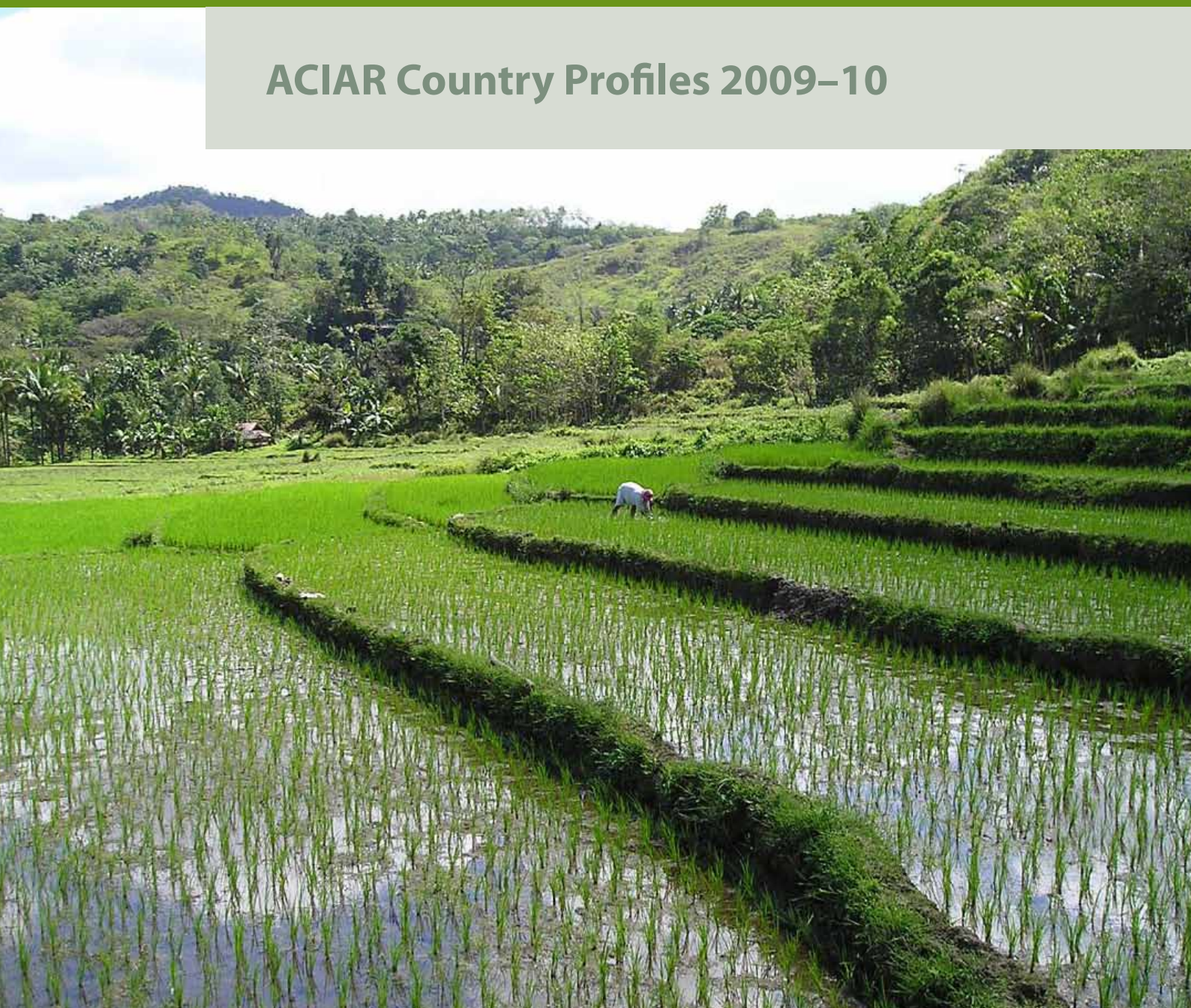




Australian Government
Australian Centre for
International Agricultural Research

ACIAR Country Profiles 2009–10



PHILIPPINES

ACIAR Country Profiles 2009–10: Philippines



ACIAR

Research that works for developing
countries and Australia

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2009

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Published by the Australian Centre for International Agricultural Research (ACIAR)

GPO Box 1571, Canberra ACT 2601, Australia

Telephone: 61 2 6217 0500

Email: aciar@aciar.gov.au

ACIAR 2009. ACIAR Country Profiles 2009–10: Philippines. Australian Centre for International Agricultural Research: Canberra.

ISBN 978 1 921615 58 0 (online)

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1 Overview

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.

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.

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

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.

John Allwright Fellowships in the Philippines

		PhD	MSc/Other
Active	Male	4	1
	Female	3	0
Concluded	Male	3	5
	Female	10	5

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.

2 Philippines chapter from the Annual Operational Plan 2009–10

2.1 Medium-term strategy

The main aim of ACIAR–Philippines cooperation is to assist in increasing productivity, marketability and international competitiveness for Philippines agricultural products, taking into account the impacts of trade liberalisation. Underlying this competitiveness is the need to improve agricultural productivity through more effective extension of research results to farmers and processors and through greater responsiveness to market opportunities. This should result in higher quality commodities being produced more competitively. Specific opportunities may come through research for development and marketing of products from aquaculture, horticulture, forestry and livestock enterprises and from farmer-driven improvements in agricultural systems. The emphasis on high-value products and market competitiveness aims to address food security by supporting research that would provide smallholder farmers and traders with increased cash income, supporting the purchase of staple foods.

A significant proportion of Philippine farming is carried out in fragile, sloping environments or sensitive watersheds, and it is important that intensification of agricultural productivity does not come at the expense of land degradation. To increase the prospects for sustainable adoption of the results of research, ACIAR’s Philippine program increasingly emphasises involvement of local partners (such as local government units, non-government organisations (NGOs) and farmer community groups) in projects and commercial agribusiness companies. It also promotes projects that implement the results of earlier ACIAR-supported research in the Philippines. As well, there is a focus on fostering linkages between regionally based delivery organisations and research organisations and policymakers based centrally in Manila and Los Baños. There is greater emphasis on the southern Philippines, within a limited number of focal provinces in regions 10 and 11 (Mindanao) and regions 6, 7 and 8 (Visayas). The southern Philippines has the greatest development needs and the strongest engagement of Australian interests across the whole of government.

2.2 Key performance indicators (2009–10)

- key disease constraints to major fruit (papaya, jackfruit and durian) production and quality, and broader constraints to papaya industry efficiency and profitability identified through mapping of representative supply chains, with results communicated to industry and producers
- economic assessment and initial farmer evaluation of cost-effective protected vegetable cropping system in Leyte completed
- integrated strategies for the management of bacterial wilt in potato developed through assessment of more resistant varieties, expansion of the existing certified seed program and refinement of biofumigation technology
- current soil fertility status and management practices in vegetable crops in the southern Philippines evaluated, and promising integrated soil and crop nutrient management practices identified for field testing
- economic potential for sea ranching of sea cucumber evaluated at multiple sites
- soil conservation and water management improvements implemented at the farm scale in corn–cassava cropping areas of the two watersheds in Bohol Island, Visayas

- capacity of Philippine Weather Bureau improved to develop and deliver seasonal climate forecasts for Philippine farmers, and potential economic value for farmers determined.

2.3 Position

ACIAR's program in the Philippines has been active since 1983. Over the last five years, a refocusing of ACIAR's efforts has occurred, moving programs to the poorer areas of Mindanao and the Visayas, while maintaining strong links to research expertise in Manila and Los Baños. Improving uptake of research in the Philippines is a major priority. In collaboration with Philippine partners, ACIAR has increased its emphasis on better understanding extension processes and involving farmer and community groups in projects. There has been encouraging success with the adaptation of the landcare approach in Mindanao, management of catchments in the Visayas island of Bohol, and uptake of methods for successful tree establishment. New research projects are underpinned by design processes that involve the end users of the research and address their needs. Project design also accommodates additional challenges that have arisen from the devolution of management and governance of extension responsibilities to local government units, and the comparatively weak research–extension linkages that frequently exist. In recognition of the strong research capacity in the Philippines and the ability of Philippines partners to co-invest in programs, there will be an increased emphasis on joint program design and monitoring during 2009–10.

Two major horticultural initiatives involving researchers, government, NGOs and industry partners commenced in 2008 with a total investment of approximately \$12 million. Both initiatives focus on the southern Philippines, specifically regions 8 (Leyte), 10 (northern Mindanao/Cagayan de Oro) and 11 (southern Mindanao/Davao). These are described below. Taken together, the initiatives address most of the agreed priorities in subprograms 1A, 1B and 1C. In 2009, a new mariculture program was designed, building on a number of pilot projects. During 2006, the Community Agricultural Technology Program commenced, which aimed to link ACIAR-generated technologies and Philippine research providers with non-government and community-based organisations. This will be absorbed into mainstream ACIAR projects in 2009–10. In 2008 and 2009, a number of natural resources management research projects concluded. In 2009–10, a new natural resources research program will be designed in collaboration with Philippine partners.

One major international agricultural research organisation, the International Rice Research Institute (IRRI), is headquartered in Los Baños, in the Philippines. ACIAR provides core funding to IRRI and also supports additional initiatives aimed at maintaining rice productivity. The regional office of the International Network for the Improvement of Banana and Plantain, a Biodiversity International network, is also headquartered in the Philippines.

2.4 Research priorities

ACIAR has a program of consultations with key partner countries on a rolling basis to establish priorities for research collaboration. The most recent full program consultation with the Philippines was held in March 2006; a record of the consultation is available at <www.aciar.gov.au> under Partner country priorities/Philippines. A horticulture consultation workshop was held in September 2007, and during 2008–09 a number of meetings were held to design a new collaborative mariculture program. It is anticipated that a further full program consultation will be held during 2009–10.

Most ACIAR-supported informal and postgraduate research degree training will remain within the context of active projects. However, ACIAR will also support short training courses that strengthen capacity to apply results of research to fit the needs of farmers and policymakers. The program of training will comprise the following courses: economics

and social science for biophysical scientists; participatory agricultural research/ extension; project evaluation and impact assessment; research business management and commercialisation; information and communication technology for research and development (R&D); and training in supply chain management.

2.5 Relationship to the Australia–Philippines Development Assistance Strategy 2007–2011

Australia's objective under the Australia–Philippines Development Assistance Strategy (2007–2011) is to 'make a contribution to improving the prospects for economic growth, poverty reduction and national stability in the Philippines'. The strategy focuses on three pillars: economic growth, basic education, and national stability and human security. It is expected that the strategy will be updated during 2009–10. ACIAR will contribute to the strategy, particularly through the first (and largest) pillar, which includes engagement with the Philippines Government on policy issues and support for 'local economic development in poor areas so that the rural population shares in the benefits of a stronger national economy'. Linkages between the biophysical, economic and market development research support by ACIAR will be made between ACIAR projects and the AusAID-funded Philippines–Australia Community Assistance Program, and with new AusAID initiatives where possible.

Agreed priorities for collaborative R&D programs are listed under four thematic areas.

Subprogram 1: Increasing the market competitiveness of Philippines horticultural products

1A: Meeting market specifications for horticultural products

- Identification of farmer incentives for adoption of horticultural postharvest systems improvements
- Development and implementation of new quality management and food safety systems
- Economic analysis of marketing chains and channels for perishables, and building of supply chains to improve alliances between suppliers, processors, institutional buyers and marketers
- Nutrient and pesticide management to save costs and reduce residues.

1B: Higher returns from vegetable production

- Adoption of protected cropping technologies and reduction of inputs
- Disease management relating to bacterial wilt and other soil-borne diseases in solanaceous and cruciferous crops; and pest management systems for diamondback moth control in brassicas
- Efficient production systems for seed potato
- Germplasm evaluation and development of management packages for native vegetables
- Improvement in postharvest handling, quality, and sanitary and phytosanitary standards for markets for salad and semi-temperate vegetables.

1C: Tropical fruit for export and premium domestic markets

- Selection and clonal propagation of new quality mango germplasm

- Improved cultural practices and control of major pests and diseases of mango, durian and jackfruit
- Improvement in postharvest handling, quality, and sanitary and phytosanitary standards for markets for tropical fruit crops.

Subprogram 2: Competitive and sustainable aquaculture production

- Adoption of mariculture-based strategies to provide livelihoods and enhance locally-managed fisheries with an initial emphasis on sea cucumbers
- Assessment of the impacts of mariculture on the community livelihoods of small fishers
- Application of results from ACIAR projects in other countries, and review of opportunities and constraints in the supply chain for key aquaculture products, particularly grouper, mud crab and seaweed
- Management of viral nervous necrosis of marine finfish.

Subprogram 3: Farmer-based land and water resource management for profitable and sustainable agriculture

- Catchment-scale adaptation of integrated soil and water conservation technologies, integrating agricultural production and agroforestry with an enhanced market focus
- Improved watershed management in the context of adaptation to potential negative impacts of climate change on food security
- Water resource management, including groundwater and water harvesting, for high-value vegetable and fruit crops
- Understanding valuation and financing mechanisms for environmental services in watersheds for soil and water conservation
- Integrated nutrient management for low-input farming systems.

Subprogram 4: Identifying and addressing policy and technical constraints to the adoption of research outputs

- Identification of research interventions to improve productivity and access to staple commodities by the poor
- Development of simple replicable business models for agribusiness development of small farms
- Application of better extension models for earlier research results
- Identification and addressing of local and national policy constraints to adoption of research, including land use, land tenure, taxation and transportation policies, sanitary and phytosanitary standards and intellectual property rights
- Assessment of policy and market constraints to agroforestry development on small farms
- Assessment of policy constraints to the control and management of illegal, unreported and unregulated (IUU) fishing
- Identification of researchable technical and agribusiness constraints for small–medium enterprise (SME) engagement in profitable livestock enterprises.

3 Active projects in the Philippines

3.1 Subprogram 1: Increasing the market competitiveness of Philippines horticultural products

In 2008, two major multidisciplinary horticultural initiatives involving researchers, government, NGOs and industry partners commenced. The first aims to improve smallholder and industry profitability and market competitiveness of selected vegetable industries (including potato, tomato, bell pepper, brassicas, leafy vegetables) in the southern Philippines. It includes technical interventions such as the use of promising management practices for efficient use of available resources to increase crop productivity and improve soil fertility; development of more profitable off-season production, particularly protected cropping, of high-value vegetables; management of major pests; and identification and management of diseases of solanaceous and cruciferous vegetables. In addition, priorities and constraints in key value chains will be identified and analysed, and appropriate interventions developed, tested and implemented, to strengthen linkages between smallholders, the private sector and markets.

The second initiative covers mango, papaya, durian and jackfruit. It aims to identify and implement improvements to domestic and export value chains for these fruits through targeted interventions in policy and regulatory analysis, production, disease and pest management, and postharvest handling. During 2009–10, there will be an increased emphasis on expanded engagement of industry partners and farmer groups in these programs.

<i>Project number</i>	<i>Project title</i>
HORT/2001/049	Development of PRSV-P resistant papaya genotypes by introgression of genes from wild <i>Carica</i> species
HORT/2007/066	Enhanced profitability of selected vegetable value chains in the southern Philippines and Australia program
HORT/2007/067	Improved domestic profitability and export competitiveness of selected fruit value chains in the southern Philippines and Australia program

HORT/2001/049: Development of PRSV-P resistant papaya genotypes by introgression of genes from wild *Carica* species

Papaya ringspot virus (PRSV-P), the major disease of papaya worldwide, has devastated papaya production in some regions on the island of Luzon, and has also spread to other islands where papayas are produced. In Australia, PRSV-P represents a severe threat to the industry in north Queensland. There is no useful resistance to the disease within *Carica papaya*, and resistance needs to come from production of resistant genotypes. This project follows on from the success of earlier research, which developed fertile, PRSV-P resistant plants through hybridisation between *Carica papaya* and *Carica quercifolia* and the successful backcross from this hybrid to *C. papaya*. Scientists are continuing to backcross the PRSV-P resistant genes to elite papaya genotypes in both Australia and the Philippines, and to produce and screen other promising lines in both countries. They aim to develop a DNA (deoxyribonucleic acid) marker for virus resistance to facilitate selection of resistant plants in the early seedling stage, and also to evaluate elite resistant papaya lines on grower properties. Scientists expect to produce elite papaya genotypes that are PRSV-P resistant, and plan to trial any genotypes with commercial potential on growers' properties in both countries by the third year of the project.

Overseas collaborating country

Philippines

Commissioned organisation

Griffith University, School of Biomolecular and Biomedical Science, Australia

Project leader

Dr Rod Drew
Phone: 07 38757292
Fax: 07 38757618
Email: R.Drew@mailbox.gu.edu.au

Collaborating institutions

University of the Philippines at Los Baños, Philippines
Bureau of Plant Industry, Philippines

Project budget

\$655,167

Project duration

01/01/2002 to 31/12/2004
(Project extended from 01/07/2009 to 30/09/2009)

ACIAR Research Program Manager

Mr Les Baxter

Website

<www.aciar.gov.au/project/HORT/2001/049>

HORT/2007/066: Enhanced profitability of selected vegetable value chains in the southern Philippines and Australia program

In the Philippines, the vegetable industry plays an important role in domestic and export markets, both economically and nutritionally. The Philippines Government and other industry stakeholders have identified the domestic market as a high priority for development and improvement due to the number of households involved in vegetable production. There is also potential for export market development. Areas that have been identified as constraints include production efficiency and sustainability, food quality, food safety, postharvest loss and domestic consumption. This is a program approach which aims to develop integrated and systems approaches to address value-chain constraints. It has six components:

Component 1—Integrated soil and crop nutrient management in vegetable crops in the southern Philippines and Australia. The aim is to develop integrated soil and crop management strategies in vegetable crops in the southern Philippines and Australia. It will define current soil fertility status and management practices, and develop and promote best management practices that suit local conditions.

Component 2—Development of a cost-effective protected vegetable cropping system in the southern Philippines and Australia. The aim is to develop, evaluate and implement a protected cropping system to allow farmers in high rainfall areas to produce high-value crops in the wet season when prices are high. These systems will also be modified for use in Australia.

Component 3—Integrated strategies for the management of bacterial wilt and other wilting diseases in solanaceous crops in the southern Philippines and Australia. This will build on the strong foundation laid down by previous projects to develop integrated crop-management systems for bacterial wilt in potatoes in southern Philippines and Australia. It will also develop robust management strategies for the control of bacterial wilt in tomatoes.

Component 4—Analysis of selected vegetable value chains in the southern Philippines and Australia. The aim is to assess the institutional market for high-quality vegetables, describe and evaluate the performance of traditional and institutional vegetable chains, improve the capacity of smallholder farmer to access these markets, and identify and propose interventions to improve the performance of value chains.

Component 5—Economic impacts of new technologies and policy constraints in the production of vegetables in the Philippines and Australia. The aim is to measure the profitability of technologies developed in components 1 to 4 and use this to influence the research process, enhance the adoption of technologies and identify policy constraints and options for change.

Component 6—Program management. The aim of this component is to provide details of management, communication and strategies for ensuring integration of components 1 to 5, and identification of opportunities for efficiency and effectiveness gains through sharing of resources, trial sites and extension activities.

Where possible, the linkages between components will be identified and integrated into appropriate adoption and extension strategies. A key aim of this program is to develop integrated and systems approaches to interventions addressing value-chain constraints. Extension and adoption activities are areas that offer considerable potential for component linkages, integration and efficiency in terms of funding and resourcing. Appropriate partnerships and collaborations will be developed with commercial and agribusiness partners such as Del Monte, Dole and East West seeds to help ensure sustainability and commercialisation of program outcomes.

Overseas collaborating country

Philippines

Commissioned organisation

New South Wales (NSW) Department of Industry and Investment, Australia

Project leader

Dr David Hall
Phone: 02 4348 1944
Fax: 02 4348 1910
Email: david.hall@industry.nsw.gov.au

Collaborating institutions

University of Sydney, Australia
Australian National University, Australia
Queensland Department of Primary Industries and Fisheries, Australia
CSIRO Plant Industry, Australia
Curtin University of Technology, Australia
University of the Philippines, Los Baños, Philippines
Visayas State University, Philippines
University of the Philippines, Mindanao, Philippines
Catholic Relief Services, Philippines
NSW Department of Primary Industries, Australia
World Agroforestry Centre, Philippines
Department of Agriculture Regional Field Unit (DA-RFU X), Philippines
Northern Mindanao Vegetable Producers Association (Normin Veggies), Philippines
ABLE Blue Pty Ltd, Australia
Southeast Asian Regional Center for Graduate Study and Research in Agriculture, Philippines
Philippine Institute for Development Studies, Philippines
Department of Agriculture, Philippines
Applied Horticultural Research, Australia
Northern Mindanao Integrated Agricultural Research Centre, Philippines
Department of Employment, Economic Development and Innovation, Australia
NSW Department of Industry and Investment, Australia

Project budget

\$4,293,430

Project duration

01/05/2008 to 30/04/2012

ACIAR Research Program Manager

Mr Les Baxter

Website

<www.aciar.gov.au/project/HORT/2007/066>

HORT/2007/067: Improved domestic profitability and export competitiveness of selected fruit value chains in the southern Philippines and Australia program

The goal of the program is to contribute to economic growth in the Philippines through increased income and improved livelihoods of tropical fruit growers in southern Philippines. The purpose of the program is to improve the smallholder and industry profitability and export competitiveness of selected tropical fruit industries in the southern Philippines. Fruit crops to be targeted are mango, papaya, durian and jackfruit. The primary audience for the outcomes of this program are medium- to large-scale commercial fruit growers and farmers predominantly in the regions of Leyte (8), northern Mindanao/Cagayan de Oro (10) and southern Mindanao/Davao (11). The program has six components:

Component 1—Analysis of the constraints to selected tropical fruit (papaya) supply chains and implementation of improved quality systems for the southern Philippines and Australia. The aim is to identify and analyse the constraints limiting the competitiveness of papaya supply chains for the Philippines (as a model for other tropical fruit supply chains) with particular emphasis on how Philippines growers could create and receive increased value from the supply chains to which they belong.

Component 2—Integrated management of Phytophthora diseases of durian and jackfruit in the southern Philippines. The aim is to increase the productivity of jackfruit growing in the Eastern Visayas and durian productivity in Mindanao.

Component 3—Integrated crop-management strategies for productive, profitable and sustainable production of high-quality papaya fruit in the southern Philippines and Australia. The aim is to increase the profitable and sustainable production of papaya fruit in the southern Philippines and Australia through the development of integrated crop-management strategies for the control of bacterial crown rot and *Phytophthora*-related diseases and major insect pests.

Component 4—Improved and sustainable value chains for mango production in the southern Philippines and Australia. The aim is to enhance the sustainability of the mango industry in the southern Philippines and Australia through a systems approach that will improve pest and disease management and the consistency of the supply of quality mangoes for targeted markets.

Component 5—Economic impacts of new technologies and policy constraints in the production of fruit in the southern Philippines and Australia. The aim of this economic/policy research component is to improve the impact of the whole program by measuring the profitability of technologies developed in components 1 to 4 and use this to influence the research process, enhance the adoption of technologies and identify policy constraints and options for change.

Component 6—Program management. The aim of this component is to provide details of management, communication and strategies for ensuring integration of program components and maximisation of resource use. Where possible, the linkages between components will be identified and integrated into appropriate adoption and extension strategies.

A key aim of this program is to develop integrated and systems approaches to interventions addressing value-chain constraints. Extension and adoption activities are areas which offer considerable potential for component linkages, integration and efficiency in terms of funding and resourcing. Appropriate partnerships and collaborations will be developed with commercial and agribusiness partners such as Del Monte, Dole and Bounty Fresh Harvest to help ensure sustainability and commercialisation of program outcomes. The program will also seek linkages with other donors and relevant projects/programs.

Overseas collaborating country

Philippines

Commissioned organisation

Department of Employment, Economic Development and Innovation, Australia

Project leader

Mr Robert C. Williams
Phone: 07 4064 1151
Fax: 07 4064 2249
Email: Bob.William@deedi.qld.gov.au

Collaborating institutions

Queensland Department of Primary Industries and Fisheries, Australia
University of Queensland, Australia
University of Sydney, Australia
Bureau of Plant Industry, Philippines
Leyte State University, Philippines
University of Southern Mindanao, Philippines
University of the Philippines, Los Baños, Philippines
Del Monte Philippines Inc, Philippines
AKC Consulting Pty Ltd, Australia
Philippine Council for Agriculture, Forestry and Natural Resources Research and Development, Philippines
Department of Agriculture, Philippines
Provincial Agriculture Office, Philippines
NSW Department of Primary Industries, Australia
Southeast Asian Regional Center for Graduate Study and Research in Agriculture, Philippines
Philippine Institute for Development Studies, Philippines
Visayas State University, Philippines
University of the Philippines, Mindanao, Philippines
University of Southeastern Philippines, Philippines
University of Southern Philippines, Philippines
Department of Employment, Economic Development and Innovation, Australia
Department of Agriculture Regional Field Unit 4B, Lipa City, Philippines
NSW Department of Industry and Investment, Australia

Project budget

\$3,208,940

Project duration

01/05/2008 to 30/04/2012

ACIAR Research Program Manager

Mr Les Baxter

Website

<www.aciar.gov.au/project/HORT/2007/067>

3.2 Subprogram 2: Competitive and sustainable aquaculture production

In the Philippines, as in many other countries, wild-harvest fish catches are declining—in some areas quite quickly—while demand continues to rise. For well over a decade, ACIAR has been working with a number of partner research agencies, both national and regional, to develop and refine robust technologies for the culture and grow-out of a number of high-value marine species, including mud crab, grouper and other marine food fish, sea cucumbers and giant clams. A major new initiative under active development will seek to promote small–medium enterprise (SME) development through the effective transfer of this knowledge to the private sector in support of the establishment of profitable local aquaculture-based industries in selected areas. In addition, research cooperation will focus on addressing the declining productivity of seaweed, a key source of income for Philippines coastal communities. Sea ranching and restocking trials will continue with sea cucumbers (sandfish), with the aim of providing new livelihood opportunities for coastal communities and, where conditions permit, of rebuilding depleted resources of this valuable commodity.

<i>Project number</i>	<i>Project title</i>
FIS/2002/077	Improved hatchery and grow-out technology for marine finfish in the Asia–Pacific region
FIS/2003/033	Integrated fisheries resource management (Rinconada Lakes, the Philippines, and New South Wales, Australia)
FIS/2003/059 (Multilateral)	Sea ranching and restocking sandfish (<i>Holothuria scabra</i>) in Asia–Pacific (WorldFish)
FIS/2009/033	Preliminary assessment of the hand-line (banca) fisheries in the Philippines

FIS/2002/077: Improved hatchery and grow-out technology for marine finfish in the Asia–Pacific region

Aquaculture of high-value marine finfish from the larval stage is hampered by poor survival rates. This barrier is impeding more widespread aquaculture activities, especially among smallholders, who stand to benefit through increased incomes. Seed-stock also continue to come mainly from wild fry and fingerlings. Developing diets to rear larvae, based on local ingredients, particularly in remote areas will cut down on unsustainable capture of seed-stock from the wild. Additional research will build on a previous project, developing more cost-effective diets. A socioeconomic study of constraints to technology will also be undertaken. Combined, this research should result in the development of more sustainable finfish aquaculture by increasing the supply of valuable finfish species.

Overseas collaborating countries

Indonesia, Philippines, Thailand, Vietnam

Commissioned organisation

Queensland Department of Primary Industries and Fisheries, Agency for Food and Fibre Sciences—Fisheries and Aquaculture, Australia

Project leader

Dr Mike Rimmer
Phone: +62 813 6091 3790
Fax: 07 4035 6703
Email: aceh_arp@iprimus.com.au

Collaborating institutions

Southeast Asian Fisheries Development Centre, Philippines
Central Research Institute for Aquaculture, Indonesia
Research Institute for Aquaculture No. 1, Vietnam
Network of Aquaculture Centres in Asia Pacific, Thailand
Sam Ratulangi University, Indonesia
Research Institute for Coastal Aquaculture, Indonesia
Gondol Research Institute for Mariculture, Indonesia
CSIRO Marine Research, Australia
Directorate General Aquaculture, Indonesia

Project budget

\$989,214

Project duration

01/07/2004 to 31/12/2007
(Project extended from 01/10/2009 to 31/03/2010)

ACIAR Research Program Manager

Dr Chris Barlow

Website

<www.aciar.gov.au/project/FIS/2002/077>

FIS/2003/033: Integrated fisheries resource management (Rinconada Lakes, the Philippines and New South Wales, Australia)

Communities living around lakes of the Rinconada System in the Philippines' Bicol region have high incidences of poverty. Many are marginal fishers depending on the lakes for their livelihood. Ensuring catch levels remain sustainable is achieved through fishery-management plans. Aside from the management of fish, natural resources also need attention, including factors such as water quality and turnover. Water hyacinth, an aquatic weed, is a key problem in the Rinconada Lakes. Integrating these approaches can be done through the implementation of ecosystem-based fisheries management. This approach has been developed and used in Australia for wild-capture management and stocking of fisheries and will now be extended to the Rinconada Lakes.

Overseas collaborating country

Philippines

Commissioned organisation

NSW Department of Primary Industries, Cronulla Fisheries Centre, Australia

Project leader

Dr Philip Gibbs
Phone: 02 9527 8411
Fax: 02 9527 8576
Email: philip.gibbs@fisheries.nsw.gov.au

Collaborating institutions

Bureau of Fisheries and Aquatic Resources, Philippines
Econcern Pty Ltd, Australia

Project budget

\$484,242

Project duration

01/07/2006 to 30/06/2009

ACIAR Research Program Manager

Dr Chris Barlow

Website

<www.aciar.gov.au/project/FIS/2003/033>

FIS/2003/059: Sea ranching and restocking sandfish (*Holothuria scabra*) in Asia–Pacific

Stocks of sea cucumbers have been chronically over-exploited throughout the Asia–Pacific. But ACIAR-funded studies of the 'sandfish' (*Holothuria scabra*)—a high-value sea cucumber easily harvested from inshore habitats—have led to technologies for producing them in hatcheries (FIS/1995/703) and for releasing them in the wild (FIS/1999/025). These technologies could assist communities, and the two major objectives of this project are 1. to test a new livelihood option in the Philippines and Australia, through releasing cultured sandfish in managed inshore habitats, then allowing communities to harvest them at market size after 3 years, and 2. to replenish selected sandfish populations in the Philippines through restocking into marine reserves for the purpose of building up a critical mass of spawning adults. The research will help to speed stock recovery, generate income and conserve wild breeding stocks.

Overseas collaborating country

Philippines

Commissioned organisation

WorldFish Center, Philippines

Project leader

Mr Len Garces
Phone: 63 2 5805659
Fax: 63 2 5805699
Email: l.garces@cgiar.org

Collaborating institutions

Department of Agriculture, Fisheries and Forestry, Australia
University of the Philippines, Philippines
University of the Philippines Mindanao, Philippines
James Cook University, Australia
Tasmanian Seafoods Pty Ltd, Australia
National Fisheries Research and Development Institute, Philippines

Project budget

\$937,549

Project duration

01/06/2007 to 31/05/2011
(Project extended from 01/10/2009 to 31/12/2011)

ACIAR Research Program Manager

Dr Chris Barlow

Website

<www.aciar.gov.au/project/FIS/2003/059>

FIS/2009/033: Preliminary assessment of the hand-line (banca) fisheries in the Philippines

Fisheries in the Philippines are divided primarily into municipal and commercial sectors. The municipal sector comprises vessels up to 3 gross tonnes (GT) and those who fish without vessels—both these groups are allowed to fish in areas up to 15 kilometres from the coast known as municipal waters. A hand-line fishery using bancas (more commonly known as pump boats) is a major and growing component of both municipal and commercial fisheries. These vessels are generally on or near the weight limit of the municipal fisheries regulations. It is estimated that there are more than 3,000 of these vessels, equating to tens of thousands of fishers. Large tunas (such as yellowfin) are their main target species. Much of the hand-line fishery can be categorised as illegal, unreported and unregulated (IUU)—its fishing vessels venture into international waters, and it is estimated that about 50% of the catch is taken in the waters of Indonesia, Papua New Guinea and other neighbouring countries. This has created considerable tension and mistrust in the region. The objectives of this project are to: 1. carry out a preliminary investigation of the nature of the hand-line fishery in the Philippines, including the IUU components; 2. benchmark the existing legal framework for the hand-line fishery against national and international obligations and best practice; 3. investigate the opportunities, challenges and information gaps in developing a management plan for this fishery.

Overseas collaborating country

Philippines

Commissioned organisation

University of Wollongong, Australia

Project leader

Associate Professor Ron West
Phone: 02 4221 4648
Fax: 02 4221 4135
Email: ron_west@uow.edu.au

Collaborating institution

National Fisheries Research and Development Institute, Philippines

Project budget

\$149,996

Project duration

01/06/2009 to 31/05/2011

ACIAR Research Program Manager

Dr Chris Barlow

Website

<www.aciar.gov.au/project/FIS/2009/033>

3.3 Subprogram 3: Farmer-based land and water resource management for profitable and sustainable agriculture

One of the most powerful and positive forces in Philippine society is the enthusiasm of communities, including farmers, to work together for a common objective. Tapping this positive energy and enthusiasm to foster uptake of research results is a research subject in itself. This project cluster pilots different approaches for extension and community engagement as well as researching the basic process. Modalities being assessed include: the landcare model, where the applicability of the model to agricultural production and marketing, as well as its better-recognised approach as a vehicle for natural-resources management, are being assessed; trials of partnerships between research organisations and NGOs; and two watershed-based projects, where government, stakeholder and farmer organisations at provincial and barangay levels in the Visayas and southern Luzon are developing new partnerships designed to demonstrate that sustaining soil and water resources is compatible with improving farm-level incomes.

A critical environmental concern in the Philippines is upland degradation brought about by loss of vegetation cover from pressures from increasing populations. At the same time, the Philippines Government's policy of developing new lands for agribusiness and employment increases the pressure on these upland regions. During 2009–10, as the current suite of projects finishes, an integrated program will be jointly scoped to address research issues of sustainable development of upland watersheds in the southern Philippines.

<i>Project number</i>	<i>Project title</i>
ASEM/2002/051	Sustaining and growing landcare systems in the Philippines and Australia
CIM/2002/106	Fertilisation-independent formation of embryo, endosperm and pericarp for apomictic hybrid rice
SMCN/2004/069	Minimising agricultural pollution to enhance water quality in Laguna de Bay (the Philippines) and Mt Lofty Ranges (Australia)
SMCN/2004/078	Evaluation and adoption of improved farming practices on soil and water resources, Bohol Island, the Philippines

ASEM/2002/051: Sustaining and growing landcare systems in the Philippines and Australia

Landcare has been successfully adapted at three sites in Mindanao in part through ACIAR project ASEM/1998/052. The sustainability of this success has not been properly examined and is not fully understood. Research in the Philippines aims to assess and enhance the sustainability of the approach at the three sites and test the approach at new sites with differing needs, such as Bohol, to complement the LWR/2001/003 project on watershed management. An Australian component will evaluate the effectiveness of landcare and farmer-group participatory approaches to improving the viability and sustainability of peri-urban horticulture. A model to engage these farmers is planned.

Overseas collaborating country

Philippines

Commissioned organisation

Department of Employment, Economic Development and Innovation, Australia

Project leader

Noel Vock
Phone: 07 5444 9614
Fax: 07 5441 2235
Email: noel.vock@deedi.qld.gov.au

Collaborating institutions

University of Queensland, Australia
SEAMEO Regional Centre for Graduate Study and Research in Agriculture, Philippines
World Agroforestry Centre, Philippines
Catholic Relief Services, Philippines
University of the Philippines at Los Baños, Philippines
Landcare Foundation of the Philippines Inc, Philippines

Project budget

\$2,064,410

Project duration

01/07/2004 to 30/06/2007
(Project extended from 01/07/2007 to 31/12/2009)

ACIAR Research Program Manager

Dr Caroline Lemerle

Website

<www.aciar.gov.au/project/ASEM/2002/051>

CIM/2002/106: Fertilisation-independent formation of embryo, endosperm and pericarp for apomictic hybrid rice

The productivity of irrigated rice in farmers' fields has stagnated over the last 15 years. As a result, the rate of increase in rice production has fallen below the rate of population increase, creating concern for future food security, particularly in Asia. Hybrid rice has shown yields up to 30% higher than open-pollinated varieties, and some 17 million hectares are grown, predominantly in China. However, the high cost and inflexibility of hybrid seed production are two of the major impediments to the wider spread of hybrid rice outside China. Some of these difficulties could be overcome through apomixis—the naturally occurring ability of some plant species to reproduce asexually through seeds that leads to inheritance of genes exclusively from the mother; meaning that plants growing from these seeds are identical to the mother plant. This project aims to make the benefits of high-yielding hybrid rice available to poor farmers in Asia through apomictic hybrid-seed production.

Overseas collaborating country

Philippines

Commissioned organisation

International Rice Research Institute, Philippines

Project leader

Dr John Bennett
Phone: 63 2 8450563
Fax: 63 2 8450606
Email: J.BENNETT@cgiar.org

Collaborating institution

CSIRO Plant Industry, Australia

Project budget

\$1,500,000

Project duration

01/07/2003 to 30/06/2008
(Project extended from 30/06/2008 to 31/12/2009)

ACIAR Research Program Manager

Dr Paul Fox

Website

<www.aciar.gov.au/project/CIM/2002/106>

SMCN/2004/069: Minimising agricultural pollution to enhance water quality in Laguna de Bay (Philippines) and Mount Lofty Ranges (Australia)

Laguna de Bay is the Philippines largest and most important freshwater resource, being made up of three bays that form one lake. The eastern of these bays is intended to provide Metro-Manilla with water in the near future. Heavy wastewater discharge and run-off cause pollution in the western bay. The eastern bay's main water source is the Pagsanjan River, a part of the Pagsanjan–Lumban subcatchment, most of which is used for agriculture and is increasingly a source of nutrient and pesticide pollutants. Identifying and quantifying these pollutant sources will be undertaken as part of a comprehensive biophysical and hydrological characterisation of the subcatchment. Complementary activities will be undertaken in the Mount Lofty Ranges in Australia.

Overseas collaborating country

Philippines

Commissioned organisation

CSIRO Land and Water, Waste and Contaminant Risk Assessment, Australia

Project leader

Dr Rai Kookana
Phone: 08 8303 8450
Fax: 08 8303 8565
Email: Rai.Kookana@csiro.au

Collaborating institutions

University of the Philippines at Los Baños, Philippines
Laguna Lake Development Authority, Philippines
University of the Philippines at Los Baños, Philippines

Project budget

\$684,796

Project duration

01/05/2006 to 30/04/2009
(Project extended from 01/05/2009 to 31/10/2009)

ACIAR Research Program Manager

Dr Gamini Keerthisinghe

Website

<www.aciar.gov.au/project/SMCN/2004/069>

SMCN/2004/078: Evaluation and adoption of improved farming practices on soil and water resources, Bohol Island, the Philippines

On Bohol Island in the Philippines, there are opportunities for farmers to reduce some of the negative aspects of agricultural activity through introduction of conservation techniques, undertaken in association with existing landcare approaches that provide training and encourage adoption. Building on the experience and expertise developed through the earlier ACIAR projects LWR/2001/003 and ASEM/2002/051, the project will promote the adoption of improved farming on highly erodible soils on steeply sloping uplands in two upper watersheds in Bohol. It will focus on better practices in corn/cassava cropping areas to improve farmer livelihoods, reduce erosion and counteract silting of the water resource.

Overseas collaborating country

Philippines

Commissioned organisation

University of Western Sydney, Centre for Water and Environment Technology Faculty of Science, Technology and Environment, Australia

Project leader

Professor H. John Bavor
Phone: (02) 4570 1264
Fax: 02 4570 1267
Email: j.bavor@uws.edu.au

Collaborating institutions

Bureau of Soil and Water Management, Philippines
Department of Environment and Natural Resources, Philippines
University of Sydney, Australia
World Agroforestry Centre, Philippines
Applied Horticultural Research, Australia

Project budget

\$840,299

Project duration

01/01/2007 to 31/12/2010

ACIAR Research Program Manager

Dr Gamini Keerthisinghe

Website

<www.aciar.gov.au/project/SMCN/2004/078>

3.4 Subprogram 4: Identifying and addressing policy and technical constraints to the adoption of research outputs

Major projects initiated under Subprograms 1–3 include components that aim to identify and address policy and regulatory constraints to the adoption of the results of horticultural, mariculture and natural resources management research. ACIAR–Philippines collaboration in forestry and community forestry has spanned more than a decade, with recent research focusing on enhancement of community adoption of farm forestry practices. While some agroforestry work will continue to be included in Subprogram 3, during 2009–10, a collaborative scoping study will be undertaken to identify opportunities in a new value chain (maize–pigs).

<i>Project number</i>	<i>Project title</i>
ASEM/2006/059	Community Agricultural Technology Program
ASEM/2006/091	Enhancing tree seedling supply via economic and policy changes in the Philippines nursery sector
CIM/2006/176 (multilateral)	Developing molecular markers to enable selection against chalk in rice (IRRI)

ASEM/2006/059: Community Agricultural Technology Program

The aim of this project is to take outcomes from ACIAR projects and develop them and enhance adoption at the community level. This is done through local NGOs who have standing and credibility. The Community Agricultural Technology Program (CATP) is designed to use an action-learning approach, which involves analysis and planning, implementation (adoption/behavioural change) and review and learning. This should enable an interaction and start of exchanges between researchers, extension workers and farmers on ideas and information on past ACIAR technologies and innovations that can help farmers improve their agricultural production and increase their income. Farmers are invited to a series of workshops and focus-group discussions to help them identify their particular needs and then to address these needs through the adoption of a specific ACIAR technology. Action plans are then formulated and statements of intention and achievement distributed for completion by farmers to serve as baseline data in assessing improvement of their agricultural production and income after one production cycle.

Overseas collaborating country

Philippines

Commissioned organisation

Southeast Asian Fisheries Development Centre, Aquaculture Department, Philippines

Project leader

Ms Sheilah Vergara
Email: sheilah86@yahoo.com

Project budget

\$544,683

Project duration

01/08/2006 to 30/06/2007
(Project extended from 01/07/2007 to 31/12/2009)

ACIAR Research Program Manager

Dr Caroline Lemerle

Website

<www.aciar.gov.au/project/ASEM/2006/059>

ASEM/2006/091: Enhancing tree seedling supply via economic and policy changes in the Philippines nursery sector

ACIAR project scientists in the Philippines have determined that the current organisation of the public- and private-sector nurseries is not providing farmers with seedlings of appropriate quality in an equitable manner. This project aims to improve the economic efficiency and policy environment of the Philippines tree nursery sector, utilising a policy-assessment model to identify appropriate intervention points for the nursery sector at both the local and national levels. Key outcomes will be the improvement of the quality of nurseries in both the private and public sectors and better integration between them, and better market structures that address issues of unmet demand for seedlings.

Overseas collaborating country

Philippines

Commissioned organisation

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

Project leader

Dr John Herbohn
Phone: 07 5460 1646
Fax: 07 5460 1324
Email: j.herbohn@uq.edu.au

Collaborating institutions

Leyte State University, Philippines
World Agroforestry Centre, Philippines
Department of Environment and Natural Resources, Philippines
Southern Cross University, Australia

Project budget

\$826,941

Project duration

01/01/2007 to 31/12/2010

ACIAR Research Program Manager

Dr Caroline Lemerle

Website

<www.aciar.gov.au/project/ASEM/2006/091>

CIM/2006/176: Developing molecular markers to enable selection against chalk in rice

Chalkiness in rice occurs during grain development and no breeding program has yet overcome it. It occurs in high temperatures during grain filling. Earlier research found that tropical germplasm (tropical japonica and indica) is more chalk-prone than temperate japonica germplasm. Therefore, to protect food security in developing countries where tropical rice is the staple, as well as the security of the world rice supply, it is imperative to resolve the genetic/physiological difference for low chalk between temperate and tropical germplasm. This project will build on earlier work to gain more insight into the genetic mechanisms of low chalk in temperate lines and how to incorporate traits that will result in reduction of chalk in tropical breeds.

Overseas collaborating countries

Philippines

Commissioned organisation

International Rice Research Institute, Grain Quality, Nutrition and Postharvest Centre, Philippines

Project leader

Dr Melissa Fitzgerald
Phone: 63 2 5805600
Fax: 63 2 5805699
Email: m.fitzgerald@cgiar.org

Collaborating institutions

NSW Department of Primary Industries, Yanco Agricultural Institute, Australia
NSW Department of Industry and Investment, Yanco Agricultural Institute, Australia

Project budget

\$998,960

Project duration

01/05/2007 to 31/05/2012

ACIAR Research Program Manager

Dr Paul Fox

Website

<www.aciar.gov.au/project/CIM/2006/176>

4 Projects expected to start in 2009–10

<i>Project number</i>	<i>Title</i>	<i>Countries</i>
ASEM/2009/044	Philippines landcare linkages with ACIAR research	Philippines
FIS/2006/126	Sandfish pond culture in Indonesia, the Philippines and Vietnam	Indonesia Philippines Vietnam
FIS/2006/143	Philippines mariculture enterprise development project	Philippines
LWR/2009/040	Climate change meta analysis	Bangladesh Cambodia China East Timor India Indonesia Laos Pakistan Papua New Guinea Philippines Vietnam
SMAR/2008/025	Improved seaweed culture and postharvest waste utilisation in South-East Asia	Indonesia Philippines
SMCN/2009/031	Integrated plant nutrient and water management for sloping-land agriculture in the Philippines	Philippines

5 Philippines chapter from the Annual Report 2008–09

5.1 Position

ACIAR's Philippines program focuses on two broad areas of priority: increasing the productivity, marketability and international competitiveness of agricultural products; and improving the management of land and water resources to benefit smallholder farmers. Each is the subject of a subprogram of research activities. These activities are complemented by a third subprogram addressing regulatory, policy and technical constraints. All three subprograms help achieve objectives under the Australia–Philippines Development Assistance Strategy (2007–11), which focuses on three pillars: economic growth, basic education, and national stability and human security. ACIAR's projects link applicable biophysical, economic and market development research to the AusAID Rural and Private Sector Development Program, as well as the AusAID-funded Philippines–Australia Community Assistance Program. A new Philippine Council for Agriculture, Forestry and Natural Resources and Development – ACIAR Memorandum of Understanding (MoU) was signed on 7 April 2009. The MoU outlines consultation and cooperation arrangements to identify key agricultural research and development areas, and the communication of the results emerging from this.

Research projects help to improve the productivity of selected commodities, particularly in horticulture, to help marketability and international competitiveness in light of recent trade liberalisation. A significant proportion of Philippines farming is carried out on fragile sloping lands or sensitive watersheds, creating challenges to intensify production without increasing degradation. There is a greater emphasis on the southern Philippines, given that that region has the most development needs.

5.2 Achievements

Subprogram 1: Increasing the market competitiveness of Philippines agricultural products

1A: Meeting market specifications for horticultural products

The El Niño Southern Oscillation affects the Philippines and Australia, and both countries routinely rely on seasonal climate forecasts to prepare for unfavourable weather. The challenge is to find knowledge from climate science—seasonal climate forecasting information—that is communicated in a timely manner in a form that can be understood and acted on.

A project has provided extra resources to the meteorological service, Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), to engage with decision-makers and intermediaries in local government to lift the country's capacity to undertake seasonal forecasts. A highlight of the project was the development of a game that simplified instruction on the use of probabilistic seasonal climate forecasts, and this has been used with farmers and advisers in both Australia and the Philippines. The game has attracted interest from the head office of the World Meteorological Organisation in Geneva and from meteorological services in Pacific island countries, India, Africa and Brazil. PAGASA plans to institutionalise the methodologies of the project within its own systems.

1B: Higher returns from horticulture products

In the Philippines, mangoes are an important crop for plantation and smallholder farming in dry regions. Despite a range of measures including pesticides and baiting, no reliable pest controls exist, and this can lead to losses of up to 40%. Establishing disinfection and meeting quarantine compliance is expensive and time consuming. A project is introducing integrated field management, which includes improved monitoring, control and detection of pests.

The project has identified five insect pests that damage mango leaves, flowers and fruits. On fruits, mango seed borer contributed much of the damage, with an average fruit damage of 19.5%, followed by mango fruit fly at 11% and cecid fly at 3.5%. Integrated pest management (IPM) interventions successfully reduced the overall fruit damage to 4.8% and gave significant yield of 140 kilograms per tree, compared with farmers' practice with damage of 7.5% and yield of 50 kilograms per tree.

A major program thrust aims to improve the smallholder and industry profitability and export competitiveness of selected tropical fruits in the southern Philippines. Fruit crops targeted are mango, papaya, durian and jackfruit. The primary audience for the outcomes of this program are medium- to large-scale commercial fruit growers and farmers, predominantly in the regions of Leyte, northern Mindanao/Cagayan de Oro and southern Mindanao/Davao. This program has six major components. Some of the highlights of the research during the past year included work on the supply chain analysis of Philippine papaya. The research team visited buying stations, wholesale and retail markets, consolidators' warehouses and supermarkets. They determined that a multilayered distribution and disaggregate sector characterised the papaya supply chain. Between the farm and the final market the chain undergoes 10–12 handling steps. Enhancing awareness by the handlers as well as the key players and decision-makers in the chain on the role of appropriate postharvest handling is one of the initial steps in improving the supply chain.

Another major program thrust is studying enhanced profitability of selected vegetable value chains in the southern Philippines. Components of this huge study include integrated soil and crop nutrient management in vegetable crops, protected cropping structures to help farmers grow crops in the wet season, and novel approaches to controlling bacterial and fungal diseases. The project has also undertaken a review of the institutional fresh vegetable markets in metropolitan Manila, the Visayas and Mindanao. The market review revealed considerable differences in quality between the modern retail supermarkets, the food manufacturers and processors, the food-service sector and the needs of the traditional wet market. Furthermore, regional differences in climate and topography influence the range, quality and quantity of vegetables available from local producers; and differences in household income, tourism, transport and infrastructure shape both the institutional demand and the extent to which vegetables are traded between regions.

1C: Competitive and sustainable aquaculture production

The bivalve mollusc industry is well established throughout the Philippines archipelago, based principally on oyster and mussel culture. However, considering the overall importance of aquaculture in the country, and the well-developed research and regional administration networks that exist, mollusc culture has not shown the same level of growth as elsewhere. In addition, there exist significant regional differences within the Philippines; for example, Luzon growers typically obtain better prices for their product than Western Visayas growers, and production volumes are also variable between regions.

Furthermore, there is no export market for Philippine bivalves despite increasing international demand. A scoping study conducted to obtain an industry overview of these two regions pinpointed differences between Luzon and Western Visayas—notably higher growth rates, differences in culture systems, different demographic profiles of industry participants and differences in microbiological status. The results will lead to further

research to develop the industry in Western Visayas, with a view to both equalising and enhancing the prospects for regional production and export markets for bivalve products.

Subprogram 2: Farmer-based land and water resource management for profitable and sustainable agriculture

A project involved the study of herbicide-use strategies and weed-management options for Philippine and Australian cropping. A survey of 400 rice growers in two major rice-growing regions, Nueva Ecija and Iloilo, established baseline weed-management practices used by farmers, and scoped farmer perceptions of weed issues and weed-management options. The survey found that farmers were highly dependent on herbicides (spraying from one to three times per season) and were using herbicides that had a high risk of leading to herbicide resistance. The research team initially established four field sites for on-farm trials of integrated weed management (IWM) versus farmers' practice, then expanded to four additional sites. At all the study sites the team observed reduced weed weights, increased yields, higher profits and reduced number of herbicide applications when IWM was applied to control weeds compared with farmers' practice. An evaluation after two to three seasons indicated that 75% of the cooperators and 10% of neighbouring farmers were adopting IWM on their farms.

Research efforts have been underway to minimise agricultural pollution and enhance water quality in Laguna de Bay (Philippines) and Mount Lofty Ranges (Australia). In the Philippines, four sites are under study—Lucban (vegetable production system), Pagsanjan (rice production system), Cavinti (coconut and mixed land use) and Majayjay (piggeries) in the Pagsanjan–Lumban catchment. Analysis of water samples for nutrients, total suspended sediment and selected pesticides continued during 2008 at these four sites, which had been previously instrumented for continuous monitoring of water flow and a range of water-quality parameters. Grab samples were also collected at the confluence of the Balanac and Bombongan rivers, close to the outflow to Lake Laguna, to provide an indication of the nutrient, sediment and pesticide concentrations entering the lake.

Landcare has been successfully adopted at three sites in Mindanao, in part through ACIAR project efforts, with substantial positive impacts reported at the grassroots level during an end-of-project review held in April. Both smallholder farmers and agroenterprise operators are benefiting from the project's impacts. A substantial component of the project has been the enabling of the Landcare Foundation of the Philippines Inc (LFPI), helping it to evolve and take on defined roles and responsibilities for the broader development of landcare in the Philippines. A 5-year strategic plan for LFPI was developed, approved by the Board of Trustees and implemented.

All three regional programs showed significant outcomes and impacts: in the northern Mindanao program, through the agroenterprise development work with a banana marketing cluster at Claveria and two vegetable marketing clusters in Lantapan; in the southern Mindanao program, through the agroenterprise development work with a vegetable marketing cluster at Ned and the testing of a landcare approach in a conflict area of Muslim Mindanao; and in the Bohol program, through the successful adaptation of the landcare approach for securing vegetable gardens for households in the municipality of Pilar. Deployment of an Australian Youth Ambassadors for Development volunteer, Scott Graham, at the Bohol site assisted with skills-building in evaluation of soil and soil-health improvement, and included the production of a soil-health training book printed in both English and Visayan.

On Bohol Island in the Philippines there are opportunities for farmers to reduce some of the negative aspects of agricultural activity through the introduction of conservation techniques, undertaken in association with existing landcare approaches that provide training and encourage adoption. Building on the experience and expertise developed through earlier ACIAR projects, a project is promoting the adoption of improved farming practices on highly erodible soils on steeply sloping uplands in two upper watersheds in

Bohol. A key objective of this project is to quantify, demonstrate and provide farmers with examples of the environmental and farm-level economic benefits that can be realised by implementing selected best management practices for soil, water and crop management in affected areas. To this end, the project team has established three improved practice and three conventional practice farmer-managed demonstration sites in the upper Inabanga watershed, focusing on a corn–cassava rotation on the highly erodible soils of the sloping uplands. The project has actively introduced improved farming practices with the potential to increase farmers' production.

Subprogram 3: Addressing regulatory, policy and technical constraints to the adoption of research outputs

ACIAR project scientists have determined that the current organisation of public- and private-sector nurseries in the Philippines has not provided farmers with seedlings of appropriate quality in an equitable manner. A project aims to improve the quality of nurseries in both these sectors and ensure better integration between them, and introduce better market structures that address issues of unmet demand for seedlings. The pilot testing of a nursery accreditation and seedling certification policy commenced in three municipalities. In early 2009, team members led the development of a draft national policy for an accreditation scheme for nurseries. During the year, the project developed a database of mother trees in Leyte, and this has been distributed to private nursery operators, managers of government nurseries and other interested parties. A similar database is being compiled in the study area in northern Mindanao. The project also established a seed centre at Leyte State University. This centre has distributed seeds of various species to partner municipalities, disseminated a nursery best management practices manual to nursery operators, and provided information of nursery locations to seedling buyers. A workshop in Manila briefed national and provincial government representatives on progress to date as part of measures to help institutionalise the policy outcomes of the project at a national level.

6 Projects concluded in 2008–09

ASEM/2003/009: Bridging the gap between seasonal climate forecasts and decision-makers in agriculture

Climate variability is particularly problematic in rainfed agricultural systems, such as those found in the Philippines and eastern Australia. One main cause of variability in both countries is the El Niño Southern Oscillation (ENSO). The ENSO phenomenon causes higher season-to-season variability relative to other regions at the same latitude. This variability causes difficulty for farmers in decisions regarding planning and managing seasonal activities. Drier seasons result from ENSO events, often dramatically reducing productivity in many systems, especially cropping. Longer ENSO events can lead to drought. For farmers, this can also result in the adoption of more conservative mindsets, with a reduced willingness to take risks, both real and perceived (such as planting a previously untried variety that may be well suited to drier conditions).

Forecasting based on ENSO indicators can be developed on a seasonal scale. The Philippines meteorological service (Philippine Atmospheric, Geophysical and Astronomical Services Administration; PAGASA) issues climate forecasts based on recently developed ENSO knowledge. Despite this, questions remain over the value of seasonal climate forecasting (SCF) amongst farmers and policymakers. Users of SCF have yet to adequately integrate forecasting identifying rainfall odds, based on ENSO, as all uncertainty is not eliminated. A framework that helps them to address such concerns is needed, to build end-user confidence into using and integrating SCF decision-making. The framework is being established to:

- improve the capacity of PAGASA to develop and deliver SCF
- distil key practical and methodological features of economic and psychological approaches to valuing SCF
- estimate the potential economic value of SCF for farm and policy or industry level case studies in the Philippines and Australia
- identify those factors leading to a gap between actual and potential values of SCF
- develop and implement strategies to better match forecasts with decision-makers' needs.

Overseas collaborating country

Philippines

Commissioned organisation

South Australian Research and Development Institute, Climate Risk Management Unit, Australia

Project leader

Peter Hayman
Phone: 08 8431 6926
Fax: 08 8303 9424
Email: hayman.peter@saugov.sa.gov.au

Project website

<<http://dirp3.pids.gov.ph/ACIAR/>>

Collaborating institutions

Philippine Atmospheric, Geophysical and Astronomical Services Administration,
Philippines
Philippine Institute for Development Studies, Philippines
Leyte State University, Philippines
University of Sydney, Australia
NSW Department of Industry and Investment, Australia

Project budget

\$833,024

Project duration

01/01/2005 to 30/06/2009
(Project extended from 01/01/2009 to 30/06/2009)

ACIAR Research Program Manager

Dr Caroline Lemerle

Project outcomes

Final report not yet submitted by the project leader

ASEM/2003/052: Improving financial returns to smallholder tree farmers in the Philippines

In the province of Leyte, as elsewhere in the Philippines, forest industry development is considered a priority. Economically, forestry is a viable industry for many farmers, particularly if underutilised land is used. Knowledge of market demands is also needed by smallholders to better deliver in-demand products. Most of the land farmed by smallholders is marginal and sloping with few other uses. With areas of the province deforested, or at best marginally productive, forestry and agroforestry addresses a second need—positive environmental management. Pressure to log native forests, in turn increasing deforestation, can be relieved through greater smallholder involvement. Most plantings are undertaken for production forestry and conservation.

In Leyte, forestry does not meet provincial demand for timber, this being met by importing logs. Smallholders and community forestry practitioners rely on timber for on-farm and household use, but less so as a supplementary income. Past ACIAR research has demonstrated greater financial returns are possible if these two groups had better market access and knowledge of prices. This would likely result in the planting of appropriate species to meet timber demand, greater volumes being produced per unit of cost and improved log size and quality. Barriers to market entry, including improved registration processes through the Department of Environment and Natural Resources (DENR) also exist and will be a focal point of project activities. A strategy to improve financial returns to existing tree farmers and intending smallholder tree farmers is being implemented to:

- assist DENR to overcome policy constraints to tree registration and log transport
- assist smallholder tree growers to satisfy market requirements and improve productivity
- identify and promote livelihood systems and policies which incorporate forestry and recognise the socioeconomic circumstances of smallholders.

Overseas collaborating country

Philippines

Commissioned organisation

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

Project leader

Dr John Herbohn
Phone: 07 5460 1646
Fax: 07 5460 1324
Email: j.herbohn@uq.edu.au

Collaborating institutions

Leyte State University, Philippines
Department of Environment and Natural Resources, Philippines
Southern Cross University, Australia

Project budget

\$698,128

Project duration

01/01/2005 to 31/03/2009
(Project extended from 01/01/2008 to 31/03/2009)

ACIAR Research Program Manager

Dr Caroline Lemerle

Project outcomes

Final report not yet submitted by the project leader

FIS/2007/045: Evaluation of production technology, product quality and market potential for the development of bivalve mollusc aquaculture in the Philippines

Bivalve aquaculture has the potential to sustain small-scale coastal communities across the Philippines and contribute to economic growth—provided problems of production, regulation, postharvest practices, food safety and marketing can be identified and addressed. This scoping study examined bivalve industries in Visayas and compared them with better performing regions in Luzon. Collected data were analysed and used to develop a clearer understanding of the factors underlying the relative underperformance of these industries in terms of productivity and economic performance, and to identify priorities for future research.

Overseas collaborating country

Philippines

Commissioned organisation

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

Project leader

Dr Peter Duncan
Phone: 07 5430 2831
Fax: 07 5430 2881
Email: pduncan@usc.edu.au

Collaborating institution

University of the Philippines in the Visayas, Institute of Fisheries Policy and Development Studies, Philippines

Project budget

\$50,497

Project duration

01/06/2007 to 28/02/2009
(Project extended from 01/07/2008 to 28/02/2009)

ACIAR Research Program Manager

Dr Chris Barlow

Project outcomes

This scoping study was conducted to obtain an industry overview of the two regions mentioned above, to assess various factors considered to contribute to regional differences in bivalve production, and to identify constraints to overall development. The areas of investigation included water-quality parameters, sediment characteristics, temporal and spatial morphometric parameters of culture species, microbial assessment of water and mollusc tissue and an in-depth survey of industry practices, demographics and organisational structures. Finally, reviews of local regulatory processes and international aspects of bivalve aquaculture were conducted.

Field sampling was attempted during wet (approximately June – November) and dry (December – May) seasons at 60 individual stations, covering nine municipalities across the two regions. Some limitations were encountered but a good overview of the main parameters was obtained. Furthermore, 388 producer surveys and 119 market surveys

were conducted during the study, providing the most comprehensive data set yet collected on this industry in the Philippines. Additional information on industry legislation and governance was gathered from interviews and communication with local and national government agencies.

In summary, data collected indicated that differences exist between Luzon and Western Visayas which may explain some of the differences in production output and value— notably, higher growth rates, differences in culture systems, different demographic profiles of industry participants and differences in microbiological status.

The findings were discussed in the context of developing a proposal for implementing in the medium-term industry-development programs in Western Visayas, and in the longer term, both equalising and enhancing the prospects for regional production as well as developing export markets for bivalve products.

HORT/2003/071: Integrated pest management and supply-chain improvement for mangoes in the Philippines and Australia

Mangoes are a popular fruit in many tropical countries in Asia and in Australia. The Philippines has a mature mango industry based on the Carabao cultivar. A large proportion of this industry is based in Luzon on the southern island of Mindanao and Guimaras in the Visayas. Smallholder production, defined as farms less than three hectares, accounts for 48% of total Philippines production. The Philippines produces around 880,000 tonnes each year. Of this, between 36,000 and 40,000 tonnes are exported, making the country the world's second-largest mango exporter after Mexico, and representing around 5.9% of global trade. There is significant scope to increase this production and trade further, as pest and disease losses, production variability, fruit perishability and supply-chain management all limit potential. The Australian industry does not have the breadth of problems but does have some pest-control and quarantine issues.

Insect pests are a significant problem in both countries. A field infestation has the potential to cause losses of 10– 40%. This can also limit market access domestically and internationally. Pesticides are frequently used, often to excess, prompting concerns relating to pesticide residues. New pests emerging in the Philippines also require that integrated pest management strategies address new threats and excessive pesticide use. In addition, improvements in the supply chain are likely to help reduce losses and foster better pre and postharvest practices at all levels. The sustainability of mango industries in the Philippines and Australia will be enhanced through a systems approach to improving pest management and the consistency of supply and quality of mangoes for targeted markets.

Overseas collaborating country

Philippines

Commissioned organisation

Queensland Department of Primary Industries and Fisheries, Horticulture and Forestry Science, Australia

Project leader

Mr Robert C. Williams
Phone: 07 4064 1151
Fax: 07 4064 2249
Email: Bob.William@deedi.qld.gov.au

Collaborating institutions

Philippine Council for Agriculture, Forestry and Natural Resources Research and Development, Philippines
Department of Agriculture, Fisheries and Forestry, Australia
Department of Agriculture, Philippines
Bureau of Plant Industry, Philippines
University of the Philippines at Los Baños, Philippines

Project budget

\$1,157,768

Project duration

01/01/2005 to 30/09/2008
(Project extended from 01/07/2008 to 30/09/2008)

ACIAR Research Program Manager

Mr Les Baxter

Project outcomes

Field studies were conducted to develop improved recommendations for integrated pest management and judicious pesticide use. Baseline data were taken as the basis for the recommendations. Pest identification and monitoring provided the indices of knowing the insect population and its degree of damage for the different control methods employed.

Data collected from the baseline surveys showed that mango growers/cooperators were dependent solely on chemical control as their method of suppressing pests and diseases, having an average of 13 chemical-spraying cycles. Almost none of the cooperators practiced insect pest monitoring as their basis for employing control measures. There was only minor pruning or none at all, sanitation and even a fertilisation scheme were given scant attention, and no soil analysis conducted.

Five insect pests (cecid fly, mango leafhoppers, blossom thrips, mango seed borer and mango fruit fly) were identified and found to damage mango leaves, flowers and fruits. Cecid fly damages both new and old leaves, while mango leafhopper and blossom thrips damage flowers. On fruits, mango seed borer contributed much of the damage (average fruit damage around 20%), followed by mango fruit fly (11%) and cecid fly (3.5%).

Integrated pest management (IPM) interventions such as regular sanitation, pruning, balanced fertilisation, pest monitoring as a basis for need-based chemical application, yellow/white sticky and light traps, early bagging, insect pheromone and use of lorsban-impregnated plastic successfully reduced the percentage of fruit damage to 4.8% from six spraying cycles applied 8, 15, 21, 35, 42 and 55 days after flower induction, and gave significant yield increase to around 140 kilograms per tree as compared to farmers' practice with 7.5% damage and yield of 50 kilograms per tree. On the cost and return analysis, IPM gave the highest return of investment (164%) with an increment of 99.5% over that of farmers' practice (chemical spray alone).

Observations on field populations of mango pulp weevil adults at quiescent stage were made. An IPM work plan was developed against three pests—leafhopper, mango pulp weevil (MPW) and fruit fly. This work plan was anchored on four IPM strategies—cultural control, pest monitoring, chemical control and physical control.

Crude extracts were collected from mango fruits, male and female weevils (virgin and mated) and male and female weevil frass (virgin and mated) to determine attractancy to virgin female weevils. The components of mated male weevil frass were determined by gas chromatography – mass spectrometry (GC–MS) and standard chemicals were used to determine attractancy to virgin female weevils.

Data on the survey conducted in northern and southern Palawan were accessed as well as data from mango x-ray examination for MPW infestation. Adult weevils were found to stay up on the main branches of mango trees at the quiescent stage. The IPM work plan consisting of cultural, physical and chemical control and pest monitoring was able to reduce MPW population to 2%. Physical control (bagging) enabled the reduction of spray application to 5 times throughout the fruit-production period.

Mated male frass at three frass equivalents elicited the highest attraction (73.3%) to virgin female weevils. Twenty-four components were identified by GC–MS from mated male frass; one component, acetic acid, elicited the same percentage attraction. A survey in northern Palawan showed that the area is still free of MPW.

SMCN/2003/006: Enhancing agricultural production in the Philippines by sustainable use of shallow groundwater

In the Philippines most lowland agriculture is in part dependent on rainfall, which is usually abundant. Rainfall also recharges lowland aquifers, which are used to supplement rainfall in irrigated cropping. This combination of rain and recharging ensures sufficient water for production. In Ilocos Norte province there are two seasons, dry from November to April and wet from May to October. The balance between these has, to date, ensured that groundwater levels remain sustainable. There is, however, a danger of groundwater overexploitation. High-value dry-season crops—mung bean, onion, garlic and other vegetables—are increasing pressure on the use of groundwater. An instance of drought or prolonged reduced rainfall could dramatically increase such pressures. Planning and development of management options before resources such as wells, mainly controlled by individuals, reach and exceed capacity is the best way to avoid exploitation and groundwater depletion. The longer this is left, the less effective it is likely to be. This project sought to establish measures to exploit shallow groundwater sustainably, aiming to increase crop production in lowland, rainfed agricultural areas of the Philippines.

Overseas collaborating country

Philippines

Commissioned organisation

CSIRO Land and Water, Australia

Project Leader

Dr Peter Dillon
Phone: 08 8303 8714
Fax: 08 8303 8750
Email: peter.dillon@csiro.au

Collaborating institutions

Bureau of Soils and Water Management, Philippines

Project budget

\$449,789

Project duration

01/07/2004 to 30/06/2009
(Project extended from 01/01/2008 to 30/06/2009)

ACIAR Research Program Manager

Dr Gamini Keerthisinghe

Project outcomes

Project work on groundwater management focused on two pilot sites within neighbouring municipalities of Pasuquin and Burgos, Ilocos Norte in the north-western tip of Luzon in the Philippines. These sites were selected because in this relatively dry area the use of groundwater for irrigation to finish rice crops and support high-valued dry-season crops was already enhancing agricultural production. Increased groundwater extraction could be expected to further increase production but the sustainable limit was undefined. Excessive groundwater extraction would most likely result in coastal saline intrusion into the groundwater resource, creating a serious problem for agriculture and for drinking water

supplies from wells. Also a new wind-turbine power station near Burgos is likely to increase availability of electrical power supplies for pumping, which could accelerate the rate of groundwater extraction.

Furthermore, limestone aquifers and available run-off in the wet season at these sites suggested that managed aquifer recharge could provide a possible means of protecting these aquifers and supporting production if a groundwater overdraft were to occur. Limestone provides a much easier target for managed aquifer recharge than sand from which Philippine coastal aquifers are more commonly composed.

The project assessed the potential of shallow groundwater resources in both pilot sites. Through modelling exercises (i.e. groundwater and economic modelling) the limit of future groundwater extraction was projected. Public consultations increased the level of awareness of farmers and decision-makers on the current situation through which management strategies were formulated. However, farmers as groundwater users should be encouraged to contribute in the overall management of groundwater as 'resource managers' to ensure a more sustainable use of this precious resource.

In June 2008, a Farmer-managed Groundwater System (FMGWS) in the project sites was implemented as a management strategy. It intends to increase the level of awareness and understanding of farmers about groundwater and its occurrence, cropping pattern development, and other technological concepts leading to a more sustainable management of the groundwater resource. This is a contingency option in the event that climate change reduces recharge or if initial estimates exceed actual sustainable yield.

As a strategy of implementation, the concept of FMGWS was introduced through the establishment of a Farmer Water School (FWS) in the pilot sites. A training of trainers was held in November 2008 to develop agricultural technicians of Ilocos Norte as potential trainers who will empower farmers and groundwater users with the required knowledge and skills to protect and manage the resource.

Training modules that suit Philippine settings and culture were prepared. These modules comprise: 1) human dimension of groundwater management; 2) basic concepts on groundwater, its occurrence and sustainable use; 3) crop planning and formulating appropriate groundwater management. With these modules, several other sub-modules expressed in local dialect were developed. From January to June 2009 FWS classes were conducted at both project sites. The sessions were supplemented by a Farmers' Field Tour in Tarlac Shallow Well areas, Maasin Small Water Impounding Project in Talugtog, Nueva Ecija, Central Luzon State University, PhilRice and Pantabangan Dam to familiarise the farmers with various water-saving technologies that they could adopt in their respective areas.

In July 2007, a two-phase consultation was held. At the end, the farmers passed a Covenant of Support to protect and manage the shallow groundwater resource. This covenant was presented to local policymakers who showed their willingness to provide a parallel effort to protect and manage the shallow groundwater resource by espousing related local policies. Furthermore, it was agreed that this should be referred to the National Water Resources Board (NWRB), the agency that regulates the utilisation, protection and management of Philippine water resources.

Works were undertaken in Australia to design artificial recharge systems for use in sandy aquifers that predominate in lowland areas of the Philippines. An evaluation of the performance of roughing filters for removal of colloidal kaolin as a pre-treatment for biofiltration (slow sand filtration) was completed. The biofiltration process was reviewed and a testing facility established at the Urrbrae Agricultural High School to evaluate stormwater biofiltration design variables. The team studied well completion techniques to prepare for design and construction of wells at the Urrbrae site and undertake an artificial systems recharge pilot study. Unfortunately the thin alluvial aquifer was not encountered in either well and it is proposed that a deeper well be installed once water-quality testing has established an effective pre-treatment for a recharge trial.

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.

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.

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.

8 Appendix 1: ACIAR contacts

8.1 Country Office

Ms Cecilia Honrado	Country Manager
Email	cecilia.honrado@dfat.gov.au
Phone	+632 757 8241
Ms Mara Faylon	Assistant Manager
Email	mara.faylon@dfat.gov.au
Phone	+632 757 8209

8.2 R&D Program

TBA	Regional Coordinator
Email	aciar@aciar.gov.au
Phone	+61 2 6217 0500
TBA	Regional Coordinator Assistant
Email	aciar@aciar.gov.au
Phone	+61 2 6217 0500
Ms Lisa Wright	Governance and Communications
Email	wright@aciar.gov.au
Phone	+61 2 6217 0535

Key Program Managers

Dr Caroline Lemerle	Agricultural Systems Management
Email	lernerle@aciar.gov.au
Phone	+61 2 6217 0532
Dr Doug Gray	Animal Health
Email	gray@aciar.gov.au
Phone	+61 2 6217 0540
Dr Chris Barlow	Fisheries
Email	barlow@aciar.gov.au
Phone	+61 2 6217 0508
Mr Les Baxter	Horticulture
Email	baxter@aciar.gov.au
Phone	+61 2 6217 0553
Dr Gamini Keerthisinghe	Soil Management and Crop Nutrition
Email	keerthisinghe@aciar.gov.au
Phone	+61 2 6217 0558

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

ACIAR • GPO Box 1571, Canberra ACT 2617
Tel: +61 2 6217 0500 • Fax: +61 2 6217 0501
Email: aciara@aciara.gov.au