural Research Council of South Africa (ARC RSA), the Department of Employment, Economic Development and Innovation, Queensland, and



Rashid Said Mpinga, a farmer in Tanzania's Morogoro District, holds up ears of TAN 250 maize variety, which he grew between March and June 2009.



Murdoch University in Western Australia.

‘The focus on maize and legumes is because maize is a staple crop while legumes help improve soil fertility and are a source of protein and cash for the majority of the rural people,’ says Dr Mulugetta Mekuria, the SIMLESA project leader.

SUSTAINABLE INTENSIFICATION PRACTICES

By early 2017 over 235,000 small farming households had adopted conservation agriculture techniques. Improved agriculture practices such as weed control, the use of herbicides, increasing the range of maize and legume varieties available to farmers, rehabilitating soils, improving value chains and scaling out proven technologies are all having a positive impact on crop diversity, resilience and production.

The five core beneficiary countries are Ethiopia, Kenya, Tanzania, Malawi and Mozambique, as well as three spill-over countries, Botswana, Uganda and Rwanda.

Smallholder access to high-quality seeds of good varieties is central to intensifying maize-legume farming. Once maize and legumes varieties were identified, both the formal and informal seed systems were used to distribute improved seed to farmers. Most of the maize varieties were distributed through the formal seed system, whereas the legume varieties were distributed through the informal system. A total of 26 seed roadmaps have been developed so far, and 33 best-bet varieties identified. More than 42 seed companies are involved in scaling up identified products, most seed companies being small to medium enterprises.

INCREASING FINANCIAL CAPACITY

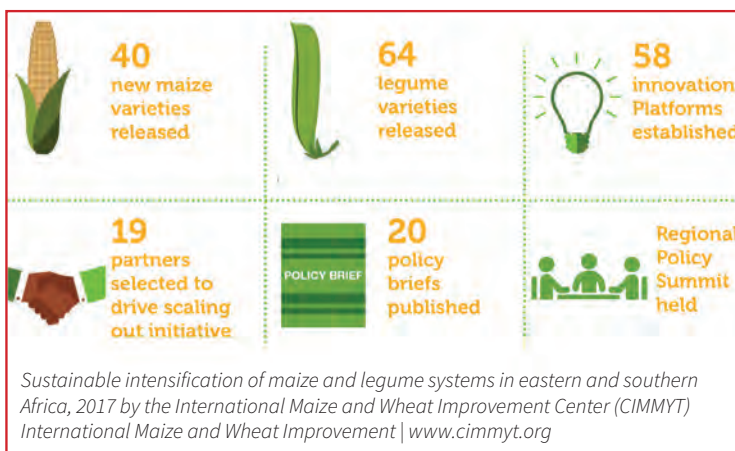
One of the major impediments to smallholder commercial-oriented farming is lack of access to reliable and lucrative markets. Smallholder farmers also face challenges of gaining access to credit, improved technology and information on good agricultural practices. SIMLESA is linking smallholder farmers to rural financing services, for example to enable farmers to obtain loans for their businesses.

Conservation agriculture systems that have introduced new drought-tolerant maize varieties and cropping techniques such as mulching, intercropping and crop rotations have helped smallholder farmers in Malawi to better cope with dry seasons from prolonged El Niño events. In Embu, eastern Kenya, the average yield of maize in SIMLESA research trials is over seven tonnes per hectare (t/ha) compared with less than 1.8 t/ha from conventional farming. Average yield from bean trials with good agricultural practices is showing 1.2 t/ha versus 0.45 t/ha from previous estimates.

1. ACIAR Senior management and Program Leader visiting farmer's field, Arusha, Tanzania, during SIMLESA SI conference, June 2017. Photo: Johnson Mapuranga Siamachira.

2. Dr Mulugetta Mekuria inspecting maize trials. Photo: CIMMYT.

3. SIMLESA host farmer in Kasungu, Malawi explaining the benefits of adopting maize legume rotation practices. Photo: ACIAR.



The program is consolidating cropping trials and training farmers. ‘While taking stock of our achievements, we are aware that there are still major challenges to overcome. We now seek to extend our impact by learning from past and current work, case studies and trying new ideas, technologies and approaches. To achieve our targets we will continue to enhance scaling out of SIMLESA practices and develop and promote climate smart

and resilient practices. All these require a sustained resource commitment by African governments and donors. Moreover, stronger collaboration between the program partners—National Agricultural Research Systems, non-government organisations, scientists from international and regional institutions, universities, the private sector and smallholder farmers—is critical to work together for a common goal,’ says Mulugetta. ■

ACIAR PROJECT: CSE/2013/008: Sustainable intensification of maize and legume systems for food security in eastern and southern Africa

MORE INFORMATION: Dr Mulugetta Mekuria, CIMMYT, m.mekuria@cgiar.org

Citrus benefits from Australia-China ag science partnerships

By Tahir KHURSHID

A decades-long citrus rootstock initiative continues to benefit Chinese and Australian farmers and ACIAR's other international partner countries.

China is the world's second-largest citrus producer, with over 29 million tonnes produced annually based on 2016–17 forecasts, yet according to the Food and Agriculture Organization the country exports only around two percent of that figure. China depends on imports and is Australia's main citrus buyer. As a supplier to China of citrus, Australia is ranked only third to South Africa and the United States. During a nine-month period in 2017, Australia exported 65,000 tonnes of oranges to China, valued at \$133 million.

Australia's strong economic ties with China are complemented by a strong and long-standing research relationship, which has seen a significant exchange of horticultural expertise between the two countries to improve the quality of citrus products and strengthen food security in the Asian region. Through long-term projects, ACIAR has led research to combat disease and develop new citrus rootstocks for adaptation to local environmental and soil conditions.

SEEDING CITRUS RESEARCH

In 2007 the ACIAR-funded project CS1/1996/076 'Evaluation of East Asian citrus germplasm as scions and rootstocks' built on a previous rootstock collaboration project with China from 1992 (CS1/1987/002 'Citrus rootstock development'). The project aimed to collect and exchange rootstock material between the coun-



Dr Tahir Khurshid is assessing the graft union compatibility on the Chinese rootstocks with Imperial mandarin.

PHOTO: STEVEN FALVENE.

tries, evaluate rootstocks for disease and salinity tolerance, and conserve germplasm for breeding by establishing source trees of rootstock collection in each country.

Stemming from this collaboration between the lead agency—the New South Wales Department of Primary Industries (DPI)—and the Citrus Research Institute (CRI) of the Chinese Academy of Agricultural Sciences in Sichuan Province, was an initial visit by three Chinese scientists to Australia in 1993. The seeds of 13 citrus species and hybrids were supplied to China, together with budwood of four navel clones and citrus scion varieties. Five Chinese scientists at CRI were trained in isozyme analysis for identifying germplasm material, and seven scientists were trained in molecular procedures for disease and genetic evaluation. A multinational germplasm conservation workshop in 1997, funded by ACIAR and the International Plant Genetic Resources Institute, helped identify the extent and management of indigenous citrus germplasm in Australia, China, India, Japan, Malaysia, Nepal, the Philippines, Thailand and Vietnam.

RETURN BENEFITS

In exchange for the genetic material, 46 rootstock types were imported as seed from China, including 24 trifoliata (*Citrus trifoliata*), ten man-



Zao Yang rootstock fruit from which seed will be extracted after harvest.



PHOTO: TAHIR KHURSHID.

Mature fruit ready for seed extraction.

darin (*C. reticulata*), four erythroasa (*C. erythroasa*), three ichangensis (*C. ichangensis*), three yuzu (*C. junos*) and two sour orange (*C. aurantium*).

ACIAR research almost always leads to follow-on projects, and the legacy of this work lives on in 16 trial trees planted at the DPI research station at Dareton, New South Wales. Horticulture Innovation Australia (HIA) has funded the remaining rootstock evaluation program since 1999 with three HIA projects: CT03025 'National program for screening and evaluation of new citrus rootstocks', CT07002 'Assessing the horticultural performance of new rootstocks via short-term orchard trials' and CT13042 'Evaluation and commercialisation of new rootstocks'.

Dr Tahir Khurshid, DPI citrus physiologist, has been running the citrus rootstocks program since 1999 and is in charge of the entire Chinese and Vietnamese rootstock evaluation program. He has continued to collaborate with scientists from CRI, and after evaluating rootstocks for horticultural performance under different soil and climatic conditions, recommended six rootstocks for the Australian citrus industry—four *Citrus trifoliata* types and two erythroasa types. These rootstocks are now available for the Australian citrus industry from Auscitrus.

ACIAR's original citrus research projects keep giving to the industry and HIA recently funded a fourth project, CT17002 'Evaluation of new rootstocks for the Australian citrus industry, 2017–22', which focuses on the commercial viability of field trials with 20 growers throughout Australia. 'We had an overwhelming response from growers when we invited them from around Australia to participate two years ago,' says Dr Khurshid.

Another component of this latest project is to complete a salt-tolerant rootstock trial at Bindoon, Western Australia. The trial will test dwarfing Chinese rootstocks along with rootstocks from the Californian breeding program with M7 navel and Tang Gold mandarins, as well as Italian rootstock for yield and quality under Australian conditions. One important component, focusing on the citrus greening disease Huánglóngbìng (HLB), is to import HLB-tolerant rootstock from the United States and test rootstocks under Australian conditions in case an outbreak occurs in Australia.

In addition to the science of rootstock evaluation, ACIAR's research and development links formed many years ago continue to support the strong relationship between Chinese and Australian agriculture into the future. ■

Philippines' marvellous mangoes

By Ian NEWTON

Mango production at risk from pest and disease is benefiting from integrated management actions in the Philippines.

KEY POINT

- Over 588 growers and contractors have benefited from training in mango tree management and pest control methods using industry best practice.

Mangoes are an economically important crop in the Philippines and Australia. In the Philippines, around 860,000 tonnes of mangoes per year are produced from 187,000 hectares, with 73% of farms operated by 2.5 million smallholder farmers. Declining production yields and poor quality of fruit caused by pests and diseases have led to unproductive, poorly nourished trees and high input costs of pesticides. Taking a holistic approach, ACIAR research aims to improve fruit quality through the development and application of integrated crop management.

Managing the incidence of insect pests and both pre- and post-harvest fungal diseases has been crucial, as has improving fruit quality, size and yields by optimising nutrition and canopy management. The project led by Dr Ian Newton, 'Research and development of integrated crop management for mango production in the southern Philippines and Australia', has collaborated with four universities/educational institutions and two ag-

ricultural organisations in the Philippines, and has strong links to two other ACIAR projects that have researched mango post-harvest processes (HORT/2012/098) and value chains (AGB/2012/109).

So far, the R&D project has developed an understanding of the biology, ecology and control of mango thrips (an adult thrip is an insect which is dark brown to black and just over one millimetre long) to enable farmers to better manage them through more accurately timed insecticide applications, management of insecticide resistance, removal of alternative host plants and the potential use of trap crops to attract insects away from valuable crops.

A nation-wide survey helped to identify smallholder mango farmer practices. Best practices have now been developed from the responses and

combined with research outcomes into an integrated crop management package, and adopted in farmer field schools and by participating farmers. So far, the project has reached 588 growers, contractors and extension staff with training in mango tree nutrition, and canopy and pest management.

Field trials assessing the effectiveness of different bio-fungicides, plant growth regulators and hot water dips have shown potential for controlling blossom blight fungal disease and post-harvest diseases. The project continues to test different bio-fungicides and endophytic fungi for pre- and post-harvest control of anthracnose fungus. Research is also continuing into the population dynamics of mango cecid flies and their natural enemies. ■



Dr E Bayogan and Professor D Joyce assess the result of post-harvest mango trials. In the background are Dr Eckman and Mr J Oakeshott. Photo: Richard Markham.

ACIAR PROJECT: HORT/2012/019: Research and development of integrated crop management for mango production in the southern Philippines and Australia

ACIAR PROJECTS: CS1/1987/002: Citrus rootstock development; CS1/1996/076: Evaluation of East Asian citrus germplasm as scions and rootstock

MORE INFORMATION: Dr Tahir Khurshid, Department of Primary Industries, Australia, tahir.khurshid@dpi.nsw.gov.au

Tapping into Indonesia's high-value horticultural markets

By Randy **STRINGER** and David **GARDINER**

Moving up the value chain is fundamental to disrupting the poverty cycle of farming worldwide. Breaking into high-value fruit and vegetable markets in Indonesia is becoming easier for smallholder growers thanks to research that uncovers the secrets of success.

KEY POINTS

- Changing diets and increasing spending of Indonesia's middle class consumers is creating opportunities for smallholders to produce more profitable crops and break into high-value markets.
- The project has established an Agribusiness Forum to create working linkages between scientific research and horticultural associations.

Horticulture is important in Indonesia and fresh fruit and vegetables are a significant feature of the Indonesian diet. Although 40% of the country's labour force is involved in agriculture, only 11% of agricultural workers are absorbed by horticulture. Indonesia depends heavily on imports to sustain domestic demand, with a burgeoning upper middle class population increasingly seeking fresh produce. According to Global Business Guide Indonesia, in 2011 Australian fresh fruit exports contributed three percent of Indonesia's needs, behind China, Thailand, the United States and Chile. The rapidly shifting diets and spending patterns of Indonesia's expanding middle-class consumers are providing important opportunities for smallholders to produce more profitable horticultural crops.

Despite a doubling of the value of the fresh fruit and vegetables market between 1995 and 2009 to an estimated \$10 (USD) billion industry, the local horticultural industry is only a minor player. Lack of quality seeds available to local farmers is one fundamental reason for failure to take advantage of increasing high-value markets, as are the lack of farmer education and uptake of modern cultivation methods. Too few Indonesian smallholder farmers are moving up the value chain into more competitive, profitable markets.

ACIAR has been foremost in recognising the gaps in Indonesia's horticultural infrastructure, forming research

ties with Bogor Agricultural University and local communities to capitalise on emerging opportunities to develop horticultural value chains in Indonesia, and enable the smallholder sector to break into more domestic and global markets. As Indonesia's modern food retail chains evolve, expand and reorganise, smallholders face greater choices and more daunting decisions about which fruit and vegetable crops to produce, how to produce them and which paths to market will return the best incomes.

Just why there are not more growers seeking to market value-added produce into modern food retail markets is the focus of an ACIAR project to improve market integration for high-value fruit and vegetable systems. The research project led by Professor Randy Stringer, 'Improving market integration for high-value fruit and vegetable production systems in Indonesia', aims to help solve the problems that smallholders face when entering high-value markets by identifying obstacles. The project aims to better understand product cycles and changes in high-value fruit and vegetable value chains, and develop policy mechanisms to deliver on changing consumer requirements.

Project leaders Prof. Arief Daryanto from Bogor Agricultural University and Dr Hardiyanto, the Director of Indonesia's Horticultural Research and Development Institute (ICHORD), are



PHOTO: CONOR ASHLEIGH

Farmers in Karang Kendal Hamlet cut fodder to feed to their cattle.



LEFT: Indohort project team during a visit to a chili seedlings plantation in the Garut region of West Java. The plantation is owned by a large chili seeds producer who distributes the seeds to government and private farmers. Photo: Henri Suudi.

BELOW: A group of female labourers in Sitanggal village of Larangan district, Brebes region is harvesting shallots. These are daily paid labourers who are hired by a shallot plantation owner. During peak harvest time, these female labourers can work long hours every day, moving from plot to plot owned by different farmers. Manpower for harvesting shallots in Brebes is entirely dominated by women. Photo: Henri Suudi.

working with Prof. Randy Stringer and Dr Dale Yi, researchers with the Centre for Global Food and Resources, to assist the Indonesian government to develop efficient strategies to improve smallholder access to high-value food chains and competitiveness. The project provides policymakers with evidence of successes that arise from promoting participation of small farms in Indonesia's horticultural chains.

Since its inception in 2013, the five-year project has focused on establishing practical 'working linkages' between science-oriented public research agencies, fruit and vegetable industry associations and the academic community. For example, global seed companies like East West Seeds are now collaborating with the project to identify research priorities, capacity needs, regulatory impediments and information gaps. The project also developed an Agribusiness Forum to encourage knowledge development, policy dialogue and industry advocacy in ways that benefit small producers.

The project also involves Indonesian PhD students who contribute to research outcomes. For example, Abdul Hasibuan is examining smallholder citrus growers' perceptions of climate change risks. He affirms the role of farmer groups and the internet in circulating knowledge of climate risks, which can link into policymakers' actions, and says



BELOW: Hardiyanto the treasurer of the cattle group in Karang Kendal Hamlet in Indonesia washes one of his cows in a small creek.

'The expansion of internet access that has reached rural areas and technology information development should be used as a significant opportunity to spread extensive agricultural technology, including how to deal with agricultural issues such as climate change.'

Another doctoral student, Apri Sayekti, is focusing on women's participation in chilli production and marketing activities, and particularly notes that involvement in value-added produce is key to asserting gender equality. 'Hybrid varieties give more employment opportunities for women, since women in rural Indonesia do not have many alternative work options as for many other developing countries,' says Apri.

By identifying the reasons why some households are more successful than others at moving up the value chain 'ladder', the project hopes to provide more fruit and vegetable smallholders with higher returns, encourage more jobs and higher wages for rural landless wage earners, and diversify income sources for fruit and vegetable producer households. ■



PHOTO: CONOR ASHLEIGH

ACIAR PROJECT: AGB/2009/060: Improving market integration for high-value fruit and vegetable production systems in Indonesia

MORE INFORMATION: Prof. Randy Stringer, The University of Adelaide, randy.stringer@adelaide.edu.au

The long road from remote Pacific village to fine Australian chocolate

By Richard **MARKHAM**, Research Program Manager - Horticulture

It's a long way from Rory Village on Vanuatu's Malekula island to Margaret River in Western Australia; but ni-Vanuatu cocoa farmer Denis Nambith and Australian chocolate maker Josh Bahen now have a business connection that shrinks the distance. The connection was forged through Vanuatu's first chocolate competition, organised by ACIAR research projects and supported by a growing network of partners.



Denis had been a cocoa farmer for some years and was chairman of the Rory Village growers' association when he heard about the chocolate competition. "I think it was a good test for me, because I have worked on cocoa but never tasted chocolate from Vanuatu", Denis explained. "This is the first time I have grown the cocoa and fermented it and dried it and now I get to taste the chocolate from my own cocoa".

In the past, farmers in Vanuatu and other Pacific islands have typically sold their cocoa beans to traders, who then sold on the beans to bulk markets in Asia at whatever price was on offer. The buyers would dock the buying price if there were too many small or shrunken beans, or if the beans were wet and mouldy – but otherwise provided little feedback on quality.

That all changed with an ACIAR agribusiness activity, led by Prof. Randy Stringer of University of Adelaide, that put the growers in direct contact with Australian chocolate makers Bahen and Co. Josh Bahen recalls that when they first came to Vanuatu in search of new 'single-origin' beans the quality was very disappointing: "There were all kinds of off-tastes from inadequate fermentation, smoke from unsuitable driers and mould from poor storage." Josh took away samples from different communities, made them

separately into chocolate and, crucially, brought the samples back to explain to the growers what was good and bad about their cocoa and how they could improve it.

Two years of hard work with another ACIAR project team (this time led by SPC, the Pacific Community) then followed. The project focused on improving basic production and processing techniques, from pruning and disease control, through regular harvest of pods, to intense fermentation and gentle sun-drying – cherishing the beans along every step of the way.

The competition provided the opportunity to evaluate progress. Cocoa samples from ten communities were brought to Port Vila for processing into chocolate by Sandrine Wallez, head chocolate-maker from local NGO ACTIV (who had herself received training at Australian chocolate maker Haigh's of Adelaide). The chocolate samples were then subjected to a rigorous blind-tasting evaluation by an international panel of judges, including father-and-son team, Mark and Josh Bahen, and Ben Kolly from Haigh's. Josh Bahen declared himself deeply impressed by the progress the growers had made.

This particular chapter of the story ended with Denis as the proud winner of the Vanuatu competition. However, as tends to be the case with ACIAR initiatives, the story has deep roots

and it continues to bear fruit in all sorts of different ways.

The origin of this work was a scoping study commissioned by ACIAR in 2005/2006. In that study, Fiji-based economist and entrepreneur Andrew McGregor teamed up with cocoa sustainability specialist Smilja Lambert from Mars Inc. (a partner in ACIAR cocoa projects in Indonesia and Papua New Guinea) and New Guinean cocoa evangelist John Konam from SPC. Their work, which has subsequently guided ACIAR's cocoa research strategy in the region for over a decade, reviewed the state of the very different cocoa industries in Fiji, Samoa, Solomon Islands and Vanuatu – and sketched out a different trajectory for each.

Since then, ACTIV has gone on to develop local manufacture of fine chocolate in Port Vila, with 'single-origin' lines from four different islands. Benefitting from links established by ACIAR's Pacific Agribusiness Research-for-Development Initiative (PARDI), at least five Australian high-end chocolate-makers are now sourcing beans from Pacific island producers, offering them a very much better price than the Asian bulk market. And an ACIAR project funded by Australia's Department of Foreign Affairs and Trade in the Bougainville Autonomous Region of PNG, has so far organised two successful chocolate competitions, establishing further mutually beneficial links to Australian chocolate-makers. Meanwhile, at the Salon du Chocolat in Paris, cocoa samples from producers in Fiji, Solomon Islands, PNG and Australia have competed with the best in the world and won 'Cocoa of Excellence' awards. At ACIAR, we feel that our researchers and network of partners are at the centre of a veritable renaissance in Pacific island cocoa and chocolate.

You can meet Denis and Josh through one of ACIAR's YouTube videos (<https://www.youtube.com/watch?v=WiMeg4-z580>) and read more about the competition in an ACIAR blogspot: <http://aciarblog.blogspot.com.au/2014/11/vanuatu-chocolate-its-all-in-smell.html>.



LEFT: Denis Nambith
Photo: Conor Ashleigh

BELOW: Josh Bahen
Photo: Conor Ashleigh



MORE INFORMATION on ACIAR's cocoa work in the Pacific islands can be obtained from the Project Leader of ACIAR's current regional cocoa project (HORT/2014/078), Yan Diczbalis: DICZBALIS Yan Yan.Diczbalis@daf.qld.gov.au

Australia's vanguard for disease defence

By David GARDINER

Multiple ACIAR projects are tackling the very serious issues of human health, nutrition and food security. This work not only improves the wellbeing of our neighbours, it is a significant line of defence for protecting Australian shores from disease.

KEY POINTS

- Food security research projects are enabling disadvantaged communities to build their own capacity to improve sustainable agricultural production.
- Human and animal nutrition issues are being addressed through work that gives farmers skills and knowledge to create their own solutions for enhancing food quality.
- The spread of disease between humans and animals is being curtailed with fundamental research to identify the sources and treatments that ultimately benefit health and bring about higher-quality foods.

With many challenges and threats facing agriculture in developing countries, among the most pressing issues are food security and nutrition. ACIAR has a long history in vital research that ensures food security and reduces poverty, tackles human and animal nutrition, and combats the incidence of disease.

The challenges posed by climate change, growing populations and increasing pressures on natural resources are impacting on the availability of safe and reliable food sources to ensure human health and reduce poverty. There is an essential, ongoing need to proactively manage food security and ensure that communities and countries have the capacity to respond to these challenges on home ground, and continue to improve human nutrition.

Of particular importance in ensuring food security is the need to manage bacterial and viral diseases in agricultural animals that threaten production and human health. The threats posed by zoonotic diseases, which spread from animals to humans, is another critical aspect of food and nutrition security, and ACIAR is spearheading research efforts to understand how to combat this.

These multifaceted issues in food security and poverty reduction are a fundamental component of many research projects and a continuing focus for ACIAR's future. A small

sample of projects that demonstrate the diversity of work undertaken to help establish key infrastructure and build more resilient communities to manage their own food security issues does not do justice to the much wider impact that ACIAR has in many countries, but is indicative.

FOOD SECURITY

Poor women farmers in India are exercising their innovation in the project 'Improving livelihoods with innovative cropping systems on the East India Plateau' (LWR/2010/082), to introduce more diverse cropping systems. Women farmers participated directly in research to conduct rice growing trials and interpret data, which resulted in developing a new, sustainable way of growing rice called direct-seeded rice.

On another front, sorghum, the world's fifth most important cereal, can withstand dry climate stresses to an extent, yet in Ethiopia droughts cause losses of this staple food crop. Through an enhanced sorghum breeding program, the project 'A targeted approach to sorghum improvement in Ethiopia' (CIM/2013/005) is introducing a raft of new breeding technologies and genes resistant to parasitic plants, and speeding up breeding trials with electronic data capture.

Carolina Mwaluko (right) works as a community vaccinator in her village in central Tanzania, administering a thermotolerant vaccine as an eye drop to chickens in exchange for a small fee from farmers. Vaccination programs against Newcastle disease, a key production constraint in many developing countries, allow chicken flocks to increase in size and households to benefit from the sale or consumption of poultry products. Since Carolina was trained in May 2014, local traders have noticed the greater availability of chickens for sale and the reduced risk of disease among birds in transit to regional markets. Sustainable Newcastle disease control programs are part of an integrated approach to increasing income and improving nutrition for households in Tanzania and Zambia. Photo: Robyn Alders, University of Sydney.





Mr Alemu Tirfessa (2nd from left), team leader of EIAR sorghum improvement program, with colleagues measuring plant development parameters. The data will be used to parameter the crop simulation model APSIM for Ethiopian sorghum. The Ethiopian team is recording the data on a mobile phone, using electronic data capture software developed by the Australian partners. Photo: Dr Eric Huttner

TACKLING NUTRITION

Malnutrition and communicable diseases, a concern for those on coral atolls such as Kiribati and Tuvalu, are compounded by the difficulty of producing food in those regions due to poor soils and environmental constraints. Several projects, including 'Improving soil health, agricultural productivity and food security on atolls' (SMCN/2014/089), are improving local communities' capacity to grow and trade high-value crops, and increase consumption of local nutritious foods. Vegetable trials are giving farmers and nurseries information on soil planting techniques to ensure better product quality.

While chickens are an essential part of African diets and livelihoods, Newcastle disease can quickly wipe out large numbers. Springing from research to develop a chicken vaccine that requires less refrigeration, local villagers are now being trained to administer the vaccine effectively. The project 'Strengthening food and nutrition security through family poultry and crop integration in Tanzania and Zambia' (FSC/2012/023) has deployed a sustainable vaccination program developed with previous ACIAR support. The locals have assumed full ownership, with vaccine production and inoculation now handled entirely at the village level. The vaccination program is an integral component of a 'One Health' approach to improve food and nutrition security, focusing on the nutrition of children under five, by integrating crop and poultry management.

STAMPING OUT DISEASE

Of concern to Australia and its northern neighbours is the dangerous spread of rabies. Introduced to Bali in 2007, the disease has already killed humans and resulted in large numbers of dogs being destroyed in an effort to curtail its spread. 'Rabies risk assessment in eastern Indonesia, East Timor, Papua New Guinea and northern Australia' (AH/2012/036) has determined the methods, routes and vehicles of disease spread with the aim of creating better surveillance systems.

From dogs to pigs, smallholder farmers in Lao PDR risk being exposed to zoonotic infectious diseases from their pigs as pork becomes a popular food source. 'Management of pig associated zoonosis in the Lao PDR' (AH/2006/161) determined the prevalence and risk factors of parasitic and viral infectious diseases passed to humans from their animals, including *Taenia solium*, *Trichinella spiralis*, Japanese encephalitis virus and hepatitis E virus.

These projects and other ACIAR-funded initiatives have spurred further partnerships and research to combat zoonotic infectious diseases worldwide. ■

Healthy pigs, healthy people

By Anna OKELLO and David GARDINER

Determining the risk factors of zoonotic disease transmission in pigs has helped reduce infection among farmers in Lao PDR.

KEY POINT

- The 'One Health' approach to sharing responsibilities for animal health between multiple agencies is giving Lao PDR a more systematic approach in identifying disease outbreaks.

Pigs are integral to livelihoods in rural Lao PDR, particularly for poorer families with limited agricultural land. But close contact between humans and pigs increases the risk of zoonotic disease transmission, prompting research to examine issues of animal and human health, and how improved pig production practices can help mitigate this risk.

Between 2010 and 2014, one part of an ACIAR project led by Dr John Allen, 'Increased productivity and reduced risk in pig production and market', which comprised two components—animal and human health, and assessment of pig market value chains—carried out a 'One Health' provincial

baseline survey of villagers in the Xayabouli and Mai districts of Lao PDR and determined the prevalence of pig-associated zoonoses and exposure risk. Risk factors were identified for the transmission of parasitic and viral diseases including Japanese encephalitis virus, hepatitis E virus, *Trichinella* and *Taenia solium*, a tapeworm that can cause human epilepsy.

District staff were trained in disease outbreak investigations, sampling and reporting to provide real-time disease surveillance for the project. Solutions to mi-

nimise disease outbreaks have included introducing improved forage crops to weaner pig diets.

A joint human and pig intervention in one of the villages treated a high prevalence of *Taenia solium* tapeworm during the project. Further afield, analysis of the pork production chain in one district enabled serological sampling for pig and human zoonoses. The study found that with the right knowledge, farmers are willing to invest more in pig management, such as waste disposal and feeding methods, to combat the spread of disease. ■



Pigs are a vitally important part of the economic and cultural life of villagers. Photo Ian McLeod

ACIAR PROJECT: AH/2009/001: Increased productivity and reduced risk in pig production and market. Component 1: animal and human health

ACIAR PROJECTS: LWR/2010/082: Improving livelihoods with innovative cropping systems on the East India Plateau; CIM/2013/005: A targeted approach to sorghum improvement in Ethiopia; SMCN/2014/089: Improving soil health, agricultural productivity and food security on atolls; FSC/2012/023: Strengthening food and nutrition security through family poultry and crop integration in Tanzania and Zambia; AH/2012/036: Rabies risk assessment in eastern Indonesia, East Timor, Papua New Guinea and northern Australia; AH/2006/161: Management of pig associated zoonosis in the Lao PDR

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The Crawford Fund and ACIAR – celebrating 30 years of collaboration

By Dr Colin **CHARTRES**

Since our establishment in 1987, The Crawford Fund has had a long and productive relationship with ACIAR. This has been manifest in partnerships around training programs including master classes, support of our annual Parliamentary Conference and outreach activities, and our shared focus on encouraging the next generation of Australian researchers.



The four Crawford Fund patrons at the 2017 Crawford Fund Conference: Mr Jim Ingram AO, The Hon Tim Fischer AC, The Hon John Kerin AM and The Hon Neil Andrew AO.
Photo: Cathy Reade

From a capacity development perspective, the Crawford Fund has contributed to the development of specialist and cross-disciplinary knowledge of over 12,000 international and Australian agricultural scientists and managers. In many cases the training has been related to specific ACIAR projects, whilst several of our master classes have been conceived to fill knowledge gaps identified by ACIAR program managers. In terms of outreach, we aim to highlight the importance in terms of benefits accruing to Australian agriculture, companies and government foreign policy objectives by sustained involvement in international agricultural activities whether via funding of CG centres or bilateral agency and institutional linkages. To

these ends, we view our relationship with ACIAR as highly synergistic.

This year, the Crawford Fund is developing a new strategic plan, which aims to further build on our relationship with ACIAR. As CEO, I have been reflecting on our focus and how a small organisation can add value to Australia's significant overseas aid program. Three areas stand out with respect to our niche; firstly, helping ensure that policy makers and the public understand the benefits accruing to Australia from our involvement in international agricultural R&D (examples include access to improved cereal and other plant cultivars, improved biosecurity and a large cohort of individuals who look to Australia for further training and technological and scien-

tific advice and services); secondly, broadening our capacity development role to include more training and support of young Australians to develop careers in international agriculture and development and thirdly, to harness the knowledge and capabilities of senior specialists nearing the end of their careers to act as mentors to overseas agencies and counterpart staff.

In 2016 ACIAR asked the Crawford Fund to host RAID (Researchers in Agriculture for International Development), providing us with a major opportunity to engage directly with the emerging generation of agricultural scientists interested in overseas opportunities and to tailor-make training and development programs for them. With respect to mentors we expect



The occasion of the ACIAR Policy Advisory Council (PAC) meeting, which was hosted by the Indonesian Agency for Agricultural Research and Development (AARD) in Bogor and Ciawim in 1984, provided an opportunity to review research on shrub legumes in Indonesia and Australia and to explore potential areas for collaborative work supported by ACIAR.



ACIAR CEO Andrew Campbell addresses the audience at the 2017 Crawford Fund Conference
Photo: Cathy Reade

that by the end of the current year, we will have two new mentors working in Cambodia (value chains) and Vietnam (forestry), complementing our significant work in this area in Laos (plant pathology).

Additionally, working with ACIAR and other partners, we have revamped our master class series and given growing demand will aim to run further master classes on Agricultural Research Leadership and Management, and Biosecurity over the forthcoming years. Attendees at these classes will add to the growing alumni of individuals who have attended and benefitted from ACIAR and Crawford Fund training activities.

Finally, all of our activities have to be cognisant of the changing world we inhabit. Asian

agriculture is undergoing a rapid structural transformation driven by growing urbanisation. Accompanying this will be a trend to larger farms and agricultural enterprises. In Australia, state and territory governments are keen to build export markets for food products and agricultural services. Factoring these together should create opportunities for Australian companies to assist and invest in international enterprises and value chains, but may also pose new demands on natural resources associated with deforestation land and water degradation and changing water demand. We need to be in a position to demonstrate that Australian knowledge of sustainable agricultural system management is available to be applied both to facilitating opportunities and to solving emerging problems. Consequently, a critical goal is for the Fund to work with ACIAR and other partners including those in the private sector to ensure that Australia

is seen as a knowledgeable, reliable and cooperative partner in tackling regional and global agricultural, food and nutritional issues. Furthermore, our distributed organisational structure with state and territory committees puts us in a good position to doing this effectively via networks of institutional and individual scientists. We look forward to continued collaboration with ACIAR in tackling these critical challenges. ●

Sir John Crawford

ACIAR's new MBA Internship soars!

By Mark MIDDLETON

When my kids were much younger than they are now, my favourite book to read them was 'Oh, the places you'll go' by Dr Seuss, you'll be on your way up! You'll see great sights. You'll join the high fliers who soar to high heights...

When I enrolled in an MBA through the UQ Business School, University of Queensland, I had no idea that on completion I would be packing my bags for an 'internship' (at the age of 44). Thanks to the opportunity afforded me by ACIAR and the inaugural Agribusiness scholarship, in August last year I joined the Yoma Bank, Agri-Finance Project team in Myanmar for a three month period investigating the sugarcane value chain.

I quickly got to know the Agri team within Yoma Bank; a team that has been hugely successful in expanding equipment finance products to remote smallholder farmers across the country. The scope of my project was to ascertain whether financing sugar cane harvesters would create shared value for the community. What I discovered was that very few people knew or understood the industry and that a detailed value chain analysis was required.

Myanmar is the poorest country in Southeast Asia. Its 60.9 million people (39.8 m adults) have an average daily income of USD\$3.50. Approximately seven out of ten adults are rural domiciled and over 19 million adults are involved in farming. Of the country's 39.8 million adults only 30% use a regulated financial service and fewer than 5% of adults have bank accounts (CENFRI, 2014).

The Myanmar sugarcane industry is currently ranked as one of the most inefficient sugarcane producers in the world. Despite this, the sugarcane industry is economically and socially highly beneficial to Myanmar. It is estimated that the industry currently comprises over 30,000 farmers producing 2.5 m tonnes of sugarcane worth approximately \$89 million (USD). Through lifting capability, productivity and bargaining power, it is foreseeable that production could double within three years. Such an increase in production would increase industry revenue at the gate

by a further \$178 million (USD), which would have significant multiplier benefits to rural communities.

Field and desk research has shown it is possible to significantly increase production and that demand for additional sugar is high both short and long term. Imports and consumption of sugar in Asia have increased by 83% in the past ten years and stock to use ratios are falling.

After weeks of research and interviews with key industry stakeholders across



the country, I concluded that sugarcane production in Myanmar can more than double through increased mechanisation, extension services, education and finance. In unison, these four variables can significantly lift production on the same acreage in a sustainable manner that delivers improved incomes for smallholders, quality outputs for millers and economic profit for the country.

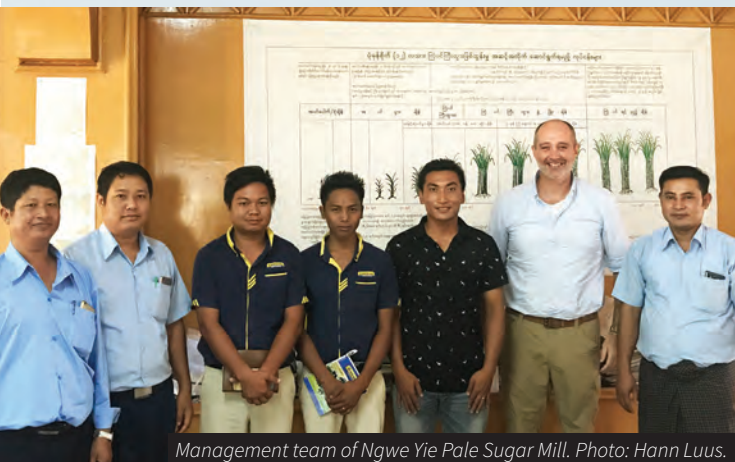
The recommendations can be pursued individually, but would inevitably be far more effective pursued in tandem. By enhancing productivity, capability and competitiveness through the entire value chain, the Myanmar sugar industry has the potential to add significant economic value to the wider economy and to rural communities.

Approaching the end of my three-month internship I presented my insights and recommendations for the Myanmar Sugarcane Industry to over 40 interested stakeholders, including senior advisers to the Ministry of Agriculture and Irrigation. Whilst I cannot lay claim to any direct link, I am confident that the government was aware of my recommendations when it recently announced a large investment into a USD\$65 m sugar processing facility in the Sagaing region.

As Dr Seuss suggested, ACIAR's agribusiness scholarship soared me to high heights in personal development, enabling me to make a positive difference and to see great sights. ■

For further information you are invited to contact Mark at mark@horizonagribusiness.com.au Mark's blog is: www.horizonagribusiness.com.au

Cattle returning home from grazing during the day, Bago Region. Photo: Mark Middleton



Management team of Ngwe Yie Pale Sugar Mill. Photo: Hann Luus.



Engaging with the private sector to improve value chains

By Peter PAPHATHANASIOU

Private sector investment in the agricultural value chain is key to opening new doors and fresh opportunities. Partnering with the private sector and other development agencies, ACIAR opens doors for entrepreneurs.

One of ACIAR's important partners for engaging with the private sector is Melbourne based *Business for Development* (B4D), a non-government organisation with a mission to build business partnerships that tackle extreme poverty.

By equipping smallholder farmers with the appropriate economic tools and partnering with the private sector, ACIAR and B4D have developed strategic pathways that connect farmers and their families to new commercial opportunities.

The CSE/2011/077 Sustainable and Resilient Farming Systems Intensification (SRFSI) project has identified and adapted technologies for Conservation Agriculture Systems Intensification (CASI) based in Eastern India, Bangladesh and Nepal. For the adoption of these technologies, farmers require services including machinery, production and knowledge. ACIAR is working with Business for Development (B4D) to design and test business models that will drive the private sector scaling of these technologies in the region. The out-scaling project aims to impact 1.5 million smallholder wheat, maize and rice farmers over five to ten years, with the adoption of new technologies leading

to increased productivity and incomes at farmer level. The longer-term goal for the private sector out-scaling project is to impact 15 million smallholder farmers in the region.

B4D, in partnership with Innovative Change Collaboration (ICCo), completed a series of business missions and research in 2016 as part of a design phase that explored pathways and business models for private sector out-scaling. A report was presented to ACIAR at the end of 2016 that provided a situation analysis, identified barriers to out-scaling and adoption, and proposed a range of possible market system solutions, including an analysis of potential partners.

Subsequently, B4D was contracted to project manage a trial of a multi-channel, whole value chain approach through the implementation of an innovative private sector agribusiness out-scaling model, using a network of Farmer Service Company and micro-entrepreneur centres that have been set up and trialled in Purnea in the first half of 2017. B4D is project managing the implementation of the trial agribusiness model in partnership with Green Agrevolution. The trial involves the establishment and evaluation of a Farmer Service Company and 5 micro-

The evidence is clear. The private sector is the engine of growth. Successful businesses drive growth, create jobs and pay the taxes that finance services and investment. In developing countries, the private sector generates 90 per cent of jobs, funds 60 per cent of all investments and provides more than 80 per cent of government revenues. Private companies are providing an ever increasing share of essential services in developing countries, such as banking, telecommunications, health and education. Foreign investment, particularly in exporting industries, can accelerate domestic development.

Sustainable and inclusive private sector-led

growth that contributes to reducing poverty does not happen of its own accord. To make this happen, the private sector needs to be encouraged and supported so it can produce high and inclusive growth while still generating the profits needed to succeed.

Australia's aid program supports private sector-led growth at three levels:

- Building better business enabling environments. For example, reforming business registration, contracting laws and providing the infrastructure essential for business (such as electricity or transport connections).
- Addressing constraints to growth in specific markets. For example, problems related to how supply chains function,

including infrastructure, access to finance, human resources and the connection between the parts of the supply chain.

- Maximising the development impact of individual businesses. For exam-

ple, supporting businesses to implement business models that serve the poor as consumers, producers or employees.'

From *The role of the private sector in promot-*

ing economic growth and reducing poverty in the Indo-Pacific region, submission 21 to the Joint Standing Committee on Foreign Affairs, Defence and Trade, May 7, 2014



Fazle Rahaman, core trial farmer in the ACIAR SRFSI project in India, awarded the Best Farmer Award. Photo: ACIAR

entrepreneur centres in Purnea as a vehicle to out-scale access to machinery, inputs and knowledge for farmers. Farmers expressed enthusiasm to adopt the new farming methodologies, especially as this reduces the farmer's dependence on external labour.

"Our collaboration with ACIAR provided a well-researched foundation for the adoption and scale out of technologies that ultimately increased farmer incomes," said Mark Ignam, B4D CEO. "The technology has now been integrated into commercial farmer support agencies to ensure sustainability and accelerate adoption in India and Bangladesh."

MORE ACIAR B4D PROJECTS

PEARL & SEAWEED PRODUCTION IN THE PACIFIC ISLANDS

These four B4D projects were concerned with developing the pearl and seaweed industries in a number of partner countries including Fiji, Tonga, Papua New Guinea, Samoa and Kiribati. Of specific focus was the need to improve pearl husbandry techniques along the entire production line, along with opening up new opportunities via segmentation of the pearl industry. For seaweed, the project aimed at diversifying the activities and opportunities available to the industry in the Pacific Islands, and to make the local industry in each partner country more resilient to both external and internal changes. All four projects have now been completed and met their scientific milestones to ensure more developed and diversified local industries for harvesting pearled oysters and seaweed, with local fishers and their families being the key beneficiaries.

SUSTAINABLE AGRICULTURE IN WEST BENGAL AND BANGLADESH

This multi-country program focuses on managing the overuse of water resources in Bangladesh and the West Bengal of India to mitigate the impact of climate change for family farmers. The project, which commenced in 2016 and is due for completion in 2020, has four main impact pathways. First, working with NGOs to engage with, empower, and mobilise marginalised community segments, in particular women, landless, and tribal minorities. The second pathway entails drawing on initial findings to better target interventions or to ensure that agricultural intensification practices do not result in unintended consequences for marginalised households. The third impact pathway involves association with a number of key donor-funded programs and government initiatives. Lastly, the fourth pathway works with private sector boundary partners to build a framework that can be implemented to support rural communities. It is anticipated that this project will provide more socially inclusive and environmentally sustainable agricultural intensification in West Bengal and Bangladesh.

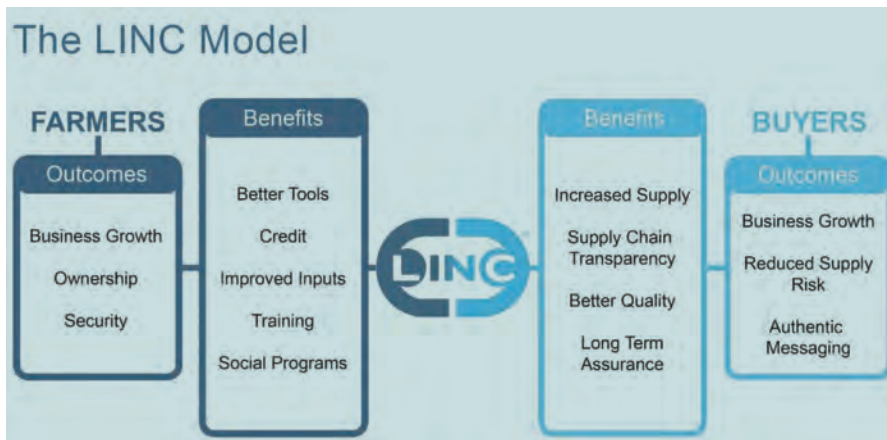
PACIFIC AGRIBUSINESS RESEARCH FOR DEVELOPMENT INITIATIVE (PARDI 2)

Running from 2017 to 2021, this four-year project builds on the Pacific Agribusiness Research for Development Initiative (PARDI), an earlier four-year project aimed at improving marketing opportunities and boosting agribusiness within the Pacific Islands. Focusing on Fiji, Tonga and Vanuatu, PARDI 2 aims to strengthen PARDI's engagement with other ACIAR projects. The project will study why and how agribusiness developments have succeeded, document



Emele (front) and Kelera (back) at J Hunter Pearls, processing Pteria penguin oysters that have previously been seeded for mabé pearl production. Mabé pearls are ideal for handicraft and jewellery production, at which Fijian women are particularly adept. Photo: ACIAR

how they benefit community livelihoods, and investigate how to extend and make their economic benefits more inclusive and sustainable. The project also aims to identify and overcome constraints and bottlenecks in value and supply chains for primary products. Within five years of its conclusion, PARDI 2 is expected to have developed the capacity for growing at least ten existing agribusinesses and creating at least ten new agribusinesses, with at least half operated or managed by women. The project also hopes to have shown enhanced benefits that flow to rural communities from agribusiness developments. ◆



ACIAR PROJECTS: FIS/2014/103: Pearl livelihood development in Fiji; FIS/2006/172: Winged oyster pearl industry development in Tonga; FIS/2009/057: Pearl industry development in the western Pacific; FIS/2010/098: Diversification of seaweed industries in Pacific island countries; LWR/2014/072: Promoting socially inclusive and sustainable agricultural intensification in West Bengal and Bangladesh; AGB/2014/057: Pacific Agribusiness Research in Development Initiative Phase 2 (PARDI 2); CSE/2011/077: Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI)

MORE INFORMATION: FIS/2014/103: Professor Paul Southgate, University of the Sunshine Coast, paul.southgate@usc.edu.au; FIS/2006/172: Professor Paul Southgate, James Cook University, paul.southgate@usc.edu.au; FIS/2009/057: Professor Paul Southgate, James Cook University, paul.southgate@usc.edu.au; FIS/2010/098: Associate Professor Nicholas Paul, University of the Sunshine Coast, npaul@usc.edu.au; LWR/2014/072: Dr Christian Roth, CSIRO, christian.roth@csiro.au; AGB/2014/057: Dr Lex Thomson, University of the Sunshine Coast, lex.thomson@gmail.com; CSE/2011/077: Dr Thakur P Tiwari, International Maize and Wheat Improvement Center, t.tiwari@cgiar.org



LEFT: Tarni Cooper with co-researchers from the Vietnamese National University of Agriculture, Dr Nguyen Huu Nhuon and Ms. Nguyen Thi Thu Huyen, December 2016

BOTTOM: Tarni Cooper and colleagues from the Vietnam National University of Agriculture conduct a participatory exercise to study animal health-seeking behaviour in Hung Yen, Vietnam, December 2016.



Looking beyond the tools to the process

Improving antimicrobial stewardship with family farmers in Vietnam.

By Tarni COOPER

Antimicrobial resistance (AMR), accelerated by the overuse and misuse of antimicrobials, poses a growing global threat to human and animal health. My PhD research takes place in Vietnam, a hot-spot for consumption of antimicrobials in livestock and predicted emergence of resistance.

Using both quantitative and qualitative methods, we aim to better understand the role of antimicrobials in the animal health systems of family farming communities and, with those communities, develop

livelihood-sensitive approaches for improved antimicrobial stewardship (AMS).

This University of Queensland (UQ) and International Livestock Research Institute (ILRI) project is underpinned by the understanding that for positive, sustainable change, *people* must be at the centre of veterinary research for development (R4D).

Looking back, my R4D career started as a UQ veterinary student, with Professor Darren Trott sending me to his AusAID project in Vietnam every year to act as a communication bridge between Australian and local partners. This early experience was very formative in my understanding of veterinary development. We discovered through listening, the Vietnamese pig farmers we had been working with were discerningly filtering and adapting suggested innovations to suit their local context. This inspired a participatory video (PV) process, where farmers were involved in planning, scripting, acting in and editing a video about pig production, to teach other farmers. An ACIAR-funded, ILRI-led impact assessment four years later (2014) found that it was during the *process* of making the PV when

many farmers learned most from each other and made sustainable changes on their farms.

One of my now supervisors, Associate Professor Elske van de Fliert, Director of the Centre for Communication and Social Change at UQ, and leader of several ACIAR projects, has always challenged me to look beyond the communication *tools*, to the communication *process*. My current PhD research aims to increase stakeholder participation in the process of improving AMS. Policies regarding regulation of antimicrobial use in livestock have the potential for many unintended, adverse effects in family farming communities. Where vulnerabilities to weather events, disease outbreaks and volatile markets are felt acutely, it is important we work with communities to find context-appropriate solutions to AMS.

My PhD research is supported by the CGIAR Research Program on Agriculture for Nutrition and Health, an Australian Government Research Training Scholarship, a large team of researchers and my advisory team:

- A/Prof Ricardo Soares Magalhães, Spatial Epidemiology Laboratory, School of Veterinary Science, The University of Queensland
- A/Prof Elske van de Fliert, Centre for Communication and Social Change, School of Communication and Arts, The University of Queensland
- Dr Delia Grace Randolph, Program Manager (joint) Animal and Human Health, International Livestock Research Institute



Tarni Cooper facilitates a 'matrix-scoring' exercise during PENAPH participatory epidemiology training in Thailand, 2018. Photo credit: Sirikachorn Tangkawattana

Healthier chickens means healthier children in Timor-Leste

By Johanna **WONG**

Australians do a double-take when I tell them I work with village chickens in Timor-Leste. Coming from a dog- and cat-vet background in Sydney, chickens are nowhere near as important to people here as they are to families in Timor-Leste.

Most rural households in Timor-Leste own free-ranging scavenging chickens. My research investigates whether improving village chicken health could improve maternal and child diets. Nutrition is a national priority in Timor-Leste, with half of all children under five years chronically undernourished.

It might initially seem paradoxical: *'Don't people keep chickens so they can eat eggs and meat? Obviously that would contribute to nutrition!'* But it's not so simple. Most households keep a small number of chickens as a form of savings, accessed when they need cash or for ceremonies. Yet disease burdens keep flock sizes small, so chickens are rarely consumed at home and eggs are hatched for propagation.

The most significant illness of chickens is Newcastle disease, which can kill entire flocks within days.

My research was associated with the implementation of a Newcastle disease vaccination program by the Timor-Leste Ministry of Agriculture and Fisheries, using a community-based approach developed with ACIAR support. This research also involved the Timor-Leste Ministry of Health, and extension and community workers associated with each ministry.

Improving village chicken health increases access to healthy chicken meat, organs and eggs, as well increasing household income to



Study participants and I in Saburai village, Maliana, May 2016.

purchase additional foods or services. It also reduces risk to human health by decreasing the common practice of consuming sick or dead birds.

To measure the effect of Newcastle disease vaccination on human nutrition, I collected data on chicken stocks and flows through the year, maternal and child diets, anthropometry and child haemoglobin in three seasons. I also used key informant interviews and focus group discussions to better understand findings.

The best aspect of my research so far has been living in rural villages, where the people are friendly and ready to share their thoughts, as well as watching the children enrolled in my study grow from babies who would cry every time a stranger came near, to worldly toddlers who bravely nod their assent to being measured and having their fingers pricked to check their haemoglobin levels. I also treasure the connections I've made with new friends and colleagues, particularly through RAID and the Sydney South-east Asia Centre (SSEAC).

My original aspiration in becoming a veterinarian was to improve the well-being of animals. In clinical practice, I realised that by treating their pets, I could also improve the well-being of people. Today my aspirations remain essentially the same, but on a more meaningful scale. ■



Village hen and chicks, Hautoho village, Remexio, April 2015. Village chickens go broody and have a strong maternal instinct, allowing flocks to self-propagate.



ACIAR's Policy Advisory Committee met in Canberra in 2017 for a two-day meeting focused on *Climate Change: emerging research needs relating to agriculture, fisheries and forestry*. Representatives from Cambodia, China, India, Indonesia, Lao PDR, Pakistan, Papua New Guinea, Philippines, Vietnam and the Pacific islands community came together with members of the Commission for International Agricultural Research and Australian researchers to discuss the technological, scientific, economic, social, environmental and policy aspects of climate-smart agriculture.

ACIAR'S VISION

ACIAR looks to a world where poverty has been reduced and the livelihoods of many improved through more productive and sustainable agriculture emerging from collaborative international research.

The Australian Centre for International Agricultural Research (ACIAR) operates as part of Australia's international development cooperation program, with a mission to achieve more productive and sustainable agricultural systems for the benefit of developing countries and Australia. ACIAR commissions collaborative research between Australian and developing-country researchers in areas where Australia has special research competence. We also administer Australia's contribution to the International Agricultural Research Centres.

