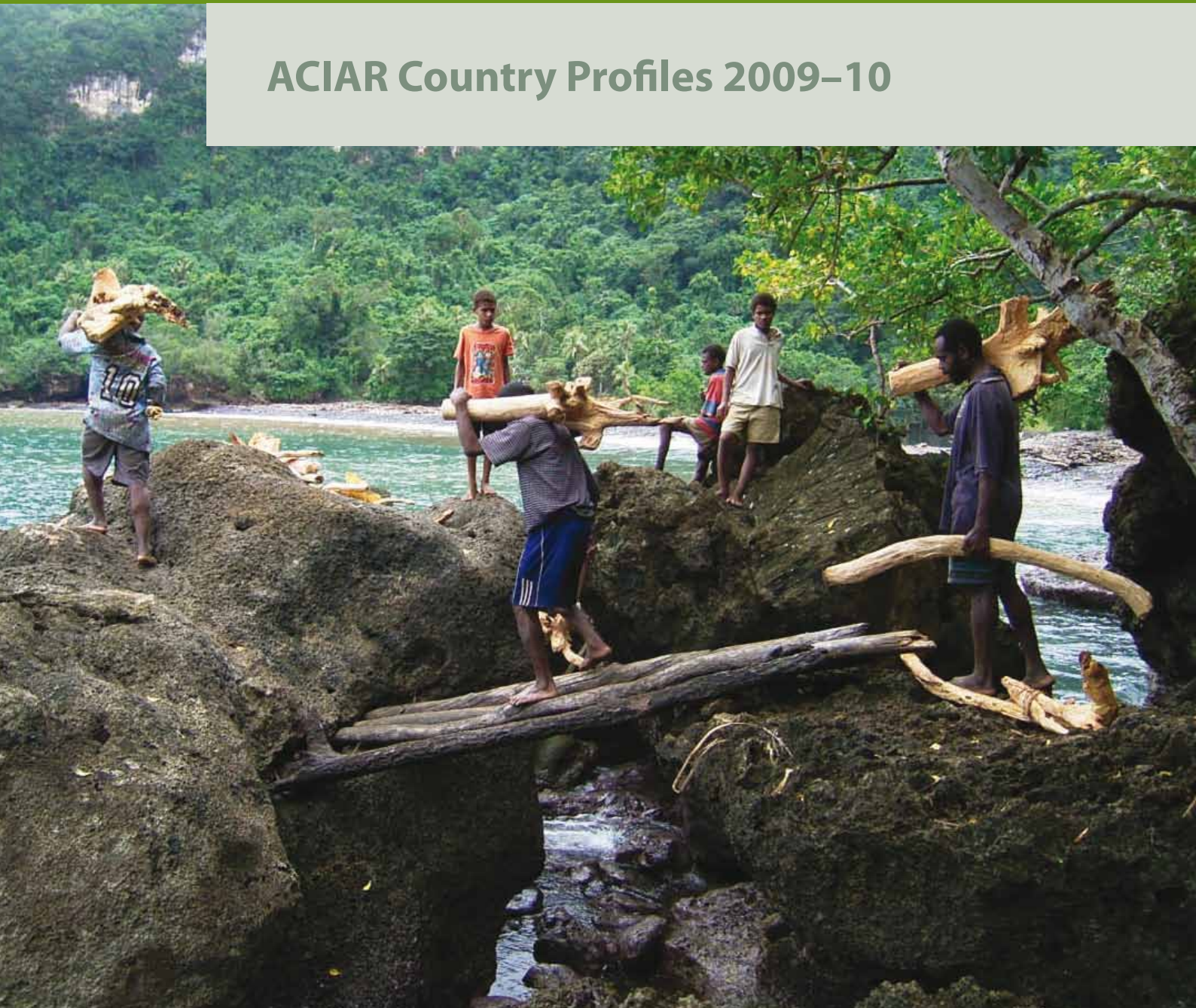




Australian Government  
Australian Centre for  
International Agricultural Research

## ACIAR Country Profiles 2009–10



**PACIFIC ISLANDS**

# **ACIAR Country Profiles 2009–10: Pacific islands**



**ACIAR**

Research that works for developing  
countries and Australia

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2009

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# 1 Overview

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## 1.1 About ACIAR

The Australian Centre for International Agricultural Research (ACIAR) is an Australian government statutory authority that operates as part of the Australian Aid Program within the portfolio of Foreign Affairs and Trade. The core principles of Australia's aid program are:

- accelerating progress towards the Millennium Development Goals
- a recognition that, while economic growth is the most powerful long-term solution to poverty, economic growth will not, by itself, deliver fair and stable societies
- a strong emphasis on the Asia–Pacific, while also increasing our efforts in Africa and South Asia
- an emphasis on the power of education to promote development
- a commitment to continue to improve effectiveness.

These principles guide the aid program in delivering sustainable development gains.

ACIAR was established in 1982 to assist and encourage Australia's agricultural scientists to use their skills for the benefit of developing countries but also to work to resolve Australia's own agricultural problems. It contributes to the aid program objectives of advancing Australia's national interest, poverty alleviation and sustainability. Australia has an exceptionally strong capacity in agricultural research and development, and is also unique amongst developed countries in possessing large agricultural areas in the tropics and subtropics.

ACIAR's corporate mission is to achieve more productive and sustainable agricultural systems, for the benefit of developing countries and Australia, through international agricultural research partnerships. ACIAR's principal goals are to reduce poverty, improve food security and care for the natural resource base for agriculture. To achieve these goals, ACIAR facilitates and supports bilateral research and development activities in a broad range of agricultural areas, including crop production and protection, animal health and animal production, fisheries, forestry, land and water resources management and postharvest technology. ACIAR also commissions studies of the economic and policy issues concerned with the management of agricultural systems and natural resources, and helps partner countries build their capacity to engage with the increasingly global market economy.

Research is not carried out by ACIAR itself. ACIAR plans, funds and manages projects which are carried out by public sector groups including universities, state departments, and other research providers such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO), in partnership with their counterparts in developing countries.

ACIAR also administers the Australian Government's contribution to the international agricultural research centres, and links the centres through multilateral projects to Australian research organisations.

ACIAR is structured into the following research program areas:

- Agribusiness (AGB)
- Agricultural Development Policy (ADP)
- Agricultural Systems Management (ASEM)
- Animal Health (AH)
- Crop Improvement and Management (CIM)
- Cropping Systems and Economics (CSE)
- Fisheries (FIS)
- Forestry (FST)
- Horticulture (HORT)
- Land and Water Resources (LWR)
- Livestock Production Systems (LPS)
- Pacific Crops (PC)
- Soil Management and Crop Nutrition (SMCN).

In developing research projects for these regions, ACIAR places emphasis on priorities determined in consultation with partner countries, balancing these against Australia's comparative advantage and capacity to assist.

### ***Our partnership model***

ACIAR develops a specific program for each partner country that is aligned with its national agricultural priorities. The programs are developed in close consultation with government and research organisations from the partner country and Australia.

ACIAR's research also closely aligns with the Australian aid program's renewed focus on poverty reduction. It is integrated closely with the Australian 'whole-of-government' aid program strategies for specific regions.

Australia's scientists work within a very strong network of institutions in Australia and partner countries, including CSIRO, federal and state government organisations and universities.

ACIAR's projects are split up into bilateral and multilateral projects. Bilateral projects are led by an Australian organisation, with collaborators in the partner country and Australia. Multilateral projects are led by an international agricultural research centre (IARC), in partnership with other research organisations.

### ***Where we work***

ACIAR carries out research in the Asia–Pacific region, and currently has projects in the following regions:

- South-East Asia (Cambodia, East Timor, Indonesia, Laos, Philippines, Thailand, Vietnam: >45% bilateral expenditure)
- Papua New Guinea and the Pacific islands (>20% of bilateral expenditure)

- North Asia (China: <15% of bilateral expenditure)
- South Asia (Afghanistan, Bangladesh, Bhutan, India, Iraq, Pakistan: <15% of bilateral expenditure).

### ***Working internationally***

ACIAR is also responsible for Australia's relationship with the international agricultural research centres—the Consultative Group on International Agricultural Research (CGIAR) centres. ACIAR's annual outlay to the CGIAR centres is around \$11 million.

These funds are used to facilitate CGIAR engagement in the Asia–Pacific and to commission projects that are consistent with ACIAR's country program strategies.

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## **1.2 Capacity building and training**

Building the capacity of agricultural research institutions and researchers in partner countries is one of ACIAR's key priorities. The training program aims to enhance the research capabilities of institutions and individuals involved in ACIAR projects. This also assists in research adoption, productive partnerships and project development.

The ACIAR training program has a budget in 2009–10 of approximately \$6.58 million. It comprises five elements:

- fellowships for postgraduate students (John Allwright Fellowships)
- postgraduate returnee follow-up awards (Returnee Small Project Awards Scheme)
- leadership development opportunities for developing country scientists (John Dillon Memorial Fellowships)
- non-award training (short courses and workshops)
- support for the Crawford Fund, both through management of the Australian Government's contribution (\$0.75 million) and sponsorship of attendees at Masterclasses and other selected training activities.

Much of ACIAR's training is carried out systematically within individual projects. In addition, specialised, discipline-specific training activities may also occur within ACIAR's individual research and development programs.

### ***John Allwright Fellowships***

The objective of the John Allwright Fellowships is to increase the research and development capacity of ACIAR partner-country institutions. The fellowships are awarded to partner-country researchers involved in an ACIAR project to undertake postgraduate studies in tertiary institutions in Australia. Studies focus on areas related to the topic or theme of the ACIAR project. The ACIAR John Allwright Fellowship scheme accounts for approximately \$5.6 million (this figure includes \$3.5 million from the Australian Agency for International Development; AusAID) of the training program budget in 2009–10.

### *John Allwright Fellowships in Fiji*

		PhD	MSc/Other
<b>Active</b>	Male	2	1
	Female	1	0
<b>Concluded</b>	Male	1	4
	Female	0	2

### *John Allwright Fellowships in Samoa*

		PhD	MSc/Other
<b>Active</b>	Male	1	1
	Female	0	0
<b>Concluded</b>	Male	0	0
	Female	0	0

### *John Allwright Fellowships in Solomon Islands*

		PhD	MSc/Other
<b>Active</b>	Male	1	1
	Female	1	0
<b>Concluded</b>	Male	1	1
	Female	0	0

### *John Allwright Fellowships in Tonga*

		PhD	MSc/Other
<b>Active</b>	Male	0	0
	Female	1	0
<b>Concluded</b>	Male	2	2
	Female	0	0

### *John Allwright Fellowships in Vanuatu*

		PhD	MSc/Other
<b>Active</b>	Male	0	0
	Female	0	0
<b>Concluded</b>	Male	0	0
	Female	0	1

### **Returnee Small Project Awards Scheme**

The Returnee Small Project Awards Scheme provides small grants to John Allwright Fellows after they complete postgraduate studies and return to their employers in their home country. The scheme allows Fellows to undertake an activity that continues, or is related to, the ACIAR project in which they are involved. The funding is primarily for developing small-scale research projects, with the intention of catalysing longer-term support and ongoing international collaboration.

### **John Dillon Memorial Fellowships**

John Dillon Fellowships provide career development opportunities in Australia for outstanding mid-career agricultural scientists and economists from ACIAR partner countries. The aim is to develop the leadership skills of Fellows in the area of agricultural research management, agricultural policy and/or extension technologies through exposure to Australian agriculture across a range of best-practice organisations involved in research, extension and policymaking.

### ***Short courses and workshops***

A limited number of short courses and workshops are undertaken as part of the training program for people involved in ACIAR projects. Most activities are directly managed by ACIAR, but some are managed by the Crawford Fund. The courses and workshops are presented by both public- and private-sector providers and topics are chosen based on advice from senior officials in partner countries.

### ***On-the-job training***

On-the-job training as part of ACIAR projects has been shown to deliver excellent returns in terms of capacity building (in addition to the benefits to farmers). The partnership model for ACIAR projects means that Australian and partner-country scientists are working side by side throughout the life of the project.

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## 2 Pacific islands chapter from the Annual Operational Plan 2009–10

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### 2.1 Medium-term strategy

ACIAR's program in the Pacific island countries (PICs) concentrates on Solomon Islands, Samoa, Tonga, Vanuatu, Fiji and Kiribati, and works through regional organisations where appropriate. Our strategy recognises the importance of the agricultural, fisheries and forestry sectors within these countries. It supports research and development (R&D) and capacity building to address three thrusts: improved food and nutritional security; integrated and sustainable agriculture, fisheries and forestry resources management and development; and improved biosecurity and increased trade in agriculture, fisheries and forestry products. It recognises the need to address individual PIC priorities arising from differences in climate and soils, availability of natural resources, institutional capacity, infrastructure and potential for economic growth, while at the same time recognising that many challenges are common and best addressed through regional collaboration. By working closely with Pacific partners, and adhering to the intent of the 'Pacific Partnerships for Development' approach, ACIAR plans to significantly increase the size of its PICs program during 2009–10 and succeeding years.

ACIAR focuses on three key stakeholder groups, smallholders, producing for commercial markets; entrepreneurs, developing value chains involving cooperative production, processing and marketing; and corporate producers and exporters, providing market linkages for outgrowers. The ACIAR strategy for the PICs identifies the participation of women in particular as a critical feature of project success. This strategy will also have a significant impact on the household food security of smaller and subsistence growers resulting from training and capacity building for government R&D staff and extensionists and non-government organisation (NGO) staff and lead farmers, and the development of crop-production systems with broad applicability. The ACIAR program provides R&D solutions and capacity building with close linkages to other extension, technology transfer and community development programs implemented by the Secretariat of the Pacific Community (SPC), Pacific island governments, NGOs and other donors.

To achieve sustainable change interventions, ACIAR will offer innovative approaches that engage, empower and invest in women. ACIAR R&D activities and projects will consider how each project will specifically address gender inequity in agricultural development; for example, inequity in decision-making and women's access to appropriate technology and knowledge. This will include consideration of the optimum level of women's participation to achieve maximum project impact on hunger, poverty and food security; significant increase in opportunities for women in income-generating activities and decision-making; and a growing understanding of gender issues in the community in which ACIAR operates. Women particularly have a central role in household food gardening, tree crop production, and marketing of horticultural, tree crop and fisheries products.

Project activities will include appropriate gender-based objectives, milestones and performance indicators. In agriculture, the program will focus on adaptation to changes in microclimate and identification and management of constraints to productivity in both staple root and high-value crops. It will assist in the identification and development of new high-value horticultural crops (fruits, vegetables and ornamentals) for domestic, regional and international markets. In fisheries, ACIAR will focus on addressing sustainable production of oceanic and inshore fisheries, the development of alternatives through aquaculture and improvements in economic returns through

improved product quality and better market linkages. The forestry program will emphasise the development of emerging plantation opportunities through improved silvicultural management, enhanced genetic resources, new products, and development of disease and pest detection and management methods. There will be increased attention to the development and strengthening of agribusiness linkages with farming systems and marketing research undertaken to underpin the strategy. The program also has a strong emphasis on building R&D capacity within the region.

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## 2.2 Key performance indicators (2009–10)

- integrated production-management packages (for ginger, leafy vegetables, brassicas and papaya) being tested commercially in at least three countries
- new market-driven product opportunities (including forestry, fruits, vegetables, flowers, fishery products, nuts, herbs and spices) identified and R&D projects to address these designed and implemented in at least two countries
- promising processing technologies identified, developed and communicated for forest products and indigenous nut crops
- research strategy to strengthen agribusiness linkages for sustainable domestic and/or export market development identified for four products
- the productivity and profitability of smallholder aquaculture significantly improved in at least two countries through the introduction of new culture technologies, the identification of better-performing brood-stock and the development of nutritious low-cost feeds.

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## 2.3 Position

Due to their proximity to Australia, the PICs are of strategic importance to Australia. ACIAR's program in the PICs will continue to develop in line with broader Australian development-assistance priorities. There is an increasing awareness of the importance of changing economic and environmental situations, and the increased vulnerability of small developing island states if flexibility, resilience and adaptation to change are not achieved. The PICs face a range of challenges including eroding tariff preferences, population and urban growth, migration of skilled labour, resource depletion and degradation, and risks from climate change and high and fluctuating food and energy prices. As described in *Pacific 2020—challenges and opportunities for growth* (published by AusAID in 2006), ineffective policy implementation is seen as a significant impediment to development and progress.

Agriculture, forestry and fisheries sustain many households and these sectors will supply the majority of livelihoods and provide the main source of food security for PICs for the foreseeable future. In Solomon Islands, local production of food crops contributes up to 71% of household income, while in Samoa and Tonga this figure is closer to 40%. Many smallholders live in isolated rural communities dependent on household food production and intermittent crop, fish and small livestock sales. Transforming these systems into sustainable income-generating activities through improved productivity and marketing will enhance food security and self-reliance and reduce poverty. Key challenges for ACIAR and its partner agencies in working in the PICs include physical isolation of countries, poor transportation logistics, human and organisation capacity constraints, land tenure disputes and uncertainties, a lack of infrastructure, poorly developed supply chains, a lack of harmonisation between countries (e.g. in biosecurity laws) and the need to link with major domestic and international markets.

Participation in regional projects that address common problems can help overcome the limited capacity of many countries to engage in collaborative activities. ACIAR has a strong emphasis on working with Pacific regional organisations to improve effective delivery of outputs. In partnership with the University of the South Pacific, ACIAR has implemented a postgraduate training program designed to increase capacity in the region through scholarships for research associated with ACIAR projects in the Pacific.

### **An expanded ACIAR–Pacific island countries program**

ACIAR will allocate an additional 35% to the 2009–10 Pacific R&D program projects budget from the existing recurrent appropriation budget. The additional Pacific R&D project allocation will fund two multi-year initiatives:

- research to improve the profitability of the plantation (tree) crop sector predominantly in Solomon Islands, particularly in oil palm and cocoa. Plantation tree crops are a priority due to the potential for economic growth and increases in grower incomes from these crops. For example, the estimated revenue to Solomon Islands economy from palm oil was US\$10 million in 2008. R&D and capacity building to remove production constraints could see this rising to over US\$30 million by 2014
- new initiatives on agricultural technology transfer and capacity building, including enhancement of the continuing University of the South Pacific (USP) postgraduate scholarship program. These set out to enhance adaptive agricultural R&D capacity within and between PICs and to foster coordination and implementation of regional agricultural technology-transfer strategies. This will result in enhanced and broader impact from the outputs of previous, current and future ACIAR projects and capacity-building activities.

The increased allocation of funds to the Pacific R&D program from the existing ACIAR budget is additional to the support of a new ACIAR-managed program ('Exploiting opportunities for developing high-value agriculture, forestry and fisheries products in the Pacific nations'), which forms part of the whole-of-government Food Security through Rural Development initiative announced in the May 2009 Budget. Taken together, these initiatives will result in a 65% increase in of the ACIAR program size in the PICs from 2008–09 to 2009–10. In addition, ACIAR supports training activities (mainly postgraduate scholarships for study in Australia) and program management, totalling \$1 million annually.

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## **2.4 Research priorities**

Priorities for ACIAR–PICs cooperation are reviewed and updated in regular consultation with relevant government, community and private sector stakeholders. ACIAR also attends regional priority-setting meetings, including the Regional Conference of Heads of Agriculture and Forestry Services, and SPC Heads of Fisheries meetings. New projects will be considered under the following three thematic programs.

### **Subprogram 1: Improving food and nutritional security**

- Identification, development and adoption of new market-driven opportunities for the improvement of horticultural and tree crops
- Development and adoption of integrated and more sustainable production management packages for food staple, fruit, vegetable and plantation crops
- Selection and adoption of staple crops with enhanced nutritional content

- Integration of existing knowledge into information packages for food staples, and fruit and vegetable crops
- Capacity building and training through postgraduate scholarships linked to ACIAR projects.

### **Subprogram 2: Integrated and sustainable agriculture, fisheries and forestry resource management and development**

- Stock status assessment and planning for the sustainable use of vulnerable inshore fisheries, with an emphasis on increased community-level management and co-management
- New opportunities for inland aquaculture, including the domestication of promising indigenous species and integration into existing farming systems
- Valuation of resources and economic analysis of smallholder and commercial fisheries
- Domestication of multipurpose trees for forestry and agroforestry, including selection of suitable germplasm, silvicultural management and protection from pests and diseases
- Value-adding processing of forest and fisheries products
- Capacity building and training in PICs through postgraduate scholarships linked to ACIAR projects.

### **Subprogram 3: Improved biosecurity and increased trade in agriculture, fisheries and forestry products**

- Use of marketing research to help producers and industry identify market opportunities for agricultural commodities
- Analysis of strategic supply chains and design and implementation of interventions to improve supply-chain efficiencies
- Development and strengthening of agribusiness linkages, including analysis of trade policy and market-chain constraints
- Identification and analysis of processing and value-adding opportunities for crops, aquaculture and forestry products and design and implementation of R&D interventions
- Identification of quarantine and pest risk issues for crop germplasm requiring exchange between countries
- Development and adoption of quarantine pest and disease control measures for crop exports.

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## **2.5 Pacific Partnerships for Development**

In 2008, the Australian Government committed to a new and elevated engagement with our Pacific island partners. 'Pacific Partnerships for Development' commits Australia and its Pacific partners to work together to meet our common challenges, raise the standard of living for people throughout the region, and in particular, to make more rapid progress towards our partners achieving the Millennium Development Goals and their own development ambitions. In this context, the 'Port Moresby Declaration' suggests measures aimed at:

- improving economic infrastructure and enhancing local employment possibilities through infrastructure and broadbased economic growth

- enhancing private-sector development, including better access to microfinance
- achieving quality universal basic education
- improving health outcomes through better access to basic health services
- enhancing governance, including the role of civil society, and the role of NGOs in basic service delivery.

Pacific Partnerships for Development will be established jointly by bilateral arrangements known as Partnership Frameworks, which address mutual respect and mutual responsibility. Australia will commit to provide new and additional bilateral assistance over time in return for commitments by Pacific partners to improve governance, enhance private-sector development, increase investment in economic infrastructure, and achieve better outcomes in health and education and in other areas.

ACIAR's Pacific program, through its three research emphases, contributes to the objectives of a number of the partnership priorities. In fisheries, ACIAR will work in cooperation with AusAID's Pacific fisheries strategy released in November 2007. This has the dual strategic objectives of 'maximising the flow of benefits to Pacific island peoples from sustainable commercial and subsistence fisheries' and 'implementing effective ecosystem-based fisheries management for sustainability'. AusAID is currently developing the Pacific Horticultural and Agricultural Market Access (PHAMA) program for commencement in 2010. PHAMA will develop and progress market access submissions for export crop and livestock products and support implementation of biosecurity and quadrant measures required to maintain market access. ACIAR will complement this through R&D work on productivity and marketing of target products, and through capacity building.

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## 2.6 Country-specific issues

Although many of the challenges for agriculture, forestry and fisheries are common to most Pacific nations, it is recognised that specific priorities may differ between countries. ACIAR will support targeted and mutually agreed single-country projects on major issues of concern. Where possible, these are linked closely with regional extension and community improvement programs to foster opportunities for dissemination of the information between countries. Priority areas for each of the PICs with which ACIAR cooperates are provided below.

### Fiji

Fiji's poverty level is comparatively low although rural–urban income inequality is an increasing problem. In recent years, ACIAR's project emphasis has shifted from crop and livestock production to horticulture, aquaculture and agribusiness. There are potential opportunities for economic and technical research aimed at developing crop and agricultural industry alternatives to sugar and, in coordination with other government and donor initiatives, underpin opportunities for regional and international export market development in crops such as papaya, root crops and ornamentals. Developments in promising horticultural crops, and accompanying postharvest technologies and marketing options could also be explored. A major constraint in Fiji's horticulture sector is capacity building in R&D and this is another potential area for engagement with ACIAR programs.

Opportunities for research to improve livelihoods in fisheries include: more productive inland farming systems, aquatic health including quarantine and import risk assessment, restocking as a tool to rehabilitate sea cucumber fisheries, and improved feed formulations for freshwater finfish and *Macrobrachium*. More research may be needed on the marketing of fisheries products. Some options for forestry cooperation

include timber use, value-adding to mahogany and native species, plantation management and health, and increasing the potential of indigenous forestry species.

### **Solomon Islands**

Opportunities exist for ACIAR to participate in activities designed to redevelop export industries such as oil palm and cocoa. Most Solomon Islanders live in isolated rural communities dependent on subsistence agriculture and intermittent crop and small livestock sales, although many also have access to more lucrative urban markets. ACIAR's Solomon Islands program has had a strong fisheries emphasis, including holistic community-based approaches to the management of vulnerable fish resources, and economic and technical research to support the development of sustainable livelihood opportunities based on the culture of coral reef animals. Income-generation initiatives, particularly in rural areas, remain important in the broader scheme of economic and social recovery in Solomon Islands, and much of this will need to occur in the area of crops, forestry and fisheries. There are opportunities for smallholders to exploit lucrative market niches for high-value horticultural crops, value-added products and other diversified products, particularly in the developing urban markets. A particular focus has been fostering the engagement of women smallholders in the production and marketing of vegetable crops and in poultry. Widespread community interest in the planting of teak offers a development opportunity. ACIAR will continue to develop further opportunities for specific linkages with other donor programs and with AusAID's Transitional Support for Agriculture program.

### **Vanuatu**

Vanuatu's agriculture sector, along with tourism, remains the major focus of the country's development strategy. The main activities relate to coconut, cattle, cocoa, and timber production, with traditional food production for subsistence and local markets. Smallholders also cultivate peanuts, potatoes, vanilla and pepper. Although Vanuatu is an agricultural exporter, the majority of the population is in the subsistence or informal sector.

The Vanuatu Government is currently developing a holistic agricultural plan for the country that will give direction to future ACIAR cooperation in agriculture and fisheries. For the current planning period, the focus of ACIAR activities in Vanuatu will be in forestry. Forest covers almost 40% of the total land area of the country; and hence, policy and technical interventions for sustainable management of plantations and development of new species of commercial value for both plantations and smallholders are important. In forestry, assistance is needed in relation to assessing commercial prospects for native species, including sandalwood and whitewood.

### **Samoa**

Samoa has recently had comparatively strong economic growth across a range of sectors, including agriculture. There has been a strong emphasis in the ACIAR program on insect pest management (fruit flies, fruit-piercing moth, whitefly and aphids), virus indexing of taro, and biological control of pests and weeds. Projects undertaken have studied forest nutrition and health as well as fisheries.

Samoa has expertise in germplasm selection of root crops and fruits and in techniques of tissue-culture propagation. Research opportunities include those that underpin the development of exports of high-value horticultural products. This may require postharvest research on improving shelf life and transport methods to boost fruit exports, and simple processing/value-addition of fruit tree and root crops. Research to assist improvements in niche marketing of commodities, potentially including organic produce, is of importance. This may include identification of alternative extension and information-transfer technologies. In forestry, research opportunities may exist in:

policy incentives for establishment of woodlots; nursery management techniques; forest weeds, pests and diseases; and better use of timbers. In fisheries, opportunities may include research on community-based approaches to the management of reef fisheries and technical interventions to underpin the development of village aquaculture industries.

## **Tonga**

Factors affecting agricultural development include geographical isolation, fluctuations in export markets for Tongan produce, a limited natural-resources base and governance structures. Tonga has high natural-disaster susceptibility, which limits income-generating opportunities, and relatively high youth unemployment. Opportunities exist for increased income generation through the development of products for the local market and the exploitation of market niches.

For crop-related research, future support is likely to be in the areas of diversification, improved productivity, reduction in input costs and postharvest quality improvement. There is a current emphasis on farming systems, and development of markets (local and inter-island) is an ongoing challenge. Areas of research emphasis in Tonga include productivity of fruits, root crops and vegetables; development of new crops such as coffee and spices; and development of capacity in postharvest technology. Development of agroforestry-based farming systems (including tree legumes and fruit trees) is a priority in forestry since plantation resources are modest. Tuna is the main fishery export from Tonga and, together with snapper and aquarium fish, is a major export income source. Research will continue into the development of aquaculture systems for commercially important reef species (e.g. hatchery production of winged oyster).

## **Kiribati**

Kiribati is one of the poorest PICs and faces problems in maintaining food security and optimum dietary balance due to poor soils for agricultural production on the coral atolls and the adverse effects of climate change. A relative scarcity of arable land, poor soil fertility, lack of water for irrigation, soil salinisation and contamination of groundwater with salt and other pollutants are major constraints to agricultural production. To assist in addressing these issues of food security and nutrition and provide market opportunities, the SPC and the International Fund for Agricultural Development (IFAD) are establishing a centre for atoll agriculture on Kiribati. ACIAR will develop targeted projects to support the activities of this centre, particularly where Australian and CGIAR centre expertise can add value.

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## 3 Active projects in the Pacific islands

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### 3.1 Subprogram 1: Improving food and nutritional security

This subprogram has two major emphases. First, it aims to develop and implement strategies to underpin improved and sustainable productivity and quality of food staples and high-value horticultural crops, with a particular emphasis on integrated crop management, including crop pests and diseases. The second emphasis is to increase household income through market-driven diversification of production by exploitation of new market niches, genetic diversity, new products and value-adding. Several projects in the subprogram focus on the integration and adoption of results from previous ACIAR research. The particular emphasis of this subprogram is on root crops, vegetables, fruit crops and ornamentals. A third, but currently minor, focus for this subprogram is the production of root crops with improved nutritional value.

<i>Project number</i>	<i>Project title</i>
HORT/2007/072	Postgraduate scholarship scheme for the University of the South Pacific, Fiji
PC/2003/046	Integrated control of powdery mildew and other disease, weed and insect problems in squash in Tonga and Australia
PC/2003/047	Improved plant protection in Solomon Islands
PC/2004/030	Control of Asian honeybees in Solomon Islands
PC/2004/049	Improved farming systems for managing soil-borne pathogens of ginger in Fiji and Australia
PC/2004/063	Integrated pest management in a sustainable production system for brassica crops in Fiji and Samoa
PC/2005/077 (multilateral)	Integrated crop management package for sustainable home gardens in Solomon Islands (AVRDC)
PC/2005/134 (multilateral)	The use of pathogen-tested planting materials to improve sustainable sweetpotato production in Solomon Islands and Papua New Guinea (CIP)
PC/2006/053	Evaluation of the effects of dasheen mosaic virus and other viruses on taro yield
PC/2006/106	Screening and field trials of high-carotenoid sweetpotato in Solomon Islands and Papua New Guinea to improve human vitamin A status
PC/2006/173	Tongan tropical fruit production—improving genetic diversity and production capacity building

PC/2007/039	The control of basal stem rot of oil palm caused by <i>Ganoderma</i> in Solomon Islands
PC/2008/003	Strengthening the Fiji papaya industry through applied research and information dissemination

## **HORT/2007/072: Postgraduate scholarship scheme for the University of the South Pacific, Fiji**

ACIAR has commissioned the University of the South Pacific (USP) to manage and administer a postgraduate scholarship scheme, initially for 3 years, focusing on those wishing to pursue further studies in agriculture, forestry, fisheries and agricultural economics.

### ***Overseas collaborating countries***

Fiji, Samoa, Solomon Islands, Tonga, Vanuatu

### ***Commissioned organisation***

The University of the South Pacific, Fiji

### ***Project leader***

Dr Pa'olelei Luteru

### ***Project budget***

\$460,334

### ***Project duration***

25/02/2008 to 30/06/2011

### ***ACIAR Research Program Manager***

Mr Les Baxter

### ***Website***

<[www.aciar.gov.au/project/HORT/2007/072](http://www.aciar.gov.au/project/HORT/2007/072)>

## **PC/2003/046: Integrated control of powdery mildew and other disease, weed and insect problems in squash in Tonga and Australia**

The agriculture sector in Tonga is a major employer, foreign-exchange earner throughout exports and source of food security. Production of squash contributes 55% of gross domestic product (GDP) and represents more than 95% of exports. Price competition and agronomic factors are threatening the viability and sustainability of the industry, necessitating improved production methods. Poor management of powdery mildew and viral diseases have resulted in total losses of some crops. Weeds act as hosts for some viral diseases and also hamper crop establishment and growth. The silverleaf whitefly has also emerged as a serious pest. Research will concentrate on delivering improved management options for all these problems.

### ***Overseas collaborating countries***

Fiji, Tonga

### ***Commissioned organisation***

University of Sydney, Faculty of Agriculture Food and Natural Resources, Australia

### ***Project leader***

Associate Professor Robyn McConchie  
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### ***Collaborating institutions***

Ministry of Agriculture, Forestry and Food, Tonga  
Secretariat of the Pacific Community, Fiji

### ***Project budget***

\$555,469

### ***Project duration***

01/01/2005 to 31/03/2010  
(Project extended from 01/10/2008 to 31/03/2010)

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Website***

<[www.aciar.gov.au/project/PC/2003/046](http://www.aciar.gov.au/project/PC/2003/046)>

## **PC/2003/047: Improved plant protection in Solomon Islands**

Many of the major food root crops in Solomon Islands are under threat from the incursion of pests and diseases. Staple root crops provide income and assure food security. Current control methods against plant pests involve pesticides which are expensive and can cause health and environmental problems. Integrated pest management strategies for major crops are being developed, including training of both government staff and community groups. This project will focus on developing an understanding of pests and diseases for sustainable approaches to cropping with less use of pesticides.

### ***Overseas collaborating countries***

Solomon Islands

### ***Commissioned organisation***

Secretariat of the Pacific Community, Fiji

### ***Project leader***

Mr Stephen Hazelman  
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Fax: 679 337 0021  
Email: Stephenh@spc.int

### ***Project website***

<<http://www.pestnet.org>>

### ***Collaborating institutions***

Department of Agriculture and Livestock, Solomon Islands  
Kastom Gaden Association, Solomon Islands  
Vois Blong Mere Solomon, Solomon Islands

### ***Project budget***

\$471,689

### ***Project duration***

01/01/2005 to 31/03/2010  
(Project extended from 01/01/2008 to 31/03/2010)

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Website***

<[www.aciar.gov.au/project/PC/2003/047](http://www.aciar.gov.au/project/PC/2003/047)>

## **PC/2004/030: Control of Asian honeybees in Solomon Islands**

Since the arrival of the Asia hive bee *Apis cerana* in Solomon Islands there has been a loss of European honeybee colonies (*A. mellifera*) and consequent decline in honey production. The Solomon Island Government, local bee farmers and other stakeholders are determined that the honey industry based on *A. mellifera* should be saved. This project will develop and implement a method for suppressing feral *A. cerana* populations on Guadalcanal and Savo islands. Other tasks include developing and implementing a surveillance system for the early detection of *A. cerana* in Solomon Islands and finding out more about the varroa mite which affects *A. cerana*. The direct participation of many groups will aid rapid adoption of results.

### **Overseas collaborating country**

Solomon Islands

### **Commissioned organisation**

CSIRO Entomology, Australia

### **Project leader**

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### **Collaborating institutions**

Department of Agriculture and Livestock, Solomon Islands  
Honey Producers' Cooperative Association, Solomon Islands  
New South Wales (NSW) Department of Industry and Investment, Australia  
NSW Department of Primary Industries, Australia

### **Project budget**

\$362,398

### **Project duration**

01/04/2007 to 31/03/2010

### **ACIAR Research Program Manager**

Dr Richard Markham

### **Website**

<[www.aciar.gov.au/project/PC/2004/030](http://www.aciar.gov.au/project/PC/2004/030)>

## **PC/2004/049: Improved farming systems for managing soil-borne pathogens of ginger in Fiji and Australia**

Ginger farming is an intensive horticultural system practiced in Fiji and Australia. In both countries, ginger is a significant agricultural export that is being threatened by the build-up of soil-borne diseases. In Fiji, *Pythium*, and in Australia, *Fusarium*, are the main diseases found. Production, particularly in Fiji, is declining and affecting rhizome (horizontal stems producing roots) quality. Production systems rely on these for new plants. Evidence suggests that increasing the microbial diversity found in root zones of plants can ameliorate soil-borne pathogen damage. The project will use this knowledge to test and develop recommendations for appropriate management strategies to control diseases in both countries.

### ***Overseas collaborating country***

Fiji

### ***Commissioned organisation***

Department of Employment, Economic Development and Innovation, Australia

### ***Project leader***

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### ***Collaborating institutions***

Biological Crop Protection, Australia  
Buderim Ginger Ltd, Australia  
Ministry of Agriculture, Sugar and Land Resettlement, Fiji  
Secretariat of the Pacific Community, Fiji

### ***Project budget***

\$617,974

### ***Project duration***

01/01/2006 to 31/12/2010  
(Project extended from 01/10/2009 to 31/12/2010)

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Website***

<[www.aciar.gov.au/project/PC/2004/049](http://www.aciar.gov.au/project/PC/2004/049)>

## **PC/2004/063: Integrated pest management in a sustainable production system for brassica crops in Fiji and Samoa**

The diamondback moth is the leading pest of brassica crops in the Pacific islands. Both large and smallholder farmers grow brassicas; mainly head cabbage, Chinese cabbage and watercress. With production increasing in recent years, opportunities for the moth to spread have expanded. The use of insecticides is the main form of control. Integrated pest management (IPM) approaches to diamondback moth have been used elsewhere in the world, limiting insecticide use while maintaining control. What is needed is the adoption of IPM with a locally relevant program. Research will develop an increased knowledge of the moth to devise the appropriate IPM packages for each country.

### ***Overseas collaborating countries***

Fiji, Samoa

### ***Commissioned organisation***

University of Queensland, School of Integrative Biology, Australia

### ***Project leader***

Dr Michael Furlong  
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### ***Collaborating institutions***

Department of Employment, Economic Development and Innovation, Australia  
Ministry of Agriculture, Sugar and Land Resettlement, Fiji  
Ministry of Agriculture and Fisheries, Samoa  
Queensland Department of Primary Industries and Fisheries, Australia  
Secretariat of the Pacific Community, Fiji

### ***Project budget***

\$686,541

### ***Project duration***

01/07/2005 to 30/06/2010

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Website***

<[www.aciar.gov.au/project/PC/2004/063](http://www.aciar.gov.au/project/PC/2004/063)>

## **PC/2005/077: Integrated crop management package for sustainable smallholder gardens in Solomon Islands**

In Solomon Islands, despite growing numbers of smallholder vegetable farms around Honiara and the growing importance of vegetable farming in the neighbouring islands of Malaita and Makira, local production and supply fall short of meeting year-round domestic demands. There is great potential to improve and increase vegetable production, but an earlier scoping study found this potential was constrained by technical and socioeconomic factors that impact on any move into vegetable production on a commercial scale. This project aims to address the technological, informational and skill needs of these farmers and help to integrate their activities into the domestic market. Increasing production of vegetable crops has the potential to increase aggregate income to smallholders by up to \$5 million per annum.

### ***Overseas collaborating country***

Solomon Islands

### ***Commissioned organisation***

The World Vegetable Center (AVRDC), Taiwan

### ***Project leader***

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### ***Collaborating institutions***

Don Bosco Technical Institute Rural Training Center, Solomon Islands  
Farmset Limited, Papua New Guinea  
Kastom Gaden Association, Solomon Islands  
Ministry of Agriculture and Livestock, Solomon Islands  
NSW Department of Industry and Investment, Australia  
NSW Department of Primary Industries, Australia  
Vois Blong Mere Solomon, Solomon Islands

### ***Project budget***

\$747,752

### ***Project duration***

01/05/2007 to 30/04/2011

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Website***

<[www.aciar.gov.au/project/PC/2005/077](http://www.aciar.gov.au/project/PC/2005/077)>

## **PC/2005/134: The use of pathogen-tested planting materials to improve sustainable sweetpotato production in Solomon Islands and Papua New Guinea**

In Papua New Guinea (PNG) and Solomon Islands, yield decline has been recorded in sweetpotato varieties over time. Introducing and adapting technologies that produce consistently high-yielding and nutritious crops of sweetpotato can help to satisfy household consumption, improve human nutrition and supply domestic markets. This project will describe and evaluate sweetpotato seed supply systems, introduce and evaluate improved varieties, then introduce, refine and disseminate technologies for improved supply systems of sweetpotato seed for smallholders practising low-input agriculture.

### ***Overseas collaborating country***

Papua New Guinea, Solomon Islands

### ***Commissioned organisation***

International Potato Center, East and Southeast Asia and the Pacific Regional Office, Indonesia

### ***Project leader***

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### ***Collaborating institutions***

Department of Agriculture and Livestock, Solomon Islands  
Department of Employment, Economic Development and Innovation, Australia  
Kastom Gaden Association, Solomon Islands  
National Agricultural Research Institute, Papua New Guinea  
Queensland Department of Primary Industries and Fisheries, Australia

### ***Project budget***

\$849,742

### ***Project duration***

01/09/2006 to 31/08/2010

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Website***

<[www.aciar.gov.au/project/PC/2005/134](http://www.aciar.gov.au/project/PC/2005/134)>

## **PC/2006/053: Evaluation of the impact of dasheen mosaic virus and other viruses on taro yield**

Two ACIAR-funded projects have worked in parallel with AusAID to develop sensitive tests to detect taro viruses. Safe movement of taro was crucial for the TaroGen project and for the future of taro in the region. These ACIAR projects focused on gathering information about the viruses present in taro, but they did not look in detail at the impact of viruses on taro yield. This study of a taro production system will determine the yield gains from using virus-free planting material, and will also undertake a benefit–cost analysis on the economic benefits of using virus-free planting material. It will particularly focus on dasheen mosaic virus (DsMV) that commonly affects taro throughout the Pacific region

### ***Overseas collaborating countries***

Fiji, Samoa

### ***Commissioned organisation***

Secretariat of the Pacific Community, Fiji

### ***Project leader***

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### ***Collaborating institutions***

Ministry of Agriculture, Fiji  
University of the South Pacific, Fiji

### ***Project budget***

\$149,734

### ***Project duration***

01/06/2007 to 31/05/2010

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Website***

<[www.aciar.gov.au/project/PC/2006/053](http://www.aciar.gov.au/project/PC/2006/053)>

## **PC/2006/106: Screening and field trials of high-carotenoid sweetpotato in Solomon Islands and Papua New Guinea to improve human vitamin A status**

Many people in Solomon Islands and PNG do not receive enough dietary vitamin A, which is vital in boosting immunity to disease. Vitamin A supplementation of infants in PNG reduced the effects of malaria, but it would be preferable to receive enough vitamin A through the diet. The orange sweetpotato (OSP) is a nutritionally enhanced staple containing among the highest concentrations of beta-carotene (the major pro-vitamin A carotenoid) of any food—as little as 100 grams per day can prevent vitamin A deficiency. This activity is surveying promising coloured Solomon Island and PNG sweetpotato cultivars for carotenoids, in particular beta-carotene. It is also examining the cultural and social dimensions of sweetpotato in the diets in Solomon Islands and PNG, to determine how to promote OSP as a healthy dietary component and to increase its consumption. As well it will introduce improved OSP cultivars and compare them with the highest-carotenoid local cultivars.

### ***Overseas collaborating countries***

Papua New Guinea, Solomon Islands

### ***Commissioned organisation***

University of Adelaide, School of Agriculture, Food and Wine, Australia

### ***Project leader***

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### ***Collaborating institutions***

Department of Agriculture and Livestock, Solomon Islands  
International Potato Center, Indonesia  
Kastom Gaden Association, Solomon Islands  
National Agricultural Research Institute, Papua New Guinea

### ***Project budget***

\$131,000

### ***Project duration***

01/02/2007 to 31/01/2010

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Website***

<[www.aciar.gov.au/project/PC/2006/106](http://www.aciar.gov.au/project/PC/2006/106)>

## **PC/2006/173: Tongan tropical fruit production—improving genetic diversity and production capacity building**

Tonga wishes to improve the domestic supply of tropical fruits at a subsistence and local trade level, with longer-term potential for export income. An earlier feasibility study (HORT/2006/108) found significant scope to increase the production of the Tongan fruit industry and thus increase household income levels, with opportunities for import replacement, growth of the existing domestic market and, in the longer term, Pacific inter-island trade, export to New Zealand, Australia and other regional markets. This project aims to increase the production, productivity and technical capacity of the Tongan tropical fruit industry with an emphasis on the local market. Activities include introduction of new improved cultivars of tropical fruits both from repositories and collections currently in the country and from a range of new tropical fruit species from Australia. This will take place along with development of production packages and improvements in the capacity of Tongans to propagate, produce, harvest, package and market fruit.

### ***Overseas collaborating country***

Tonga

### ***Commissioned organisation***

Secretariat of the Pacific Community, Regional Germplasm Centre, Fiji

### ***Project leader***

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### ***Collaborating institution***

Ministry of Agriculture, Food, Forestry and Fisheries, Tonga

### ***Project budget***

\$399,984

### ***Project duration***

01/06/2008 to 31/05/2011

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Website***

<[www.aciar.gov.au/project/PC/2006/173](http://www.aciar.gov.au/project/PC/2006/173)>

## **PC/2007/039: The control of basal stem rot of oil palm caused by *Ganoderma* in Solomon Islands**

Basal stem rot, caused by the wood-rotting fungus *Ganoderma boninense*, is a disease that reduces oil palm yields in most production areas of the world. Where incidence increases progressively, it slowly but inevitably erodes the profitability of this major industry. In 1997, it was identified as a major threat to the oil palm industry in Solomon Islands and subsequently, in 1998, the PNG Oil Palm Research Association initiated a research program (funded by the European Union) that recorded disease levels as high as 43% in some blocks. The disease compromises the future sustainability of the industry in Solomon Islands, and the recommended strategy for long-term control is to implement improved cultural practices and use more resistant planting material. This project will implement and monitor a short-term control program amongst smallholders in Solomon Islands, and establish progeny trials to identify suitable seed lines for planting in a high-risk environment. It will also determine the most appropriate cultural methods to minimise disease levels in subsequent planting cycles. The scientists predict implementation of a short-term control program within 2 years, and selection of more appropriate planting techniques within 6 years. In 5–10 years, with the most susceptible progeny identified and eliminated from breeding programs, more suitable (disease-resistant) material will be available for replanting. The results from this research will be applicable throughout the Pacific region as well as in the major areas of oil palm cultivation in South-East Asia.

### ***Overseas collaborating countries***

Papua New Guinea, Solomon Islands

### ***Commissioned organisation***

University of Queensland, School of Land, Crop and Food Sciences, Australia

### ***Project leader***

Associate Professor Ian Godwin  
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### ***Collaborating institutions***

Guadalcanal Plains Palm Oil Limited, Solomon Islands  
Ministry of Agriculture and Livestock, Solomon Islands  
PNG Oil Palm Research Association Inc, Papua New Guinea

### ***Project budget***

\$817,371

### ***Project duration***

01/06/2009 to 31/05/2013

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Website***

<[www.aciar.gov.au/project/PC/2007/039](http://www.aciar.gov.au/project/PC/2007/039)>

## **PC/2008/003: Strengthening the Fiji papaya industry through applied research and information dissemination**

Papaya has become Fiji's most important fruit export commodity and offers the prospect of becoming a major industry. Many new growers are taking up papaya farming, but there is a lack of sound information with regards to production, harvest and postharvest issues. Consequently, there are serious quality and consistency issues that threaten the long-term viability of the Fiji papaya industry. This project aims to address the immediate needs of the industry and to establish the framework to take the industry forward. Its primary aim is to substantially increase the contribution of fruit and vegetable exports to livelihoods of rural people in western Viti Levu. The expected outputs of the project include: a threefold increase in exports of papaya; a doubling of persons involved in the papaya industry; a 50% reduction in culled fruit from the farm; and an increase in competitiveness of Fiji papaya on the export market through the use of sea freight. In Australia, the papaya industry is undeveloped due to high levels of losses in the supermarket system and inconsistency of product flavour and fruit-ripening behaviour. A project study will help to solve key research problems in the supply chain and to foster wide uptake of improvements by farmers and other supply chain members. An assured supply of good-quality papaya should contribute to an improvement in the demand for higher quality tropical fruits both domestically and for export.

### ***Overseas collaborating country***

Fiji

### ***Commissioned organisation***

Secretariat of the Pacific Community, Fiji

### ***Project leader***

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### ***Collaborating institutions***

Consultant, Tropical Horticulture Development, Australia  
Department of Employment, Economic Development and Innovation, Australia  
Koko Siga, Fiji  
Natures Way Cooperative, Fiji

### ***Project budget***

\$869,359

### ***Project duration***

01/01/2009 to 31/12/2012

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Website***

<[www.aciar.gov.au/project/PC/2008/003](http://www.aciar.gov.au/project/PC/2008/003)>

## 3.2 Subprogram 2: Integrated and sustainable agriculture, fisheries and forestry resource management and development

This subprogram aims at developing and implementing strategies to sustainably use and manage natural resources associated with forestry and fisheries production. These are often community-owned and publicly-managed resources that require broadbased and inclusive management strategies, while at the same time recognising that forestry and fisheries provide significant sources of income. The fisheries project cluster has an increased emphasis on freshwater aquaculture and mariculture of sedentary species which provide greater opportunity for income generation at the local level.

<i>Project number</i>	<i>Project title</i>
FIS/2005/108	Freshwater prawn aquaculture in the Pacific: improving culture stock quality and nutrition in Fiji
FIS/2006/138	Developing aquaculture-based livelihoods in the Pacific islands region and tropical Australia
FIS/2006/172	Winged pearl oyster industry development in Tonga
FIS/2007/116 (multilateral)	Improving resilience and adaptive capacity for fisheries-dependent communities in Solomon Islands (WorldFish)
FIS/2008/031	An assessment of the extent of genetic introgression in exotic culture stocks of tilapia in the Pacific
HORT/2007/072	Postgraduate scholarship scheme for the University of the South Pacific, Fiji (see Subprogram 1 for summary)

The forestry project cluster underpins the development of emerging industry opportunities, in particular plantation programs with teak, sandalwood, whitewood and *Flueggea*, while identifying processing opportunities for coconut wood and non-timber forest products.

<i>Project number</i>	<i>Project title</i>
FST/2004/054	Improving value and marketability of coconut wood
FST/2004/055	Domestication and commercialisation of <i>Canarium indicum</i> in Papua New Guinea
FST/2005/089	Improved silvicultural management of <i>Endospermum medullosum</i> (whitewood) for enhanced plantation forestry outcomes in Vanuatu
FST/2006/048	Processing of <i>Canarium indicum</i> nuts: adapting and refining techniques to benefit farmers in the South Pacific
FST/2007/020	Improving silvicultural and economic outcomes from community teak and rosewood plantations in Solomon Islands by inter-planting with <i>Flueggea flexuosa</i> and other Pacific agroforestry species
FST/2007/057	Socioeconomic constraints to smallholder sandalwood in Vanuatu

## **FIS/2005/108: Freshwater prawn aquaculture in the Pacific: improving culture stock quality and nutrition in Fiji**

Freshwater prawn aquaculture, though relatively new to the Pacific, has been identified as having great potential for countries in the region. Until recently, culture of the prawn *Macrobrachium rosenbergii* in the Pacific was confined to Fiji, but now other Pacific island nations have indicated a strong interest in developing their own industries, particularly using *Macrobrachium* as stock. This project therefore seeks to compare the relative productivity of the prawn stock currently farmed in Fiji against selected high-performing stocks available in Asia and also to assist in development of low-cost, nutritionally adequate feeds, based on local ingredients formulated specifically for freshwater prawns.

### ***Overseas collaborating country***

Fiji

### ***Commissioned organisation***

Queensland University of Technology, School of Natural Resource Sciences, Australia

### ***Project leader***

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### ***Collaborating institutions***

Ministry of Fisheries and Forests, Fiji  
Secretariat of the Pacific Community, New Caledonia  
University of the South Pacific, Fiji

### ***Project budget***

\$385,680

### ***Project duration***

01/05/2007 to 30/04/2010

### ***ACIAR Research Program Manager***

Dr Chris Barlow

### ***Website***

<[www.aciar.gov.au/project/FIS/2005/108](http://www.aciar.gov.au/project/FIS/2005/108)>

## **FIS/2006/138: Developing aquaculture-based livelihoods in the Pacific islands region and tropical Australia**

As a component of a previous ACIAR project (FIS/2001/75 *Sustainable aquaculture development in the Pacific islands region and northern Australia*), managed by the Queensland Department of Primary Industries and Fisheries, 14 'mini-projects' were successfully implemented. The mini-project concept was a novel approach to target specific bottlenecks to regional aquaculture. They led to significant capacity building and generated widespread support for their continuation. The final project review in November 2006 specifically recommended that ACIAR consider funding a follow-on project to extend the mini-project concept. The overall aim of the project is to support economically, socially and environmentally sustainable aquaculture in the Pacific islands region, and to assist Indigenous aquaculture in tropical Australia. The project will support the SPC's Regional Aquaculture Strategy and supplement the R&D activities of the SPC Aquaculture Action Plan. The specific objectives are to: identify and implement targeted research activities and technology transfer in response to priority issues identified by Pacific island countries, where possible by drawing on results and expertise developed through completed and ongoing ACIAR, WorldFish and other aquaculture projects; increase institutional capacity amongst Pacific island countries to support and manage research, particularly PNG; and provide technical support for Indigenous Australian aquaculture ventures.

### ***Overseas collaborating countries***

Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu

### ***Commissioned organisation***

James Cook University, School of Marine and Tropical Biology, Australia

### ***Project leader***

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### ***Collaborating institutions***

Secretariat of the Pacific Community, New Caledonia  
University of the South Pacific, Fiji  
WorldFish Center, New Caledonia

### ***Project budget***

\$1,229,660

### ***Project duration***

01/10/2007 to 30/09/2011

### ***ACIAR Research Program Manager***

Dr Chris Barlow

### ***Website***

<[www.aciar.gov.au/project/FIS/2006/138](http://www.aciar.gov.au/project/FIS/2006/138)>

## **FIS/2006/172: Winged oyster pearl industry development in Tonga**

The winged pearl oyster, *Pteria penguin*, is traditionally used for production of half-pearls ('mabe') in Tonga for which there is an export market in Japan and elsewhere. *Pteria penguin* was introduced to Tonga in 1975 by the Tasaki Pearl Co. of Japan. Subsequent research conducted by the Ministry of Fisheries in Tonga and supported by Food and Agriculture Organization of the United Nations' South Pacific Aquaculture Development Project (FAO SPADP) attracted the interest of local investors and there were 25 small pearl farms in Tonga at the end of 2000. The current value of the industry is not known as the majority of pearls are sold locally. A major impediment to the sustainability and expansion of the pearl industry in Tonga is a reliable and adequate supply of oysters. Over recent years, poor recruitment of spat has resulted in the harvesting of adult oysters from the wild, which has further impacted recruitment, and natural spat fall of *P. penguin* in Vava'u is now extremely limited. This project will focus on the developing of appropriate hatchery culture techniques for *P. penguin* and the use of hatchery-propagated oysters for pearl production. Further development of the pearl industry in Tonga is hindered by a lack of knowledge of the culture requirements of *P. penguin*. Research is required to optimise culture methodology and pearl production as a basis for sustainable industry development. This project will address the following major aspects: hatchery culture of *P. penguin* and optimisation of hatchery culture techniques; nursery culture and grow-out—optimising culture techniques; half-pearl production and aspects affecting pearl quality (position, location, time); investigation of round pearl production from *P. penguin*; training of Tonga Fisheries staff in culture methods and pearl production; and training of farmers and members of the Pearl Grower Association.

### **Overseas collaborating country**

Tonga

### **Commissioned organisation**

James Cook University, Department of Marine Biology and Aquaculture, Australia

### **Project leader**

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### **Collaborating institutions**

Ministry of Fisheries, Tonga  
Secretariat of the Pacific Community, New Caledonia

### **Project budget**

\$149,574

### **Project duration**

01/06/2007 to 30/11/2009

### **ACIAR Research Program Manager**

Dr Chris Barlow

### **Website**

<[www.aciar.gov.au/project/FIS/2006/172](http://www.aciar.gov.au/project/FIS/2006/172)>

## **FIS/2007/116: Improving resilience and adaptive capacity of fisheries-dependent communities in Solomon Islands**

More than 70% of people in the Melanesian countries of the Pacific derive their basic needs from subsistence fishing and agriculture. Managing the pressures on coastal reef fisheries is a challenge for local communities, who have relatively few tools and traditions to reconcile the limited resources with the increasing demand for them. In parts of Solomon Islands, customary rights to marine resources are well defined and traditional institutions continue to influence small-scale fisheries management. Within this environment, the potential for successful uptake of enhanced community-based management of traditionally owned small-scale fisheries is high. However, a broader management framework that meets the needs of other environments must be more flexible, and the WorldFish Center aims to develop and test a generic adaptive-management framework and a set of diagnostic tools that feeds directly into its application. The tools and the management framework will form the basis of community-based management plans that will assist communities to address threats from within the domain of the fishery (fish stock, habitat, economic viability) while reducing their vulnerability to external threats (such as ecosystem change, trends in world markets, fuel costs). A sustainably managed marine environment will contribute to a resilient ecosystem, and this increased resilience should further help the communities to better adapt to future economic, social and environmental changes.

### ***Overseas collaborating countries***

Solomon Islands, Fiji

### ***Commissioned organisation***

WorldFish Center, Malaysia

### ***Project leader***

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### ***Collaborating institutions***

Foundation of the Peoples of the South Pacific International, Fiji  
Ministry of Fisheries and Marine Resources, Solomon Islands  
WorldFish Center, Solomon Islands

### ***Project budget***

\$899,900

### ***Project duration***

01/07/2008 to 30/06/2011

### ***ACIAR Research Program Manager***

Dr Chris Barlow

### ***Website***

<[www.aciar.gov.au/project/FIS/2007/116](http://www.aciar.gov.au/project/FIS/2007/116)>

## **FIS/2008/031: An assessment of the extent of genetic introgression in exotic culture stocks of tilapia in the Pacific**

Freshwater aquaculture in Pacific island nations (PINs) began in the 1950s. Since the indigenous freshwater fish fauna in PINs is depauperate (having a limited biodiversity), non-native species were later introduced for culture. Introduction of Mozambique tilapia (*Oreochromis mossambicus*) in the 1950s paved the way for introductions of Nile tilapia (*Oreochromis niloticus*) strains in the 1980s. The Genetic Improvement of Farmed Tilapia (GIFT) program was initiated in the Philippines in the 1990s to address issues of declining stock quality and GIFT stocks were distributed to a number of developing nations—including Fiji as part of ACIAR projects. The number of operating farms in Fiji has increased to approximately 200, but concern has been raised about the quality of farmed stocks. In PNG, stocks of GIFT tilapia were introduced in the late 1990s, but only small numbers of brood-stock survived and all GIFT in PNG are their progeny.

An ACIAR project has distributed improved fingerlings and feed to farmers across PNG since 2005. However, general quality of tilapia in PNG varies, and there needs to be a study of the genetic structure of PNG tilapia populations. Genetic analysis of tilapia from Samoa, Vanuatu, Nauru and Solomon Islands would also provide evidence of the extent of hybrid introgression across the Pacific.

This project seeks to pool the resources of Fiji, PNG, Solomon Island, Vanuatu and Samoan fisheries researchers to achieve a rapid improvement in tilapia culture in the region. A stock of uncontaminated GIFT tilapia is available at WorldFish Centre, Penang, as a reference for GIFT quality. The project will adopt a population genetics approach to identify the extent of *O. mossambicus* introgression in cultured *O. niloticus* stocks in the region and to assess relative levels of genetic diversity in culture stocks of PINs.

### **Overseas collaborating countries**

Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu

### **Commissioned organisation**

Queensland University of Technology, School of Natural Resource Sciences, Australia

### **Project leader**

Dr Peter Mather  
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Email: p.mather@qut.edu.au

### **Collaborating institutions**

Ministry of Fisheries and Forests, Fiji  
National Fisheries Authority, Papua New Guinea  
Secretariat of the Pacific Community, New Caledonia

### **Project budget**

\$148,675

### **Project duration**

15/06/2009 to 14/06/2010

***ACIAR Research Program Manager***

Dr Chris Barlow

***Website***

<[www.aciar.gov.au/project/FIS/2008/031](http://www.aciar.gov.au/project/FIS/2008/031)>

## **FST/2004/054: Improving value and marketability of coconut wood**

In the Pacific region, large areas of coconut palm (*Cocos nucifera*) have grown senile, and copra yields are greatly reduced as a consequence. Production of flooring material from senile stems has been proposed as means of clearing the old plantations while generating some income. There is very high demand for flooring products in Asia, America and Europe, but while market demand is increasing, the supply of suitable resources is decreasing. This project aims to develop appropriate processes and provide the technical information that will underpin the manufacture and broad acceptance of coconut wood (cocowood) in the international high-value flooring market.

### ***Overseas collaborating countries***

Fiji, Samoa

### ***Commissioned organisation***

Queensland Department of Primary Industries and Fisheries, Australia

### ***Project leader***

Dr Michael Kennedy  
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### ***Collaborating institutions***

Coconut Industry Development Authority, Fiji  
Department of Forests, Fiji  
Ministry of Agriculture, Samoa  
Ministry of Natural Resource & Environment, Samoa  
Secretariat of the Pacific Community, Fiji  
Strickland Bros Ltd, Samoa

### ***Project budget***

\$520,552

### ***Project duration***

01/05/2007 to 30/04/2010

### ***ACIAR Research Program Manager***

Dr Russell Haines

### ***Website***

<[www.aciar.gov.au/project/FST/2004/054](http://www.aciar.gov.au/project/FST/2004/054)>

## **FST/2004/055: Domestication and commercialisation of *Canarium indicum* in Papua New Guinea**

The feasibility of domesticating and commercialising the canarium nut in PNG was established by past ACIAR research. Building on those findings is the aim of this research; to ensure sufficient supply of *Canarium indicum* and establish a network for this. The nut is currently used for food but supply falls well below demand. Selecting cultivars that produce nuts regularly and fruit heavily will close this gap. Establishing robust nursery propagation techniques using low-cost systems suitable for community and village uptake will help create a more regular supply of high-quality fresh nuts that can underpin the development of a marketing network.

### ***Overseas collaborating countries***

Papua New Guinea, Solomon Islands

### ***Commissioned organisation***

James Cook University, Agroforestry and Novel Crops Unit, Australia

### ***Project leader***

Dr Jonathan Cornelius  
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### ***Collaborating institutions***

Cocoa and Coconut Institute, Papua New Guinea  
Commodities Export Marketing Authority, Solomon Islands  
Kastom Gaden Association, Solomon Islands  
National Agricultural Research Institute, Papua New Guinea  
Pacific Nuts Co., Vanuatu

### ***Project budget***

\$634,571

### ***Project duration***

01/01/2006 to 31/12/2009

### ***ACIAR Research Program Manager***

Dr Russell Haines

### ***Website***

<[www.aciar.gov.au/project/FST/2004/055](http://www.aciar.gov.au/project/FST/2004/055)>

## **FST/2005/089: Improved silvicultural management of *Endospermum medullosum* (whitewood) for enhanced plantation forestry outcomes in Vanuatu**

The government of Vanuatu intends to greatly expand its plantation estate over the next 18 years, and there is international interest in a whitewood (*Endospermum medullosum*) plantation industry. A significant amount of genetic improvement and propagation research of whitewood has already been carried out, but current plantation practices are poor; seriously reducing the economic returns to landholders and preventing the development of a more substantial industry. This project will develop comprehensive silvicultural prescriptions for community-based plantation forestry with whitewood in Vanuatu. Both monocultures and polycultures will be trialled, with a focus on plantings with and without interspersed agricultural crops (and an emphasis on the important impacts of thinning other species and harvesting root crops to bring in early financial returns).

### ***Overseas collaborating country***

Vanuatu

### ***Commissioned organisation***

Southern Cross University, Australia

### ***Project leader***

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### ***Collaborating institutions***

Department of Forests, Vanuatu  
Melcoffee Sawmills, Vanuatu  
Queensland Department of Primary Industries and Fisheries, Australia

### ***Project budget***

\$660,116

### ***Project duration***

01/07/2007 to 30/06/2011

### ***ACIAR Research Program Manager***

Dr Russell Haines

### ***Website***

<[www.aciar.gov.au/project/FST/2005/089](http://www.aciar.gov.au/project/FST/2005/089)>

## **FST/2006/048: Processing of *Canarium indicum* nuts: adapting and refining techniques to benefit farmers in the South Pacific**

*Canarium indicum* nuts are marketable products with great potential to improve the livelihoods of rural households in the South Pacific. At the moment, the canarium nut industry is small in world terms, but there is strong consumer demand and acceptance of the product in PNG, Solomon Islands and Vanuatu. In these countries, there is great potential for expansion of the domestic markets and developing an export market. A major constraint to increased commercialisation of the *C. indicum* industry is poor quality of the nuts due to postharvest handling and processing. This project is aimed at the development of postharvest handling and processing techniques that optimise quality, while being appropriate for small-scale agriculture. The project will take advantage of expertise and experience in the Australian macadamia industry.

### ***Overseas collaborating countries***

Papua New Guinea, Vanuatu

### ***Commissioned organisation***

University of the Sunshine Coast, Faculty of Science, Health and Education, Australia

### ***Project leader***

Dr Helen Wallace  
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### ***Collaborating institutions***

Department of Forests, Vanuatu  
Hidden Valley Plantations, Australia  
Kava Store Anabrou/Pacific Nuts Co., Vanuatu  
Macro Agribusiness Consultants Pty Ltd, Australia  
National Agricultural Research Institute, Papua New Guinea

### ***Project budget***

\$651,776

### ***Project duration***

01/01/2008 to 31/12/2010

### ***ACIAR Research Program Manager***

Dr Russell Haines

### ***Website***

<[www.aciar.gov.au/project/FST/2006/048](http://www.aciar.gov.au/project/FST/2006/048)>

## **FST/2007/020: Improving silvicultural and economic outcomes for community timber plantations in Solomon Islands by inter-planting with *Flueggea flexuosa* and other Pacific agroforestry species**

A significant community-based teak plantation industry is now emerging in Solomon Islands. Teak is a high-value timber with a strong market demand that is likely to escalate as the supply of timber from natural forests dwindles. This project aims to develop agroforestry systems, suitable for smallholders, based on wider final-crop spacing of teak or rosewood, and row inter-planting with tree species, such as *Flueggea flexuosa*, that could be harvested as a commercial crop at an earlier age. This will address the silvicultural problems that have become evident as a result of grower reluctance to thin pre-commercially. The project will also investigate high-value products from small-size logs of teak, rosewood and inter-planted species. Based on some quite conservative assumptions, annual yield from the teak component alone of a realistic 20,000 hectare estate would be 200,000 cubic metres with a free-on-board value of US\$90 million.

### ***Overseas collaborating country***

Solomon Islands

### ***Commissioned organisation***

Griffith University, Centre for Forestry and Horticultural Research, Australia

### ***Project leader***

Professor Gary Bacon  
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### ***Collaborating institutions***

Hopevale Shire Council, Australia  
Integrated Tree Cropping Limited, Australia  
Kolombangara Forest Products Ltd, Solomon Islands  
Maraghoto Consultancy Services, Solomon Islands  
Ministry of Education and Training, Solomon Islands  
Ministry of Natural Resources, Solomon Islands  
N&S Consulting, Solomon Islands  
Pacific Australia Reforestation Co Ltd, Australia  
Queensland Department of Primary Industries and Fisheries, Australia  
Solomon Islands College of Higher Education, Solomon Islands

### ***Project budget***

\$1,099,750

### ***Project duration***

01/04/2008 to 31/03/2012

### ***ACIAR Research Program Manager***

Dr Russell Haines

### ***Website***

<[www.aciar.gov.au/project/FST/2007/020](http://www.aciar.gov.au/project/FST/2007/020)>

## **FST/2007/057: Socioeconomic constraints to smallholder sandalwood in Vanuatu**

Vanuatu has a large rural population with high population growth and typically low income. There is a need for the development of industries that deliver income into remote communities. Commercial smallholder sandalwood agroforestry is an industry that can help increase both rural income and export earnings. Thus, smallholder farmers in Vanuatu may be able to capitalise on recognised future global shortages of sandalwood by building an industry that sustainably harvests from existing stands and plants the local species *Santalum austrocaledonicum*—for which an earlier ACIAR project (FST/2002/097) identified populations of a quality that meets the international standard. While a marked increase in sandalwood planting has occurred in Vanuatu over the past 5 years, there is a number of technical and socioeconomic factors that limit the expansion of this industry. This project aims to address the knowledge and resource gaps that currently constrain the industry's development. By supporting the development of community sandalwood agroforestry, this project can bring positive social, economic and environmental benefits to the people of Vanuatu. The project outputs may also have relevance to potential sandalwood planting by Indigenous communities in northern Queensland.

### ***Overseas collaborating country***

Vanuatu

### ***Commissioned organisation***

James Cook University, Australia

### ***Project leader***

Dr Tony Page  
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### ***Collaborating institution***

Department of Forests, Vanuatu

### ***Project budget***

\$149,000

### ***Project duration***

01/06/2008 to 31/01/2010

### ***ACIAR Research Program Manager***

Dr Russell Haines

### ***Website***

<[www.aciar.gov.au/project/FST/2007/057](http://www.aciar.gov.au/project/FST/2007/057)>

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### 3.3 Subprogram 3: Improved biosecurity and increased trade in agriculture, fisheries and forestry products

This subprogram aims to support the identification and development of opportunities for domestic, inter-island and international trade for agricultural, fisheries and forest products with a view to increasing the economic growth in PICs. It potentially includes a range of regional and individual country-based activities including market research, strengthening of agribusiness linkages, analysing and increasing the efficiency of value chains, and identifying and developing value-adding opportunities. There are two major emphases. Firstly, underpinning of the European Union-funded Facilitating the Agricultural Trade (FACT) program and providing R&D support for the PHAMA program currently being developed by AusAID and, secondly, providing capacity building in quarantine, biosecurity, market access and market development within the PICs.

<i>Project number</i>	<i>Project title</i>
FST/2004/053	Establishing forest pest detection systems in South Pacific countries and Australia
PC/2004/064	Biological control of 'mile-a-minute' ( <i>Mikania micrantha</i> ) in Papua New Guinea and Fiji

## **FST/2004/053: Establishing forest pest detection systems in South Pacific countries and Australia**

The aim of the project is to reduce the risk of serious damage by exotic pests to the valuable timber resources of Fiji, Vanuatu and Australia by establishing efficient detection systems for target pests in high-hazard sites. Simple and robust technologies involving static trapping systems and sentinel plantings will be developed. In particular, the project aims to minimise losses in the valuable plantations of Fiji and the emerging plantation industry of Vanuatu. Some major target pests are the cedar shoot caterpillar, wood and bark beetle pests of pines and hardwoods, lepidopterous defoliators, guava rust and *Erythrina* gall wasp. This is part of a 'neighbourhood watch' approach to incursion management that will benefit all regional countries, including Australia.

### ***Overseas collaborating countries***

Fiji, Vanuatu

### ***Commissioned organisation***

Queensland Department of Primary Industries and Fisheries, Australia

### ***Project leader***

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### ***Collaborating institutions***

Department of Forests, Vanuatu  
Forestry Tasmania, Australia  
Ministry of Agriculture, Sugar and Land Resettlement, Fiji  
Ministry of Fisheries and Forests, Fiji  
Secretariat of the Pacific Community, Fiji  
Vanuatu Quarantine and Inspection Services, Vanuatu

### ***Project budget***

\$401,824

### ***Project duration***

01/01/2006 to 31/12/2009  
(Project extended from 01/01/2009 to 31/12/2009)

### ***ACIAR Research Program Manager***

Dr Russell Haines

### ***Website***

<[www.aciar.gov.au/project/FST/2004/053](http://www.aciar.gov.au/project/FST/2004/053)>

## **PC/2004/064: Biological control of 'mile-a-minute' (*Mikania micrantha*) in Papua New Guinea and Fiji**

Food production, both of estate crops (sugarcane, vanilla, cocoa, coconut, banana, coffee, kava and palm oil) and in food gardens (taro, papaya and green vegetables), is important for smallholder incomes. This is particularly the case in PNG, Fiji and Samoa. Two species of weeds, 'mile-a-minute' and 'giant sensitive plant' threaten these enterprises. Both are invasive weeds, widespread through each country, and capable of smothering food crops. Yields can be significantly reduced, affecting food security. Manual and chemical controls are too expensive for most farmers. Biological control, established through the identification and release of natural weed predators will be evaluated, based on known agents trialled or in use elsewhere.

### ***Overseas collaborating countries***

Fiji, Papua New Guinea

### ***Commissioned organisation***

Department of Employment, Economic Development and Innovation, Australia

### ***Project leader***

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### ***Project website***

<<http://www.spc.int./lrd/mikania>>

### ***Collaborating institutions***

Ministry of Agriculture, Sugar and Land Resettlement, Fiji  
National Agricultural Research Institute, Papua New Guinea  
Oil Palm Research Association, Papua New Guinea  
Papua New Guinea Cocoa and Coconut Institute, Papua New Guinea  
Secretariat of the Pacific Community, Fiji

### ***Project budget***

\$579,018

### ***Project duration***

01/01/2006 to 31/12/2009  
(Project extended from 01/10/2009 to 31/12/2009)

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Website***

<[www.aciar.gov.au/project/PC/2004/064](http://www.aciar.gov.au/project/PC/2004/064)>

## 4 Projects expected to start in 2009–10

<i>Project number</i>	<i>Title</i>	<i>Countries</i>
AGB/2008/045	Strengthening agribusiness linkages in the Pacific for sustainable domestic and export market development	Fiji Samoa
FST/2008/010	Development and delivery of germplasm for sandalwood and whitewood in Vanuatu and northern Australia	Vanuatu
FST/2008/050	Assembly of teak germplasm for provision to relevant ACIAR partner countries	Indonesia Lao PDR Papua New Guinea Solomon Islands
PC/2008/044	Improving the competitiveness of high-value agricultural, fisheries and forestry products in Pacific island countries	Fiji Kiribati Samoa Solomon Islands Tonga Vanuatu
PC/2009/003	Pacific technology transfer and capacity building for the Pacific Islands	Fiji Samoa Solomon Islands Tonga Vanuatu

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## 5 Pacific islands chapter from the Annual Report 2008–09

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### 5.1 Position

ACIAR's position in the Pacific island countries (PICs) supports research, capacity building and the adoption of successful past projects to assist with reducing unemployment and improving food security through economic growth. Agriculture, forestry and fisheries comprise the majority of livelihoods for many people living in the Pacific. The dependence on these sectors creates an opportunity to increase household income through lifting productivity of, and diversification from, new crops, products and value-adding, together with the development of sustainable forestry and fisheries management systems and the strengthening of marketing and biosecurity.

These research thrusts support the broader AusAID Pacific Regional Aid Strategy 2004–09, which identifies broadbased economic growth as a key theme. The centrality of agriculture in the economies of the Pacific islands presents opportunities to use increased production to achieve economic growth. Creating an environment that supports this growth, and addresses the vulnerability of small island states to changing economic and environmental situations, also requires a more effective implementation of policy.

ACIAR research focuses activities through three subprograms: more productive and diverse farming systems for householders; sustainable natural-resource management and farming systems economics; and marketing and biosecurity. Priorities in 2008–09 included the identification and management of constraints to productivity in high-value crops, sustainable production of oceanic and inshore fisheries, and development of emerging forestry plantation opportunities. Trade liberalisation, policy and constraints to new market opportunities were assessed across the region.

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### 5.2 Achievements

#### Subprogram 1: Improving household incomes and food security through more productive and diverse farming systems

The Asian honeybee (*Apis cerana*) has spread in Solomon Islands since 2002, impacting on the European honeybee (*A. mellifera*), which is kept for honey production. Since Asian honeybees were first detected, the number of hived European honeybees has declined and feral European honeybees have virtually disappeared on some islands—on Guadalcanal Island, they have disappeared completely. Project work is underway to develop a means of suppressing Asian honeybee densities in Solomon Islands, based on the assumption that fewer Asian honeybees will improve the competitiveness of European honeybees. During the past year, a trial was conducted on Savo Island to determine whether the broad-spectrum insecticide fipronil would suppress Asian honeybees. Fresh sugar syrup containing a concentrate of fipronil was used to attract the bees, and colonies under observation that showed clear signs of poisoning were dead within 14 days. No detrimental side effects were observed from using fipronil, and Asian honeybees have only slowly recolonised the site.

The project work has detected the serious microsporidian pathogen *Nosema ceranae*, which has recently been implicated in severe mortality of European honeybees in Europe and the United States of America. The decline of European honeybees on Solomon Islands was thought to have resulted from poor management and from the Asian honeybees being more aggressive. However, high levels of the *N. ceranae*

pathogen were found in Asian honeybees on Savo Island, which is free of European honeybees, indicating that the Asian honeybees may have introduced the pathogen and it may now be playing an important role in the decline of European honeybees. The reproductive behaviour of the varroa mite hosted by the newly arrived Asian honeybees (the Java strain of *Varroa jacobsoni*) was also monitored. This task assumed greater urgency following the discovery in May 2008 that the same mite had developed a newfound ability to reproduce on European honeybees in PNG. Monitoring confirmed that the mite in Solomon Islands still lacks the ability to reproduce on European honeybees.

In both Fiji and Australia, a significant agricultural export, ginger, is being threatened by the build-up of soil-borne diseases. The main diseases found are *Pythium* in Fiji and *Fusarium* in Australia. Production, particularly in Fiji, is declining and affecting the quality of rhizomes, which production systems rely on for new plants. Evidence suggests that increasing the microbial diversity found in root zones of plants can ameliorate soil-borne pathogen damage.

The project is using this knowledge to test and develop recommendations for appropriate management strategies to control diseases in both countries. The project has confirmed that *Pythium myriotylum* is highly pathogenic on ginger in Fiji, and has established that disease epidemics occur when soils become saturated after extended periods of high rainfall and relatively high soil temperatures. In addition, other species of *Pythium* have been isolated from ginger rhizomes in both Fiji and Australia. Investigating suitable control measures for *Pythium* rhizome rot has been problematic in the past due to the discontinuous distribution of the fungus in the soil, the development of disease 'hot spots' and the particular epidemiological features of the disease. Trials are underway using a prepared inoculum and controlled watering regime to replicate the disease spread and allow an understanding of outbreak patterns.

The diamondback moth is the leading pest of brassica crops in the Pacific islands. Both large and smallholder farmers grow brassicas, mainly head cabbage, Chinese cabbage and watercress. With production increasing in recent years, opportunities for the moth to spread have expanded. The use of insecticides is the main form of control. IPM approaches to the diamondback moth have been used elsewhere in the world, limiting insecticide use while maintaining control. A project is developing a locally relevant program for Fiji and Samoa, based on more comprehensive knowledge of the moth's behaviour in each country. Good progress has been made towards demonstrating the effectiveness of IPM approaches to brassica pests in both countries. Trials of IPM were conducted at Nu'u crop research station in Samoa in 2008–09. These experiments confirm that the IPM strategy promotes natural enemy activity and can maintain pest numbers below threshold levels. The trials have found that the number of applications required of a biological pesticide based on *Bacillus thuringiensis* is far fewer than the conventional insecticide applications typically applied.

Two ACIAR-funded projects have worked in parallel with AusAID to develop sensitive tests to detect taro viruses. A follow-up study of a taro production system is determining the yield gains from using virus-free planting material, and is also undertaking a benefit–cost analysis on the economics of using such material. The work has focused on dasheen mosaic virus (DsMV) that commonly affects taro throughout the Pacific region. Despite its widespread occurrence, there have been no studies carried out to determine the impact of this virus on yield of taro in the Pacific. The research team has identified taro plants infected with DsMV and also non-infected plants in both Fiji and Samoa through a series of exhaustive tests. Aphid-proof screenhouses have been erected in both countries and plants are now being grown to determine the relative performance of infected versus non-infected plants.

Many people in Solomon Islands and PNG do not receive enough dietary vitamin A, which is vital in boosting immunity to disease. The orange-fleshed sweetpotato (OFSP)

is a nutritionally enhanced staple containing among the highest concentrations of beta-carotene (the major pro-vitamin A carotenoid) of any food—as little as 100 grams per day can prevent vitamin A deficiency. In Solomon Islands and PNG, a project is surveying promising coloured sweetpotato cultivars for carotenoids, in particular beta-carotene. The screening phase of the project, focusing on Solomon Islands, is now complete, with 77 orange- and yellow-fleshed sweetpotato varieties analysed for tuber levels of beta-carotene. Eighteen local varieties exceeded 100 milligrams per kilogram (mg/kg) beta-carotene (dry weight basis), with seven of these recording over 200 mg/kg; an excellent level.

The most suitable Solomon Islands OFSP varieties identified in the survey have been included in the improved root crops program of the Kastom Gaden Association (KGA), with bulking and distribution occurring at several regional centres. Local knowledge of the health benefits of OFSP varieties was scarce, and an awareness program has led to 22 nutrition workshops now being conducted in Makira, Ulawa, Malaita (Solomon Islands) and around Lae, Marobe province (PNG). The program has now been expanded to include other local nutritious foods, including high-carotenoid bananas, legumes and leafy vegetables.

A feasibility study in 2006 found significant scope to increase production in the Tongan fruit industry and thus increase household income levels, with opportunities for import replacement, growth of the existing domestic market and, in the longer term, Pacific inter-island trade and export to other regional markets.

A project arising from the study is seeking to increase the production, productivity and technical capacity of the Tongan tropical fruits industry with an emphasis on the local market. In March 2009, Tongan project members embarked on a study tour to northern Queensland. The aim of the tour was to give them greater familiarity with the commercial fruit industry, in particular the fruits themselves, nursery practices and nursery enterprises. In Tonga, two nurseries have been identified for use by the project—one for seedling production and one for trials and demonstration plots—and both have undergone significant renovation. Of 35 fruit species identified, 18 were selected to provide propagating material. Seeds of 12 different species were also imported from northern Queensland for establishment, with the seedling nursery now holding 40 fruit species with a stock of around 10,000 seedlings and plants.

Stakeholders in a project to improve plant protection in Solomon Islands have worked over the past 3 years to install a crop-protection capability in the country. Research continues on the seasonal abundance, life cycle and taxonomic status of *Nisotra*, a chrysomelid beetle pest of *Abelmoschus manihot*, an important green leafy vegetable. A local derris variety has been identified as a potent spray against the beetle and, from experience in PNG, is likely to be equally effective against *Amrasca*, a jassid pest. Derris and also neem (a natural pesticide extracted from the neem tree) are being multiplied and distributed.

Lead farmers continue to show others how to employ IPM to control alomae (a lethal virus disease of taro) by understanding its spread. Work to identify natural enemies of the diamondback moth of head cabbage has been unsuccessful, but there is renewed enthusiasm among watercress growers at Mamara, near Honiara, to control the moth and other pests, and to obtain help with marketing.

## **Subprogram 2: Sustainable use and management of forestry and fishery resources**

The bêche-de-mer (sea cucumber) fishery is potentially a multimillion-dollar industry in Solomon Islands; however, persistent overfishing has put the fishery in real danger of collapse. A project set out to work with coastal communities in Solomon Islands to assist them to manage their sea cucumber resources sustainably while gaining better returns for their bêche-de-mer product. But 6 months after the project began, the

Solomon Islands Government implemented a national ban on the collection and export of bêche-de-mer. The project was re-cast in consultation with stakeholders to increase the emphasis on sustainable management of the sea cucumber and to work with communities to assist in dealing with the sudden inability to use this important resource.

The project team has worked with communities in Kia district and Jorio to establish community-based management plans for sea cucumber. At the request of the community, the plans were broadened to cover all marine resources. As a result, in May 2008, the Kia community established a marine managed area covering approximately 450 square kilometres. This work formed the basis for a similar management plan for an area of 170 square kilometres of the Jorio region, which was implemented from September 2008. This project offers a critical case study in a much broader re-analysis of approaches to small-scale fishery management in the developing world.

The focus of another project is culture of the winged pearl oyster (*Pteria penguin*), in support of the cultured pearl industry in Tonga. The first hatchery run in Tonga in May 2008 produced a large quantity of spat (~60,000). The spawning induction and larval culture methods used were based on those developed for other species of pearl oyster in an earlier project. However, relatively cold water temperature and problems with live microalgae culture (food for the larvae) at the facility in Tonga led to the use of a heat-exchange system, to maintain good water temperature in larval culture tanks, and commercially available microalgae concentrates, which eliminate the need for live microalgae culture. This has major potential benefits for hatchery culture of pearl oysters (and other invertebrates) in the region, including reduced reliance on dedicated hatchery infrastructure, reduced hatchery costs and elimination of the need for specialised algae-culture skills.

Prawn farming is currently one of the most important sectors in fisheries in Fiji; however, expansion of prawn farming in Fiji depends on availability of good-quality prawn postlarvae, the supply of which is currently the main bottleneck to growth. A current project seeks to compare the relative productivity of the prawn strain currently farmed in Fiji against a set of selected high-performing stocks available in Asia, and to develop low-cost feeds specifically for the local species. Postlarvae stock of three high-performing culture lines from Indonesia, Malaysia and Vietnam were introduced to Fiji, following 21 days' quarantine, to stock brood-stock ponds at Naduruloulou Research Station. In addition, feed ingredients have been sampled at Viti Levu and taken to the Queensland Primary Industries and Fisheries laboratory in Brisbane for analysis.

A forestry project aims to reduce the risk of serious damage by exotic pests to the valuable timber resources of Fiji, Vanuatu and Australia by establishing efficient detection systems for target pests in high hazard sites. Simple and robust technologies involving static trapping systems and sentinel plantings are being developed. In particular, the project aims to minimise losses in the valuable plantations of Fiji and the emerging plantation industry of Vanuatu. This is part of a 'neighbourhood watch' approach to incursion management that will benefit all regional countries, including Australia. The project has already had a potentially significant impact; the Asian ambrosia beetle (*Xylosandrus crassiusculus*), a pest of potential economic significance to Fiji's mahogany plantations and not previously known in Fiji, was detected during static trapping. The Fiji Forestry Department has shown its commitment by allocating its own funds to continue surveillance work, and has already detected and controlled an incursion of *Semanotus* beetle.

An ACIAR project to improve the value and marketability of coconut wood has completed resource characterisation assessments on material sampled from a range of Fijian and Samoan sites. Recovery data and drying information added to the existing information on cocowood (coconut wood) sawn recovery. In addition to sawn boards, full cross-sectional discs were harvested from sampled logs to provide test specimens

for grain deviation and grain angle measurements. It was discovered that cocowood has three helices, offset to each other, that form a strong interlocked structural cylinder.

Cocowood has a reputation for high silica content, often given as the reason for rapid blunting of tool edges during processing. Studies found that the abrasiveness is more likely attributed to the combination of high levels of a range of mineral compounds (total mineral content is 2–3%) rather than specifically due to silica.

As well, samples covering the range of density found in cocowood were tested for resistance to termites at a northern Queensland site. It was found that, although resistance increases with increasing density, all densities were susceptible to termites.

The government of Vanuatu intends to greatly expand its plantation estate over the next 18 years, and there is international interest in a whitewood (*Endospermum medullosum*) plantation industry. A significant amount of genetic improvement and propagation research of whitewood has already been carried out, but current plantation practices are poor. A project is developing comprehensive silvicultural prescriptions for community-based plantation forestry with whitewood in Vanuatu. Trial plots of whitewood monocultures have been established to deal with issues of weed control, plantation management and spacing–thinning practices. These have been augmented with other trials focusing on agroforestry combinations and mixtures involving other tree species.

*Canarium indicum* nuts are marketable products with great potential to improve the livelihoods of rural households in the South Pacific. At the moment, the canarium nut industry is small but there is strong consumer demand and acceptance of the product in PNG, Solomon Islands and Vanuatu, offering the potential for expansion of the domestic markets and development of an export market. A major constraint to increased commercialisation of the industry is poor quality of the nuts due to inferior postharvest handling and processing techniques. A project aims to develop techniques that optimise quality while being appropriate for small-scale agriculture. Researchers have determined that placing unshelled nuts in water enables the full-kernelled ones that sink to be separated from those with little inside that float. This process is now recommended as a protocol at point of purchase. Floaters will be of lower value and can either be discarded or downgraded. Drying nuts at 40 °C increased the percentage of whole kernels to around 80%. This is a very significant finding as canarium nuts tend to break into small fragments and these are difficult to market. A nutcracker developed for macadamias has been modified for use with canarium, creating strong interest among growers, with many expressing interest in purchasing one.

A significant community-based teak plantation industry is now emerging in Solomon Islands. Teak is a high-value timber with a strong market demand that is likely to escalate as the supply of timber from natural forests dwindles. A project aims to develop agroforestry systems, suitable for smallholders, based on wider final-crop spacing of teak or rosewood, and row inter-planting with tree species that could be harvested as a commercial crop at an earlier age. The project is also investigating high-value products from small-size logs of teak, rosewood and inter-planted species. The initial phase of the project has successfully finished, with demonstration trials established at three Rural Training Centres (RTCs). Work has begun on developing curricular materials for use by the RTCs at the curriculum development unit of the Solomon Islands College of Higher Education. This work is being partially funded through the European Union and is a close collaboration with a similar project introducing smallholder timber plantings into the state school system.

While a marked increase in sandalwood planting has occurred in Vanuatu over the past 5 years, there is a number of technical and socioeconomic factors that limit the expansion of this industry. A project aims to address the knowledge and resource gaps that currently constrain the industry's development. It is investigating the economic prospects for a sandalwood planting industry in Vanuatu, analysing financing and

industry partnership models and marketing options. The project's main output is a prospectus outlining investment potential for sandalwood in Vanuatu.

### **Subprogram 3: Farming systems economics, marketing and biosecurity**

Analysts studying an established tuna cannery in Madang province, PNG, and a proposed cannery in Solomon Islands have used modelling to measure the range of benefits and costs that the host country could expect to flow from a domestic tuna cannery. The model also measures the net benefit to a foreign firm investing in a cannery under a range of possible financial arrangements, and can be used as a tool in negotiating any tax or similar concessions requested by the firm. Partner-country staff members have been fully involved in the survey at the Madang cannery and the subsequent development of the model, and they are now able to apply their knowledge to new proposals as they come forward.

ACIAR has commissioned the University of the South Pacific (USP) to manage and administer a postgraduate scholarship scheme, initially for 3 years, focusing on those wishing to pursue further studies in agriculture, forestry, fisheries and agricultural economics. In 2008, eight postgraduate students were selected and received ACIAR–USP scholarships for postgraduate diploma and Masters programs. Five students are based in Lacuala Campus, Fiji, at the Marine Studies Program and the other three students at the School of Agriculture in Alafua Campus, Samoa.

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## **5.3 Pacific flower industry set to bloom**

Flower cultivation (floriculture) is an infant industry in the Pacific. By contrast, in some Asian and African countries it is big business, and can give smallholders a profitable cash enterprise.

The opportunity for Pacific smallholders to embrace floriculture has led to an ACIAR scoping study to examine the potential for the industry in Fiji and PNG. Flowers such as heliconias, anthuriums, ornamental ginger and orchids thrive in Pacific countries and make spectacular floral displays. But until recently, little regard has been given to their commercial potential. The ACIAR study considered opportunities for small producers to capitalise on this resource.

A major part of the study focused on the rapid expansion of the local non-tourist flower market in Fiji, which followed the establishment of wholesale markets in Nadi (1999) and Suva (2001). Their establishment has given small florists and informal flower-arranging businesses a consistent supply of high-quality inexpensive flowers. The result has been an unprecedented growth in demand. The traditional main market is for weddings and funerals, but a new outlet has emerged for cut flowers in homes and the workplace. The survey highlighted that the future of the industry lay in encouraging these local markets. Investigations into the potential for export found that Fiji had no comparative advantage, especially in relation to the industry in South-East Asia.

The study looked at the prospects for developing other floral lines for the local Fijian market. Guzmanias, ornamental members of the pineapple family and known in the Australian industry as bromeliads, were recommended.

As a result, more than 16,000 improved variety plants were imported from Holland in 2008 and distributed to growers. A horticulturist from Darwin who pioneered the Northern Territory's multimillion-dollar cut-flower industry back in the 1980s worked with women growers in Fiji to help them improve their business practices and bring elements of quality and value to growing and marketing. The study attracted interest from seven other Pacific countries, whose representatives, with the support of the Technical Centre for Agricultural and Rural Cooperation, toured floriculture enterprises in Fiji. They saw much to encourage them and learnt the lessons of success and failure experienced by the Fiji industry.

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## **6 Projects concluded in 2008–09**

### **ADP/2003/069: Policy options for improving the value of land use in smallholder Fijian agriculture**

Appropriate policy interventions need decision-makers who are up to date on relevant information. Analytical tools to support policymaking are also vital. In the case of food, agriculture and natural resource management, inappropriate policies can be detrimental to supporting agricultural development and its important role in broader economic growth.

Fiji is a resource-rich country, but poor in terms of economic growth. The climate, considerable areas of good soils and arable land, and rich marine and forest resources should ensure high levels of agricultural productivity. Although the workforce is relatively small, it is highly skilled. All of these factors, combined with tourism as an ongoing contributor, should combine to result in good economic growth, rather than the poor performances characteristic of the last 15 years, when real economic growth in Fiji has averaged 2.6% per annum.

Agriculture as a sector is vital to improving this overall performance, accounting for 22% of total official GDP, but much beyond this is uncertain. The percentage agriculture contributes to the real economy and the numbers it employs are unknown. This level of uncertainty spreads beyond overall impacts, with levels of production from smallholders to subsistence farmers and land-use patterns and trends also being largely unknown. With significant challenges relating to land tenure, particularly in the sugar industry as a result of reforms, and little information relating to the impacts of production on poor dietary nutrition and increasing obesity levels, appropriate policy interventions are needed, based on sound and accurate information.

The aim of this project is to guide policy intervention in the agricultural sector in order to improve the overall efficiency of the agrifood policy system. This broad aim will be achieved through:

- a measuring and forecasting system of smallholder production, consumption and sales
- understanding price elasticities of major foods
- a market-based model for policy simulations.

#### ***Overseas collaborating country***

Fiji

#### ***Commissioned organisation***

Deakin University, School of Accounting, Economics and Finance, Australia

#### ***Project leader***

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#### ***Collaborating institutions***

Ministry of Agriculture, Sugar and Land Resettlement, Fiji  
Secretariat of the Pacific Community, Fiji

#### ***Project budget***

\$724,445

***Project duration***

01/07/2005 to 31/05/2009  
(Project extended from 01/07/2008 to 31/05/2009)

***ACIAR Research Program Manager***

Dr Simon Hearn

***Project outcomes***

Final report not yet submitted by the project leader

## **ADP/2005/140: Participatory needs assessment for capacity building in extension (Pacific islands)**

One of the key priorities emerging from the Pacific Extension Summit hosted by Tonga in November 2005 was the need to build the capacity of extension staff and associated institutions to undertake participatory research and extension (PARE). In support of the process, this project will conduct a participatory needs assessment. It will study a range of Pacific islands and different institutions, to account for variations in context (e.g. social and cultural differences, previous institutional experiences, farmers needs) and differences in institutional roles (e.g. of tertiary institutions, NGO networking agencies, government extension and research staff).

### ***Overseas collaborating countries***

Fiji, South Pacific general

### ***Commissioned organisation***

University of Queensland, School of Natural and Rural Systems Management, Australia

### ***Project leader***

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### ***Collaborating institutions***

Secretariat of the Pacific Community, Development of Sustainable Agriculture in the Pacific, Fiji  
University of the South Pacific, School of Agriculture and Food Technology, Fiji

### ***Project budget***

\$77,600

### ***Project duration***

01/07/2006 to 30/09/2008  
(Project extended from 01/01/2008 to 30/09/2008)

### ***ACIAR Research Program Manager***

Dr Simon Hearn

### ***Project outcomes***

Final report not yet submitted by project leader

## **ASEM/2004/011: Evaluating domestic tuna fisheries projects**

While PNG has substantial stocks of tuna within its exclusive economic zone, the annual sustainable catch from these resources has probably already been achieved. Further development of the tuna fishery will take the form of a change in the balance between the longline and purse seine fisheries, or a change in the allocation of the purse seine catch. PNG has adopted a policy of domestication of its tuna fishery, which involves encouraging domestic longline vessels and expanding the proportion of the purse seine catch taken by locally based vessels supplying domestic canneries. As locally based purse seiners displace the purse seine fleets of distant-water fishing nations, the level of access fees paid by the latter will decline. Lower access fees are a real cost to PNG and it is important to ensure that the domestic operations which replace those fleets generate at least corresponding benefits for the host nation.

Many foreign companies have expressed interest in setting up tuna-processing operations in PNG. At the time the project was conceived, two plants were in operation with several others proposed. Staff at the National Fisheries Authority needed help in developing and applying a method of analysing the economic benefits and costs to PNG of competing proposals. Other countries in the Pacific islands region were facing similar issues and staff at the Forum Fisheries Agency indicated that they would also like to be involved in the project.

The objective of the project was to develop a benefit–cost model that could be applied to proposals for domestic development of the tuna industry in order to calculate the full range of benefits and costs of any development proposed by a foreign firm. The methodology of a spreadsheet-based benefit–cost model had already been developed, and the aim of the project was to gather the data required to apply this model to the analysis of an established cannery in Madang, PNG, as a case study. The case study would then serve as a template for analysis of proposed processing projects in the region.

### ***Overseas collaborating countries***

Papua New Guinea, Solomon Islands

### ***Commissioned organisation***

University of Queensland, School of Economics, Australia

### ***Project leader***

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### ***Collaborating institutions***

Forum Fisheries Agency, Solomon Islands  
National Fisheries Authority, Papua New Guinea

### ***Project budget***

\$331,435

### ***Project duration***

01/04/2005 to 31/12/2008  
(Project extended from 01/04/2008 to 31/12/2008)

## ***ACIAR Research Program Manager***

Dr Caroline Lemerle

### ***Project outcomes***

Estimates of a range of shadow prices required to measure the opportunity cost to PNG of the resources, principally fish stocks and labour, if a domestic tuna-processing operation were generated. A large sample survey of the domestic labour force in the Madang cannery was undertaken with the cooperation of the company and a great deal of data about employees' personal and employment characteristics was collected and analysed to determine the shadow price of labour. The data were also used to determine the effect of level of education on labour productivity in the cannery.

Shadow prices of tuna catches, foreign exchange, public funds, environmental costs and locally provided services were also considered. The results were incorporated in a spreadsheet benefit–cost analysis using the method earlier developed by Campbell and Brown, which emphasises the net benefits to the host country. A member of the Forum Fisheries Agency staff undertook a similar analysis of a proposed tuna cannery in Solomon Islands.

The benefit–cost model details and measures the range of benefits and costs which the host country could expect to flow from a domestic tuna cannery. Since the model also measures the net benefit to the foreign firm under a range of possible financial arrangements, it can be used as a tool in negotiating any tax or similar concessions requested by the firm. Since partner-country staff members were fully involved in the survey work at the cannery and the subsequent development of the model, they are able to apply their knowledge to new proposals as they come forward. Working on the project has also improved the general level of understanding about the range and size of the benefits and costs of domestication to the countries of the region. The model and its results are available to fishery analysts throughout the region at:  
<<http://www.uq.edu.au/economics/tuna>>.

## **FIS/1997/031: Pearl oyster resource development in the western Pacific**

The small island nations of the Pacific have limited opportunities for export trade. Only non-perishable or high-value products are feasible due to their remoteness. The production of black pearl and cultured mother-of-pearl shell has become an important industry in some Pacific nations. In French Polynesia, the black pearl industry is now their major export earner, with over 2,800 kilograms of cultured black pearls worth an estimated A\$164 million produced in 1994. The Cook Islands are also producing black pearls, earning A\$5.25 million in the mid 1990s.

Many Pacific island countries, particularly those that are atoll-based, have a strong interest in the development of national pearl oyster culture industries, with several now actively working towards this goal. This is a major priority of the government of Kiribati, along with Solomon Islands, Fiji and the Cook Islands.

This project follows directly from a previous project that focused on the pearl oyster resources of Kiribati. During that project, which ran from 1993 to 1996, the natural stock of pearl oysters in Kiribati and Fiji were assessed, along with the rates of spatfall of black-lip pearl oysters in the atoll lagoons of Kiribati. Low technology methods for hatchery and nursery culture of the oysters were developed to allow replenishment of natural oyster stocks. Finally, practices to improve gem quality of pearls were investigated.

The key elements of this second phase of the project are to:

- further develop and refine hatchery culture techniques for black-lip pearl oysters
- investigate nursery and grow-out technology for use in the atolls and open reef systems of Kiribati and other Pacific nations
- examine the rate of spat collection of black-lip pearl oysters and winged pearl oysters in areas of Fiji and determine the growth rate of spat/individuals under culture conditions
- produce a simplified manual on the mariculture methods developed for black-lip pearl oysters during the project
- develop an appropriate business plan for the establishment of a cultured pearl industry in Kiribati.

This project aims to develop the culture of black pearl oysters and establish an industry to help raise the quality of life of people living in the Pacific atoll islands where there are few potential sources of income or employment.

### ***Overseas collaborating countries***

Fiji, Kiribati, Solomon Islands

### ***Commissioned organisation***

James Cook University, Department of Zoology, Australia

### ***Project leader***

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***Collaborating institutions***

Ministry of Agriculture, Fisheries and Forestry, Fiji  
Ministry of Environment and Natural Resources Development, Kiribati  
WorldFish Center, Malaysia

***Project budget***

\$1,424,707

***Project duration***

01/01/1998 to 31/07/2008  
(Project extended from 01/01/2001 to 31/07/2008)

***ACIAR Research Program Manager***

Dr Chris Barlow

***Project outcomes***

Final report not yet submitted by the project leader

## **FIS/2003/051: Improving sustainability and profitability of village sea cucumber fisheries in Solomon Islands**

Marine resources are important industries in the Solomon Islands. Tuna and sea cucumber (bêche-de-mer) fisheries contribute the most value to Solomon Islands' economy; both worth millions of dollars annually. Sea cucumbers have been a valuable export commodity, with the export price rising in recent years, at a time when other commodity prices are falling. Another important aspect of utilising marine resources is food and income for smallholders in coastal communities. Sea cucumber harvesting, usually conducted at the village level, creates significant income flows that stream throughout villages and nearby communities. Recent civil unrest has limited the opportunities available to villagers to earn income. One consequence of this has been increased harvesting of sea cucumber.

Increased harvests in the early 1990s, a time of economic hardship, led to a sharp rise in catches that soon proved unsustainable. Soon after, harvests declined dramatically. Numbers of sea cucumber have gradually risen but with economic hardship again prevalent following civil unrest, many coastal communities are again increasing harvests, threatening a collapse of fisheries. This would be the worst possible result given that income streams would dry up. Sustainable management is needed to ensure that coastal communities can continue to utilise this vital resources without compromising its long-term value.

The project aimed to facilitate this through sound, community-based management of the sea cucumber fishery, working in collaboration with the national Department of Fisheries and Marine Resources and the provincial governments, and to ensure incomes are available to fishers for the bêche-de-mer that they produce. These objectives were to be achieved by:

- working with selected communities to develop sustainable, community-based sea cucumber fisheries and producing high-quality bêche-de-mer
- assisting communities to obtain improved returns for their bêche-de-mer product.

### ***Overseas collaborating country***

Solomon Islands

### ***Commissioned organisation***

WorldFish Center, New Caledonia

### ***Project leader***

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### ***Collaborating institutions***

Department of Fisheries and Marine Resources, Solomon Islands  
WorldFish Center, Solomon Islands

### ***Project budget***

\$400,000

### ***Project duration***

01/01/2005 to 31/12/2008

## ***ACIAR Research Program Manager***

Dr Chris Barlow

### ***Project outcomes***

From 2005 to 2008, WorldFish worked with communities in Kia district (Santa Isabel island, Isabel province) and Jorio (Vella Lavella island, Western province) to establish community-based management plans for sea cucumber. At the request of the community, the plans were broadened to cover all marine resources. At the community level, the project included a participatory process of household interviews and focal-group discussions to facilitate the development of a management plan. Beginning in Kia community, the project expanded in 2007 to include all of Kia district and led to the establishment of a marine managed area covering approximately 450 square kilometres. The management plan was officially launched in Kia on 23 May 2008, setting a time-mark from when lessons will be learned from monitoring and compliance with the management plan, and applied with adaptive management.

The suite of indicators is now open to testing through the implementation of the plan and the durability and outcomes from the plan over the coming years will be the ultimate test of the effectiveness of the process taken to get to this stage. Through a similar participatory process, a management plan for an area of 170 square kilometres of the Jorio region was implemented from September 2008. Responsibilities for administration, enforcement and penalties now rest with the communities through their own governance structures. Community technical teams have been trained in simple techniques for reef surveys of benthic invertebrates. The methodology was purposely kept as low-cost as possible and the teams could independently conduct the technical component of surveying. But the distance of some monitoring sites requires a boat with an outboard motor and therefore fuel. WorldFish continues to assist the teams with data interpretation and in seeking funds to sustain monitoring activities into the future.

In mid 2008, representatives from both Kia and Jorio (along with representatives from related projects in other parts of the country) attended the first community workshop for coastal fisheries held by the Solomon Islands Ministry of Fisheries and Marine Resources. This watershed workshop had the goal of 'netting community knowledge' to better ensure coastal community participation in Solomon Islands inshore and coastal fisheries management. It was an important start to recognising, and ultimately implementing, the work of communities such as Kia and Jorio, in fisheries legislation and policy.

This project was a critical case study in a much broader reanalysis of approaches to small-scale fishery management in the developing world. Many of the concepts needed for practical management of such data-sparse fisheries, and ways of communicating them to participants in the fishery, were developed and tested within the project and are now being further refined through a new ACIAR-funded project that has developed from the experiences gained.

## **FST/2003/049: Review of portable sawmills in the Pacific: identifying the factors for success**

Portable sawmills are cheaper to use than conventional mills, causing less collateral damage than conventional harvesting. One important benefit is in allowing small-scale operators to undertake high-quality sawmilling and gain much of the value added in the production of milled forest products. These benefits saw more than 7,000 portable mills purchased throughout the Pacific. Less than 20% are believed to be operating effectively. A lack of technical expertise, poor maintenance and market accessibility are behind this low rate. These causal factors are being evaluated by studying a range of mill operations to design strategies for more effective usage. Appropriate recommendations will then be provided to key stakeholders for dissemination.

### ***Overseas collaborating countries***

Papua New Guinea, Solomon Islands

### ***Commissioned organisation***

Australian National University, School of Resources, Environment and Society, Australia

### ***Project leader***

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### ***Collaborating institutions***

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Papua New Guinea Ecoforestry Forum, Papua New Guinea  
Papua New Guinea Forest Authority, Papua New Guinea  
Secretariat of the Pacific Community, Fiji  
Solomon Islands Development Trust, Solomon Islands  
University of Melbourne, Australia  
University of Technology, Papua New Guinea

### ***Project budget***

\$149,989

### ***Project duration***

01/04/2005 to 31/08/2008  
(Project extended from 01/10/2007 to 31/08/2008)

### ***ACIAR Research Program Manager***

Dr Russell Haines

### ***Project outcomes***

Final report not yet submitted by the project leader

## **LPS/2003/054: Feeding village poultry in Solomon Islands**

Village poultry are a vital source of food security and, in many cases, supplemental income for smallholder farmers. In Solomon Islands, an estimated 22,000 families have poultry, producing 210,000 birds and 2.64 million eggs a year. Both live birds and eggs are sold, usually in local markets. Poultry production by village families has considerable scope for improvement. Only one bird is consumed on average each month along with some eggs, with this likely to vary given other enterprises and income streams. On average, 30% of infants are underweight, with malnutrition the cause, despite an available source of protein and nutrition through eggs and birds. Two main barriers exist to increased production: better feeds and the size of the average family's flock.

Kastom Gaden Association (KGA), a local NGO, estimates that between 20 and 40 chickens per family would allow eggs to be eaten and sold each day as well as a regular consumption of chicken meat. Existing feeding systems, however, limit the number of chickens that can be run. This is despite a wide variety of local feed resources being available, including root crops, fruit and native plants. Identifying feeds for village chickens that would result in a higher nutritional intake and more cost-effective poultry systems will produce more birds and eggs. This will boost income and begin to change the current system, ensuring more chickens are run and families see greater financial and dietary returns.

The project aimed to develop improved systems of village-based poultry production, through:

- identifying rations for village-based layer and meat birds based on locally available feedstuffs
- interacting with farmers and farmer groups to evaluate, disseminate and communicate the value of rations based on local feedstuffs.

### ***Overseas collaborating country***

Solomon Islands

### ***Commissioned organisation***

South Australian Research and Development Institute, Pig and Poultry Production Institute, Australia

### ***Project leader***

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### ***Collaborating institutions***

Department of Agriculture and Livestock, Solomon Islands  
Kastom Gaden Association, Solomon Islands  
National Agricultural Research Institute, Papua New Guinea  
Solomon Islands College of Higher Education, Solomon Islands

### ***Project budget***

\$523,159

### ***Project duration***

01/01/2005 to 31/10/2008

(Project extended from 01/01/2008 to 31/10/2008)

### ***ACIAR Research Program Manager***

Dr Peter Horne

### ***Project outcomes***

To evaluate rations for village chickens based on locally available feedstuffs, a poultry production research unit was built at Solomon Islands College of Higher Education (SICHE) in collaboration with the Ministry of Agriculture and Lands (MAL) and KGA. This unit at SICHE enhanced research capacity, encouraged hands-on training of students in poultry production and strengthened the links between collaborators. Four experiments were completed to evaluate the performance of village chickens on diets comprising local feed resources compared to an imported commercial ration. The local diets included various combinations of sorghum, pigeonpea grain and leaves, fresh coconut and cassava, papaya fruit and leaves, maize, mung bean and fishmeal. The results showed that egg production and feed efficiency were lower for birds fed on local diets compared with the imported commercial ration. However, the cost of imported feed was five times higher than the local rations.

To interact with farmers and farmer groups on poultry feeding, a survey was initially carried out to obtain information on current feeding practices used by village farmers. The survey results showed that most farmers thought chickens were easy to care for and a good enterprise for providing cash income and extra food for the family. Other farmers were interested in farming but there was a shortage of village chickens. The problems farmers faced were a lack of available information and training on local chicken management. Many villagers had tried keeping poultry, but lacked knowledge on how to manage them.

To disseminate the research information, KGA conducted farmer workshops on improved poultry feeding and management with over 100 village participants in Malaita and Western provinces. KGA also hosted 30 farmer attachment programs at an upgraded KGA Burns Creek poultry extension facility. The farmers learnt how to feed, house and care for village poultry. The KGA attachment program generated good results with the majority of students putting into practice the feeding and management skills learnt. One-page information leaflets on best-practice feeding methods for village poultry were made available for village farmers.

In Australia, work focused on the role of traditional herbs in organic poultry farming. There is a growing interest in using herbs as a substitute for synthetic antibiotics as a result of the ban in the European Union on the inclusion of antibiotics in poultry diets. Herbs used in the trials were rosemary, thyme, fennel and sage. The team assessed the performance of the broilers grazing on a commercial diet supplemented with herbs and compared them with birds fed a commercial broiler diet. The results showed that grazing on fresh herbs did not significantly influence bird growth, feed conversion or the flavour of the meat but improved the crop weight of the birds. Fresh herbs could be included in a free-range pasture for birds to graze and give the potential for the organic poultry industry to develop a production system based on herbs as a forage source.

## **LPS/2006/149: Using local feeds to reduce the cost of pig and poultry production in Tonga**

The major constraints to the development of a commercial pig and poultry sector in Tonga are the lack of a local feed-manufacturing industry, the high cost of imported feed, and cheap meat and egg imports. This has led to a reduction in the number of pig and poultry producers over recent years, despite the adequate local supplies of cassava, sweetpotato, fresh coconut and maize that could form the basis of the feed industry. This project aimed to establish a local livestock feed manufacturing industry to revitalise the Tongan pig and poultry industries. Project members provided training for Tongan government staff and key producers, enabling them to learn about profitable pig and poultry feeding systems developed in current ACIAR pig and poultry projects in Indonesia, PNG and Solomon Islands. They also learnt to operate mini mills and received instruction on how to feed pigs and poultry using concentrates, ration dilution and whole-ration formulation out of local feed resources. Farmers and students observed demonstrations of feeding systems suitable for Tonga, both on-station at the Livestock Division of the Ministry of Agriculture, Food, Forests and Fisheries (MAFFF ) and at Tupou College (which trains high school students in pig and poultry production).

### ***Overseas collaborating country***

Tonga

### ***Commissioned organisation***

South Australian Research and Development Institute, Australia

### ***Project leader***

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### ***Collaborating institutions***

Ministry of Agriculture, Food, Forestry and Fisheries, Tonga  
Ministry of Community, Employment, Youth and Sports, Tonga  
Tupou College, Tonga

### ***Project budget***

\$110,736

### ***Project duration***

01/05/2007 to 31/10/2008

### ***ACIAR Research Program Manager***

Dr Peter Horne

### ***Project outcomes***

Project members held a workshop for partners at MAFFF Headquarters, Nuku'alofa, Tonga, in October 2007. Participants agreed at the meeting that the pig and poultry farmers' association should establish a mini-mill in partnership with MAFFF. They recommended the purchase of a flake mill, drier, hammer mill and mixer. Three Tongan livestock farmers and a government scientist undertook a study tour to Solomon Islands and PNG. They spent 2 days in Solomon Islands and 5 days in PNG and met

with local research staff and NGOs to learn about the operation of mini mills. The Tongan delegation received advice on how to feed pigs and poultry using concentrates, ration dilution and whole-ration formulation out of local feed resources.

Following the study tour, all the project partners discussed suitable feeding systems that could be used for pigs and poultry in Tonga based on examples observed in PNG and Solomon Islands. A mini mill was purchased from PNG and shipped to Tonga for establishment on a commercial egg farm. Feeding trials with pigs and poultry to demonstrate the feeding systems that incorporate local feeds were run at Tupou College and on a commercial egg farm.

For the pig feeding trial, pigs weighing 10–20 kilograms were allocated to three dietary treatments over a 4-week period: 1. a village diet (containing fresh cassava, fresh coconut and fresh sweetpotato vines); 2. a milled diet (containing 80% of local feed resources); and 3. a commercial, imported grower diet.

For the poultry trial, adult layers were allocated to three dietary treatments over 8 weeks: 1. a commercial, imported layer diet; 2. a commercial, imported layer diet diluted with 30% copra meal; and 3. a village diet (containing maize, copra meal, fishmeal and cassava meal).

In the pig trial, the commercial diet resulted in better growth by comparison with the village diet. Likewise, in the layer trial, superior egg production was noted when birds were fed the commercial layer diet compared with the village diet. However, the birds fed the diet diluted with 30% copra meal had equivalent performance to birds fed the commercial diet only, raising the potential for using dilution of commercial feeds with locally abundant feed resources as a feeding system. Currently, the feeding trials are being repeated using good-quality copra meal, since the copra meal used in the pig and poultry feeding trials was spoiled during the drying process.

The use of local copra meal to dilute commercial rations is recommended as the best feeding system tested so far in Tonga for pigs and poultry. This feeding system could lead to an expansion of the smallholder egg and chicken meat and pork sectors and make a significant contribution to the meat requirements of the country.

## **PC/2006/109: The potential for increasing the value of cocoa industries in Solomon Islands, Vanuatu, Fiji and Samoa**

Cocoa production in Solomon Islands, Vanuatu, Fiji and Samoa can make a substantial contribution to economic growth. It can also provide countries with the opportunity to rehabilitate long-standing industries based on higher-value niche-market opportunities. All four countries have the geographical environment for cocoa production, however they face significant production, technical management and marketing problems. Improving these aspects can increase farmer income, as well as building capacity. This project is investigating the current status of the cocoa industries in these countries to identify opportunities for industry development and potential constraints.

### ***Overseas collaborating countries***

Fiji, Samoa, Solomon Islands, Vanuatu

### ***Commissioned organisation***

Secretariat of the Pacific Community, Fiji

### ***Project leader***

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### ***Collaborating institutions***

Koko Siga, Fiji  
Mars Asia Pacific, Australia

### ***Project budget***

\$100,000

### ***Project duration***

01/06/2008 to 28/02/2009

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Project outcomes***

Final report not yet submitted by the project leader

## **PC/2008/029: Cost-effective disinfestation treatments for Pacific horticulture—scoping study**

The Australian and New Zealand governments, via the Pacific Agreement on Closer Economic Relations (PACER), have helped to encourage increased trade between Pacific island countries as well as with Australia and New Zealand. Some countries (such as Fiji) already have market access to Australia and New Zealand with a number of agricultural commodities such as taro, ginger, yam, sweetpotato and ornamentals. There is also the potential for Pacific island countries to export a new range of commodities, but to date their inability to meet biosecurity requirements limits their capacity to export. Crops are often fumigated with methyl bromide before export and again on arrival in Australia or New Zealand when live insects, nematodes or snails are found, diminishing quality and shelf life or completely destroying the produce. Good alternative treatments exist but need to be developed for local crops and conditions. Providing acceptable treatment technologies and facilities would encourage growers and exporters to increase the volume and range of commodities traded.

The SPC has developed a preliminary proposal for a project to study hot-water treatment disinfestation protocols for Pacific crops. As part of the project development process, this scoping study helped to confirm the priority commodities for research and countries where the project would take place, and to determine what disinfestation procedures other than hot-water treatment were appropriate to include in the project. The study also made recommendations on a lead organisation along with suitable collaborators and commercial partners. The tasks involved a 1-week mission to Fiji and a desk study in Australia, and its report addressed the issues raised by the reviewers of the project proposal.

### ***Overseas collaborating country***

Fiji

### ***Commissioned organisation***

Department of Agriculture and Food, Western Australia, Australia

### ***Project leader***

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### ***Project budget***

\$36,925

### ***Project duration***

27/03/2009 to 30/06/2009

### ***ACIAR Research Program Manager***

Dr Richard Markham

### ***Project outcomes***

The need and scope of the project was assessed through site visits and meetings with major stakeholders in Fiji, including growers, government regulatory, extension and research staff, SPC experts, commercial exporters and marketing agencies. Priority crops were identified as taro, cut flowers and foliage. The study team identified Fiji as

the priority country in which to initiate the project, since it has the most experience in exporting agricultural produce and also the best infrastructure to conduct research, development and extension.

After Fiji, countries such as Samoa, possibly Tonga, and PNG should be included as the R&D and export programs are developed and experience gained in the new technologies.

The study team identified disinfestation technologies with the best potential to satisfy quarantine and quality criteria after treatment as hot-water treatment (HWT) for taro and some species of cut flowers, and fumigation using a commercial ethyl formate gas mixture (Vapormate) for external insects of taro roots, leaves, cut flowers and ornamental foliage.

The appropriate lead organisation was named as the Department of Agriculture and Food, Western Australia, working jointly with SPC as the in-country project coordinator and implementer. The main collaborator named was the Ministry of Agriculture, Fiji, especially for the research, extension and quarantine services. Commercial partners are all the major exporters of taro and specialised floriculture grower exporters.

The outcomes of this study are:

- revision of the disinfestation project proposal to allow it to proceed to phase 2 of implementation by cooperating agencies
- methodology for research on HWT and fumigation to achieve market access
- an approach towards improving the post-farmgate supply-chain process for taro and cut flowers
- methodology for commercial development of the selected disinfestation treatments
- a process of training Fijian staff for scientific capacity building.

Action is now required to present the revised project proposal to all collaborating parties and institutions and negotiate service delivery and implementation.

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## 7 Impact Assessment Program

ACIAR has a long history of assessing the impact of its research and development (R&D) investments. These assessments have provided valuable lessons in improving the selection, design and delivery of R&D projects. They have also been useful for demonstrating the value of ACIAR as part of Australia's international development assistance program. The two main types of finished project assessments are adoption studies and impact assessments.

Adoption studies became part of ACIAR's evaluation strategy in 2003–04. They are undertaken by project leaders on completed projects where ACIAR expenditure was greater than \$400,000, and for which there is no follow-on project. The primary purpose of these evaluations is to provide information on the uptake of the project results, three years after a project's completion. In addition, where there has been no adoption, information on the reasons for the lack of uptake is sought. Information from adoption studies, of which over 50 have been completed to date, is used to support ACIAR's investment decision-making process, in project development and design and in the selection of projects for impact assessment.

Impact assessments involve extensive analysis of the adoption and impact of the project results, both in the partner country or countries and in Australia. Over the last six years, there has been an increased focus on undertaking thematic impact assessments, rather than assessing the impact of individual projects. The credibility of ACIAR impact assessments has been enhanced by several meta evaluations and the use of independent consultants to undertake the studies. In addition, stratified random-sampling techniques are used, where practical, to select projects for impact assessments. ACIAR has also published guidelines for assessing the impacts of its research activities to ensure rigour and consistency in all future assessments.

As part of the evaluations, areas for practical methodology innovations were identified and some advances in impact assessment methods were made. In recent years, the focus has been on developing and implementing frameworks to measure the returns to ACIAR's investment in capacity building. Over 50 full benefit–cost assessments have been published in ACIAR's impact assessment series.

ACIAR has developed a database for systematically recording all the adoption studies and impact assessments and providing important summary information to support decision-making. This continues to be developed, expanded and refined to ensure maximum use is made of the results of these impact assessment efforts.

ACIAR has begun the process of linking its impact assessment work to the activities of the Australian Government's Office of Development Effectiveness and will strengthen this link during 2009–10.

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### 7.1 Impact assessments undertaken in 2008–09

This year, five impact assessment studies were undertaken, with details reported below. The ACIAR Database for Impact Assessments became operational, with a report describing the framework and functionality of the database published in the Impact Assessment Series. The database allows a comprehensive update of previous analysis of returns to ACIAR's investments in R&D. Based on an analysis of the quantitative information obtained from 37 ACIAR impact assessment studies, the total cost of the investment in these projects is around \$234 million in net present value terms (2008 dollar equivalents). Of these costs, \$128 million are direct ACIAR costs. In total, these projects generated an estimated total benefit of \$12.6 billion, with the benefits attributable to ACIAR being \$6.8 billion. The benefit:cost ratio for all the projects evaluated is around 54:1.

This study also contained a significant qualitative element, which involved drawing evidence on the appropriateness, effectiveness and efficiency of ACIAR's activities within the broad context of Australia's aid delivery system. There is a particular emphasis on whole-of-government and public good issues, which demonstrates that ACIAR is an effective and efficient funding agency. Despite its relatively small size on the international aid and research for development arena, ACIAR performs well, ensuring that the research it invests in meets the needs of its stakeholders, makes a difference to the livelihoods of the poor and aligns within the broader Australian aid program.

### **Two-stage grain drying in the Philippines**

Grain drying is a major issue in all grain-producing countries, presenting particular problems in humid, tropical climates. ACIAR and the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development, in association with other Philippine research organisations, supported a major effort in this area dating back to the early days of ACIAR's activities. The assessment indicated that the grain-drying technologies had not been adopted in the Philippines despite evidence of adoption in other collaborating countries in the Asian region and in Australia. This lack of adoption and impact was due to the structure of the grain industry in the Philippines, with the grain-trading industry dominated by small-scale operators. As a consequence, economies of scale do not exist in grain trading, and the grain-drying technologies developed are therefore currently not profitable. These lessons will help guide future investments in research, in particular the interactions between local industry and policy conditions and research activities. The analysis undertaken suggests that, if the structure of the grain industry in the Philippines changes, application of the grain-drying technologies developed could yield returns as high as those gained in other countries.

### **ACIAR Database for Impact Assessments (ADIA): an outline of the database structure and a guide to its operation**

This report describes the development of a database established as the repository of information from impact assessments. The database provides a mechanism to choose a stratified random sample of completed projects for impact assessment. As well, on the basis of the data entered, the database can be used to manipulate information and present it in various forms for reporting and analytical purposes.

### **Salinity reduction in tannery effluents in India and Australia**

The tanning industry is an important contributor to economic output in India, particularly in the state of Tamil Nadu, which produces around 60% of India's total leather production. Tannery effluent, however, is high in salinity and has caused significant environmental damage, including increased salinity in groundwater and river systems, contaminating productive agricultural land and drinking water. Reducing the salinity of effluent was a common challenge for both Indian and Australian tanners. ACIAR provided funding of \$0.8 million in nominal terms out of a total budget of \$1.9 million for a project to reduce the salinity of tannery effluent by developing technologies that reduced salt inputs. The project was undertaken by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Textile and Fibre Technology in partnership with the Central Leather Research Institute in India. It is estimated that, in constant 2008–09 dollars, the project will deliver benefits to Indian tanners of around \$62.0 million in present value terms, using a discount rate of 5%. Of these total benefits, \$28.1 million can be attributed to ACIAR on a cost-share basis, resulting in a net benefit of \$59.9 million; a benefit of \$29.60 for every dollar spent. The internal rate of return on the project is estimated to be 35.1%.

## **Integrated management of insect pests of stored grain in the Philippines**

Protecting stored grain in tropical areas relies on the use of pesticides. ACIAR supported a series of four research projects to develop effective alternative control options for major pests of stored grains in the tropical areas of Australia, the Philippines, Malaysia, Thailand and China. The combined research involved the Bureau of Postharvest Research and Extension and two research groups in Australia—the Queensland Department of Primary Industries and CSIRO. This assessment focused on the impact in the Philippines and, through surveys of members of the grain sector, found that there has been significant adoption of the outcomes. This has been primarily by the larger storage and handling sectors of the rice and other grain industries. The study found that the return on this significant investment by all parties was substantial, with a net present value of research gains to the Philippines of \$1,696 million. This provides a benefit:cost ratio of approximately 174:1 and an internal rate of return of 46.6%.

## **Analysis of ACIAR's returns on investment: appropriateness, efficiency and effectiveness**

Following the development of an impact assessment database, a study was commissioned to analyse the results of 37 quantitative impact assessments. In total, the benefits to ACIAR research calculated in these impact assessments are estimated at \$12.6 billion for a total investment of approximately \$234 million in 2008 dollar present value terms. Of the total benefits, \$11.4 billion accrued to developing countries, with \$1.2 billion in benefits to Australia. The average benefit:cost ratio across all assessed projects is 54. Of the \$12.6 billion, the benefits directly attributable to ACIAR funding are estimated at \$6.8 billion for an investment of \$128 million across the assessed projects. Given that total ACIAR expenditure since inception is estimated at \$2.1 billion, the returns from assessed research effectively pay for total expenditure more than three times over.

This impact assessment demonstrates the appropriateness, effectiveness and efficiency of ACIAR-funded research over a long period of time. A key finding is the importance of partner-country scientific, research and extension capacity. ACIAR's research tends to be more successful in countries with strong capacity in these areas, while countries where uptake of ACIAR research has been low tend to have lesser in-country capacity. Alignment of priorities agreed by partner countries and ACIAR is also an important factor in uptake of research.

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## **7.2 Impact assessments planned for 2009–10**

### **Key performance indicators**

- at least five impact assessment studies of completed projects published
- impact assessment review of at least one thematic area in Indonesia
- impact assessment of at least one thematic area in Papua New Guinea (PNG)
- assessment of the impact of international agricultural research centre (IARC) activities in ACIAR's mandate region
- 2009–10 project leader adoption studies published for selected projects completed in 2005–06
- links established with partner-country, IARC and Australian impact assessment groups.

## **Key priorities**

### ***Project-specific***

- Publish five assessments in 2009–10 of the impacts of completed projects (this year, with an emphasis on increasing the number of impact assessments undertaken in ACIAR's two largest partner countries, Indonesia and PNG)
- Where possible and appropriate, increase emphasis on the type and quantity of data used in the impact assessments, in an effort to further strengthen their rigour and credibility
- Review and publish the 2009–10 project leader adoption studies for the set of large projects concluded in 2005–06.

### ***Capacity building***

- Develop collaboration with Consultative Group on International Agricultural Research (CGIAR) centres in impact assessment activities, particularly of projects jointly funded through ACIAR
- Provide feedback on the implications of impact assessment studies for research project development and management within ACIAR, through 'lessons learnt' style meetings with all staff
- Enhance clarification and estimation of the outcomes of new projects, by assisting project research groups during peer review of their proposals and by including impact analysis in the project design; in particular, provide summaries of the implications of impact studies to meetings of these groups.

### ***Thematic studies***

- Review the application and impact of ACIAR natural resource management research activities in the Philippines
- Undertake an assessment of ACIAR's animal health and/or forestry research in Indonesia
- Commission a comprehensive review of all ACIAR impact assessment studies. This will expand its focus to include issues such as the public good basis for funding this type of collaborative research. It will also disaggregate the benefits to more accurately identify those attributed to other funders of the research and, especially, the development; and will look particularly for whole-of-government and between-government interactions; for example, the shares of benefits to other aid donors such as the Australian Agency for International Development (AusAID)
- Commission two studies to assess the impact of IARC activities in ACIAR's mandate region—the first, review of past CGIAR impact assessment studies and development of an overview of the impact on the Asia–Pacific region and individual countries within this region; and the second, an assessment of the impact of at least one centre's genetic improvement program in ACIAR's mandate countries
- Work closely with the Office of Development Effectiveness (ODE) to ensure ACIAR's impact assessment work maintains close links with the ODE's activities.

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## 8 Appendix 1: ACIAR Contacts

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### 8.1 R&D Program

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## 9 Appendix 2: ACIAR Publications

This is a list of ACIAR publications produced in 2008–09. Print copies are available by emailing <comms@aciarc.gov.au>, or electronic versions may be downloaded from ACIAR's website <www.aciarc.gov.au>.

Monographs	
120c	<i>Better-practice approaches for culture-based fisheries development in Asia</i> [Tamil translation], Sena S. De Silva, Upali S. Amarasinghe and Thuy T.T. Nguyen (eds), 2009, 117 pp.
120d	<i>Better-practice approaches for culture-based fisheries development in Asia</i> [Sinhalese translation], Sena S. De Silva, Upali S. Amarasinghe and Thuy T.T. Nguyen (eds), 2009, 115 pp.
129a	<i>Diagnostic manual for plant diseases caused by fungi and fungal-like pathogens</i> [Vietnamese translation], Lester W. Burgess, Timothy E. Knight, Len Tesoriero and Phan Thuy Hien, 2009, 210 pp.
134	<i>Growing peanuts in Papua New Guinea: a best management practice manual</i> , Michael Hughes, Rao C.N. Rachaputi, Lastus Kuniata and A. Ramakrishna, 2008, 77 pp.
135	<i>Sea cucumber fisheries: a manager's toolbox</i> , K. Friedman, S. Purcell, J. Bell and C. Hair, 2008, 34 pp.
136	<i>Measuring plant-associated nitrogen fixation in agricultural systems: theory and practice</i> , Murray Unkovich, David Herridge, Mark Peoples, Georg Cadisch, Bob Boddey, Ken Giller, Gruno Alves and Phillip Chalk, 2008, 258 pp.
137	<i>Jorani and the green vegetable bugs</i> [in English], Bob Martin and Deb White, 2009, 48 pp.
137a	<i>Jorani and the green vegetable bugs</i> [Khmer translation], Bob Martin and Deb White, 2009, 48 pp.
138	<i>Landcare in the Philippines: a practical guide to getting it started and keeping it going</i> , Landcare Foundation of the Philippines, Inc., 2009, 144 pp.

Proceedings	
128	<i>Management of classical swine fever and foot-and-mouth disease in Lao PDR</i> , J.V. Conlan, S.D. Blacksell, C.J. Morrissy and A. Colling (eds), 2008, 100 pp.
129	<i>Silvicultural management of bamboo in the Philippines and Australia for shoots and timber</i> , David J. Midmore (ed.), 139 pp.
130	<i>Efficient nutrient use in rice production in Vietnam achieved using inoculant biofertilisers</i> , I.R. Kennedy, A.T.M.A. Chudhury, M.L. Kecskés and M. Rose (eds), 2008, 136 pp.

Impact Assessment Series Reports	
59	<i>Two-stage grain drying in the Philippines</i> , Agnes Chupungco, Elvira Dumayas and John Mullen, 2008, 50 pp.
60	<i>ACIAR Database for Impact Assessments (ADIA): an outline of the database structure and a guide to its operation</i> , Centre for International Economics, 2009, 38 pp.
61	<i>Salinity reduction in tannery effluents in India and Australia</i> , Hayden Fisher and David Pearce, 2009, 53 pp.
62	<i>Integrated management of insect pests of stored grain in the Philippines</i> , S.R. Francisco, M.C. Mangabat, A.B. Mataia, M.A. Acda, C.V. Kagaoan, J.P. Laguna, M. Ramos, K.A. Garabiag, F.L. Paguia and J.D. Mullen, 2009, 45 pp.
63	<i>Analysis of ACIAR's returns on investment: appropriateness, efficiency and effectiveness</i> , Matthew Harding, Tingsong Jiang and David Pearce, 2009, 37 pp.

Final reports	
2008-19a	<i>Development of an embryo culture manual and an embryo transplantation technique for coconut germplasm movement and seedling production of elite coconut types [HORT/2006/006]</i> [Vietnamese translation], Stephen W. Adkins, Erlinda Rillo and Osmundo Orense, 2008, 29 pp. < <a href="http://www.aciar.gov.au/publication/FR2008-19a">http://www.aciar.gov.au/publication/FR2008-19a</a> >
2008-19b	<i>Development of an embryo culture manual and an embryo transplantation technique for coconut germplasm movement and seedling production of elite coconut types [HORT/2006/006]</i> [Indonesian translation], Stephen W. Adkins, Erlinda Rillo and Osmundo Orense, 2008, 29 pp. < <a href="http://www.aciar.gov.au/publication/FR2008-19b">http://www.aciar.gov.au/publication/FR2008-19b</a> >
2008-35a	<i>Agricultural water-use efficiency in north-western China [LWR/2002006/076]</i> [Mandarin translation], Philip Young, David Marston, Wang Jinxia and Li Xiande, 2008, 100 pp. < <a href="http://www.aciar.gov.au/publication/FR2008-35a">http://www.aciar.gov.au/publication/FR2008-35a</a> >
2008-36	<i>Facilitating farmer uptake of ACIAR project results: World Vision collaborative program [PLIA/2000/165]</i> , Soda Souvannaphong, Jonathan Treagust, John Schiller, Siddhartha Sahu, Monthathip Chanphengxay, Phoudalay Lathvilayvong and Phoumi Inthapanya, 2008, 42 pp. < <a href="http://www.aciar.gov.au/publication/FR2008-36">http://www.aciar.gov.au/publication/FR2008-36</a> >
2008-37	<i>Increasing milk production from cattle in Tibet [LPS/2002/104]</i> , John Wilkins, John Piltz, Kristy Bailes, Colin Griffiths, Se Zhu, Tsamyu Osman and Nyima Tashi, 2008, 54 pp. < <a href="http://www.aciar.gov.au/publication/FR2008-37">http://www.aciar.gov.au/publication/FR2008-37</a> >

2008-38	<i>A sea cucumber fisheries management project in Papua New Guinea: a project feasibility review to ACIAR [FIS/2006/133]</i> , Alistair McIlgorm, Bob Lindner and Jeff Kinch, 2008, 32 pp. < <a href="http://www.aciar.gov.au/publication/FR2008-38">http://www.aciar.gov.au/publication/FR2008-38</a> >
2008-39	<i>Genetic and morphological relationships of mud crabs, genus Scylla, from throughout the Indo–Pacific [FIS/1992/017]</i> , C.P. Keenan, D. Mann, S. Lavery and P. Davie, 2008, 74 pp. < <a href="http://www.aciar.gov.au/publication/FR2008-39">http://www.aciar.gov.au/publication/FR2008-39</a> >
2008-40	<i>Improving smallholder crop–livestock systems in eastern Indonesia [LPS/2004/005]</i> , Shaun Lisson, Neil MacLeod, Cam McDonald, Jeff Corfield, Lalu Wirajaswadi, Rahmat Rahman, Syamsu Bahar, Nasruddin Razak, Ketut Puspadi, Dahlanuddin, Yusuf Sutaryono, Rusnadi Padjung, Sania Saenong, Lia Hadiawati, Sahardi Mashur and Dwi Proptomo, 2008, 212 pp. < <a href="http://www.aciar.gov.au/publication/FR2008-40">http://www.aciar.gov.au/publication/FR2008-40</a> >
2008-41	<i>Establishment of beef industries in additional red soils provinces in China [PLIA/2006/151]</i> , R.A. Hunter, J.V. Nolan, N.D. MacLeod, Xu Minggang and Wen Shilin, 2008, 14 pp. < <a href="http://www.aciar.gov.au/publication/FR2008-41">http://www.aciar.gov.au/publication/FR2008-41</a> >
2008-42	<i>Impact of migration and off-farm employment on roles of women and appropriate technologies in Asian and Australian mixed farming systems [PLIA/2000/039]</i> , Thelma R. Paris, Fay Rola-Rubzen, Truong Thi Ngoc Chi, Chaicharn Wongsamun and Joyce S. Luis, 2008, 56 pp. < <a href="http://www.aciar.gov.au/publication/FR2008-42">http://www.aciar.gov.au/publication/FR2008-42</a> >
2008-43	<i>Horticulture industry development for market-remote communities: Cape York and Samoa [HORT/2001/023]</i> , Rowland Holmes, Roger Boebel, Philip Tuivavalagi, Jeff Daniells and Mafutaga Tinifu, 2008, 82 pp. < <a href="http://www.aciar.gov.au/publication/FR2008-43">http://www.aciar.gov.au/publication/FR2008-43</a> >
2008-44	<i>Developing profitable beef business systems for previously disadvantaged farmers in South Africa [LPS/1999/036]</i> , Heather Burrow, Ephraim Matjuda, Phillip Strydom, Baldwin Nkhane Nengovhela, Percy Madzivhandila, Dan Motiang, Garry Griffith and Richard Clark, 2008, 45 pp. < <a href="http://www.aciar.gov.au/publication/FR2008-44">http://www.aciar.gov.au/publication/FR2008-44</a> >
2009-12	<i>Improving sustainability and profitability of village sea cucumber fisheries in Solomon Islands [FIS/2003/051]</i> , A. Schwarz, D. Boso, C. Ramofafia, N. Andrew and W. Nash, 2009, 69 pp. < <a href="http://www.aciar.gov.au/publication/FR2009-12">http://www.aciar.gov.au/publication/FR2009-12</a> >
2009-13	<i>Increasing the productivity of cattle in India and Australia with rumen fungal treatments [AH/1997/058]</i> , C.S. McSweeney, K.T. Sampath, C.S. Prasad and S.E. Denman, 2009, 55 pp. < <a href="http://www.aciar.gov.au/publication/FR2009-13">http://www.aciar.gov.au/publication/FR2009-13</a> >
2009-14	<i>Salinity reduction in tannery effluents in India and Australia [AH/2001/005]</i> , Catherine A. Money, T. Ramasami, N.K. Chandra Babu, C. Muralidharan, J. Ragava Rao, P. Saravanan, A. Amudeswari, A.B. Mandal, Ken Montgomery, Mark Hickey, Cameron Simpson, Chi Huynh and Rita Siekris, 2009, 51 pp. < <a href="http://www.aciar.gov.au/publication/FR2009-14">http://www.aciar.gov.au/publication/FR2009-14</a> >

2009-15	<i>Evaluating domestic tuna fisheries projects [ASEM/2004/011]</i> , Harry Campbell, Ronald Kuk, Margaret Ame, Len Rodwell and Linda Kaua, 2009, 38 pp. < <a href="http://www.aciar.gov.au/publication/FR2009-15">http://www.aciar.gov.au/publication/FR2009-15</a> >
2009-16	<i>Development of a vaccine for the control of Gumboro in village and small-poultry holdings in Indonesia [AH/2000/083]</i> , Jagoda Ignjatovic and Lies Parede, 22 pp. < <a href="http://www.aciar.gov.au/publication/FR2009-16">http://www.aciar.gov.au/publication/FR2009-16</a> >
2009-17	<i>Farming systems research for crop diversification in Cambodia and Australia [ASEM/2000/109]</i> , Bob Martin, Bob Farquharson, Fiona Scott, Stephanie Belfield and Chan Phaloeun, 2009, 27 pp. < <a href="http://www.aciar.gov.au/publication/FR2009-17">http://www.aciar.gov.au/publication/FR2009-17</a> >
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ACIAR is an Australian Government Statutory Authority that operates within the portfolio of Foreign Affairs and Trade. ACIAR aims to enhance rural household incomes and broader economic growth by investing in international research partnerships that encourage agricultural development, sustainable use of natural resources and capacity-building to benefit partner countries and Australia.

ACIAR works collaboratively with AusAID in areas of mutual priority, with both organisations contributing to the whole-of-government emphasis of the aid program.

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