

5.2

## East and South-East Asia



# East and South-East Asia

**Collectively, the countries of East and South-East Asia are the most populous in the world and an economic powerhouse. Ten of these countries are members of the Association of Southeast Asian Nations (ASEAN) and engage closely in terms of trade and investment with east Asian countries, including China and South Korea.**

Before the COVID-19 pandemic, ASEAN economies were forecast to have some of the highest growth rates in the world over the next 5 years. The IMF and OECD had forecast an average of 5% growth per annum, a higher rate than some of the more developed economies of Europe and North America. The ASEAN economy has consistently outperformed the global economy and is the fifth largest economy in the world, with a combined GDP of A\$4.8 trillion in 2018.

As a result of the pandemic, 4.7 million people in South-East Asia were living in extreme poverty in 2021. According to a new Asian Development Bank report presented at the Southeast Asia Development Symposium, 9.3 million jobs disappeared, the region's GDP shrank by 3.3% and foreign direct investment inflows declined by 33.2%.

Throughout 2020, the number of cases and death rate due to COVID-19 were relatively low in ASEAN countries. However, during 2021, the region experienced substantially higher rates of COVID-19 infection, hindering recovery and economic growth. With only 59% of the region's population fully vaccinated (as of February 2022), there remains a major risk of widespread unemployment, worsening inequality, and rising poverty levels, especially among women, youth and the elderly, in South-East Asia.

With more than 100 million hectares of agricultural land, the ASEAN countries collectively are a major producer, supplier and exporter of various crops, grains (including rice) and livestock products. Although agriculture only contributes around 10% of total ASEAN GDP, it is the main sector for employment in most member states, accounting for approximately one-third of total ASEAN employment. Given its significant role, the development of the food, agriculture and forestry sectors in ASEAN countries is vital to ensuring equitable and inclusive growth in the region.

The COVID-19 pandemic exposed the vulnerabilities of food supply chains in the region, prompting calls for the region to become food resilient and sustainable by shortening existing food supply chains and strengthening food systems. The pandemic also heightened the pressure on countries to reverse the trend of underinvesting in the food and agriculture sector. This includes investing in rural logistics, upskilling, research and development, in addition to harnessing the use of digital technology to benefit the farming community.

Food security, food safety and better nutrition remain priority concerns within the region. These priorities align with ASEAN's goals of agricultural cooperation. Support for women's economic empowerment, which has become a prominent approach to addressing gender gaps in economic spheres, including agriculture, continues to grow.

## Partner countries in the ACIAR East and South-East Asia region

- » Cambodia
- » China
- » Indonesia
- » Laos
- » Malaysia
- » Myanmar
- » Philippines
- » Thailand
- » Timor-Leste
- » Vietnam



## Drivers of regional collaboration

The principal driver of regional collaboration in the East and South-East Asia region is the ASEAN, which for more than 50 years has addressed shared challenges and engaged trade and development partners, including Australia and China. Recently, regional collaboration has been driven by critical factors such as the COVID-19 pandemic, geopolitics, and transboundary concerns.

Trade and investment are the major drivers of economic growth in the region, aided by overseas development assistance. The ASEAN-led Regional Comprehensive Economic Partnership (RCEP) Agreement came into force in January 2022 and is expected to help strengthen regional economic integration and provide access to a larger market, which will assist the post-pandemic recovery of the ASEAN economies.

In the agricultural research sector, ACIAR is supporting regional collaboration through support to Asia-Pacific Association of Agricultural Research Institutions (APAARI). Cross-border challenges such as plant and animal biosecurity remain prominent and also drive regional integration. In the Mekong region, plant diseases have recently spread across borders, destroying crops of cassava and banana. African swine fever has taken a tremendous economic toll on countries such as Vietnam, the Philippines, Laos and Cambodia. The COVID-19 pandemic has raised biosecurity and One Health (the interface between human, animal and environmental health) as priorities in the region.

Shared concerns about imminent and increasing threats posed by climate change have resulted in ASEAN creating a 'framework of ASEAN community building, with strategies and actions to enhance regional and international cooperation in supporting adaptation'. In the field of agricultural research and development, regional cooperation plays a significant role, particularly regarding increasing resilience and adaptation to climate change, natural disasters and other shocks.

The South-East Asia region is one of the most natural disaster-prone in the world. Natural disasters threaten food security and rural livelihoods and have economic consequences for the whole region, so disaster mitigation is a common interest among neighbouring countries. The ASEAN Declaration on 'One ASEAN, One Response' aims to increase the speed, scale and solidarity of disaster response in the region.

## ACIAR East and South-East Asia region program

Our program in East and South-East Asia remains the largest across the 4 regions in which ACIAR operates. The nature of our engagement within the region is strongly bilateral, based on robust partnerships with national research systems, long-standing diplomatic connections, and sustained development collaboration with Australia. However, there is a growing trend towards regional collaboration between countries facing shared challenges. This is consistent with the research partnerships under ASEAN, which acknowledge that collaboration among member states is a sensible path towards addressing common challenges in the region.

### Region-wide cooperation on forest biosecurity

Our on-the-ground work in South-East Asia primarily occurs with 7 partner countries. However, we do work with development and coordinating organisations based in other countries in the region on issues and programs of regional significance.

For example, in recent decades Thailand has transitioned from aid recipient to aid donor. Thailand hosts regional organisations of relevance to ACIAR programs, including APAARI (page 20), the Asian Institute of Technology and the FAO regional office. We also include Thai expertise on projects of regional significance when opportunities arise.

In 2022–23, we have a regional project, 'Building effective forest health and biosecurity networks in South-East Asia' (FST/2020/123), that includes partners from Thailand and Malaysia, as well as partners from Cambodia, Indonesia, Laos and Vietnam. A description of this project can be found on page 93 in the Cambodia chapter.



The ASEAN drive towards regional economic integration and connectivity will increase demand from individual countries and regional bodies for research support that harmonises approaches to some agricultural issues across countries, including biosecurity, food safety and climate resilience. We contribute to this by funding regional research collaboration and through our support and chairing of APAARI.

Among our newer regional collaborations in the East and South-East Asia region are efforts to identify efficient biosecurity risk-management systems in the region to respond to prominent outbreaks affecting plant and animal health. For example, Indonesia, the Philippines and Laos are involved in regional research focusing on an integrated system to manage *Fusarium* wilt (Panama disease) in banana crops with components of biosecurity and disease management.

Another research collaboration focusing on plant biosecurity engages the whole of the Mekong region and China. The research will address serious diseases of cassava through a multipronged strategy involving breeding, surveillance, agronomy and seed systems interventions, coupled with engagement with government institutions and agribusiness.

The incursion of African swine fever to the region in 2019 also provided a strong context for regional collaboration in One Health. An ACIAR regional research collaboration that involves Cambodia, Vietnam and Laos seeks to understand how veterinary service markets might be better managed and governed by agents of government interested in human health, in cooperation with agents interested in agriculture and animal health.

During 2022–23, a series of project will be implemented throughout the region under the ACIAR-IDRC Research Program on One Health (AIRPOH). Cambodia, Indonesia, Laos, The Philippines and Timor-Leste will host a portfolio of interconnected projects supporting research that aims to promote new ideas and thinking on the relationship and management of human, animal and environmental health (page 24).

Trilateral collaboration and new partnership models are emerging for ACIAR in the East and South-East Asia region. Driving these new partnership models are greater capacities that can be achieved when resources are pooled. This is translating into substantial co-investment from partners such as Vietnam, Indonesia and the Philippines. While bilateral relationships remain the predominant model for development cooperation in the region, trilateral collaboration is increasingly possible and desired by partner countries.

Opportunities for trilateral research collaboration with Australia in the region include varietal development to manage devastating new diseases in banana, cassava and citrus; machinery innovation for conservation agriculture among smallholder farmers; and research to develop perennial rice varieties.



### Securing the future of coconut

Grown in more than 90 tropical countries, on more than 12 million hectares, coconut is important to millions of smallholder households. The future of coconut production and livelihoods is threatened by senile plantings, which face further decline from pest and disease, climate change and poor conservation and management of genetic resources. Access to coconut genetic diversity is vital to sustaining the livelihoods of millions of smallholders and their communities around the world, particularly in the Asia-Pacific region.

During 2022–23, ACIAR, DFAT and the International Coconut Community will continue their collaboration to reinvigorate and sustain the Coconut Genetic Resources Network (COGENT). The program will focus on better coconut science, through a global coconut strategy to address the challenges outlined above. The program will work with other organisations to ensure a viable COGENT secretariat to safeguard coconut genetic resources and better address disease threats. The network is active throughout the Asia-Pacific region and led by Dr Jelfina Alouw, Executive Director of the International Coconut Community, who is based in Jakarta, Indonesia.

ACIAR project GP/2018/193

# East and South-East Asia region program 2022-23

Partner country	No. projects
Cambodia	17
Indonesia	20
Laos	19
Myanmar	3
Philippines	11
Timor-Leste	5
Vietnam	24

Note that a project may be conducted in several countries, therefore the total number of projects in this table will be greater than the number of projects in the region.

**75**  
projects

**58 research**  
projects

**17 small**  
research  
activities

## Research portfolio



**12**

Agribusiness projects



**3**

Climate Change projects



**3**

Crops projects



**13**

Fisheries projects



**6**

Forestry projects



**8**

Horticulture projects



**11**

Livestock Systems projects



**7**

Social Systems projects



**11**

Soil and Land Management projects



**1**

Water project

**Table 5.2 Current and proposed projects in the East and South-East Asia region, 2022–23**

Project title	Project code	Country
<b>Agribusiness</b>		
Agricultural policy research to support natural resource management in Indonesia's upland landscapes	ADP/2015/043	Indonesia
Understanding the drivers of successful and inclusive rural regional transformation: Sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan	ADP/2017/024	Bangladesh, China, Indonesia, Pakistan
Inclusive agriculture value chain financing	AGB/2016/163	Indonesia, Myanmar, Vietnam
Establishing sustainable solutions to cassava diseases in mainland South-East Asia	AGB/2018/172	Cambodia, Laos, Myanmar, Vietnam
Increasing the sustainability, productivity and economic value of coffee and black pepper farming systems and value chains in the Central Highlands Region of Vietnam	AGB/2018/175	Vietnam
Agribusiness-led inclusive value chain development for smallholder farming systems in the Philippines	AGB/2018/196	Philippines
Planning and establishing a sustainable smallholder rice chain in the Mekong Delta	AGB/2019/153	Vietnam
Integrating smallholder households and farm production systems into commercial beef supply chains in Vietnam	AGB/2020/189	Vietnam
Evaluating supply chain interventions and partnerships to sustainably grow the smallholder dairy sectors of Indonesia and the Philippines	AGB/2021/124	Indonesia, Philippines
Creating resilient communities through smallholder-inclusive tourism markets in Indonesia	AGB/2021/125	Indonesia
Piloting digital monitoring of VietGAP compliance and quality in Vietnam vegetable value chains	AGB/2021/153	Vietnam
Food loss in the <i>Pangasius</i> catfish value chain of the Mekong River Basin (Food Loss Program)	CS/2020/209	Cambodia, Laos, Vietnam
<b>Climate Change</b>		
Supporting greenhouse gas inventories and targeted rice mitigation options for Vietnam	CLIM/2019/150	Vietnam
Preparing for mangrove-based climate and agribusiness transformation in the Mekong Delta	CLIM/2021/138	Vietnam
Supporting the tracking sharing learning platform of the Adaptation Research Alliance	CLIM/2022/108	Global
<b>Crops</b>		
International Mungbean Improvement Network 2	CROP/2019/144	Bangladesh, India, Indonesia, Kenya, Myanmar
Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos	CROP/2019/145	Cambodia, Laos
Agricultural Innovations for Communities: Intensified and diverse farming systems for Timor-Leste (AI-Comm 2)	CROP/2021/131	Timor-Leste
<b>Fisheries</b>		
Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits	FIS/2016/116	Indonesia
Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines	FIS/2016/122	Philippines, Vietnam
Half-pearl industry development in Tonga and Vietnam	FIS/2016/126	Tonga, Vietnam
Assessing upstream fish migration measures at Xayaburi Dam in Laos	FIS/2017/017	Laos
A nutrition-sensitive approach to fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia	FIS/2017/032	Indonesia, Timor-Leste
Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration	FIS/2018/128	Philippines
FishTech: Integrating technical fisheries solutions into river development programs across South-East Asia	FIS/2018/153	Cambodia, Indonesia, Laos, Vietnam, Thailand

Project title	Project code	Country
Regional coral restoration networks and appropriate technologies for larger-scale coral and fish habitat restoration in the Philippines and Australia	FIS/2019/123	Philippines
Innovating fish-based livelihoods in the community economies of Timor-Leste and Solomon Islands	FIS/2019/124	Solomon Islands, Timor-Leste
Developing social and economic monitoring and evaluation systems in Indonesian tuna fisheries to assess potential impacts of alternative management measures on vulnerable communities	FIS/2020/109	Indonesia
Blue economy: Valuing the carbon sequestration potential in oyster aquaculture	FIS/2020/175	Vietnam
Institutional effectiveness and political economy of coral reef restoration in the Philippines	FIS/2021/112	Philippines
Supporting grouper-farming smallholders in Vietnam to improve their SME businesses by engaging with aquafeed companies to produce commercial feeds	FIS/2021/121	Vietnam
<b>Forestry</b>		
Advancing enhanced wood manufacturing industries in Laos and Australia	FST/2016/151	Laos
Managing risk in South-East Asian forest biosecurity	FST/2018/179	Indonesia, Vietnam
Building an effective forest health and biosecurity network in South-East Asia	FST/2020/123	Cambodia, Laos, Vietnam
Vietnamese native tree species for improved livelihoods	FST/2020/134	Vietnam
Forest restoration for economic outcomes	FST/2020/137	Laos
Retaining the jewels in the crown: Kalimantan peat forest remnants	FST/2021/145	Indonesia
<b>Horticulture</b>		
Supporting an international initiative to maintain the coconut genetic resources network (COGENT)	GP/2018/193	Indonesia
Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region	HORT/2015/042	Indonesia, Philippines
Developing vegetable value chains to meet evolving market expectations in the Philippines	HORT/2016/188	Philippines
Improving mango crop management in Cambodia, the Philippines and Australia to meet market expectations	HORT/2016/190	Cambodia, Philippines
An integrated management response to the spread of <i>Fusarium</i> wilt of banana in South-East Asia	HORT/2018/192	Indonesia, Laos, Philippines
Preparedness and management of huǎnglóngbǐng (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia	HORT/2019/164	Indonesia
Safe, fresh, year-round vegetables in Cambodia and Laos through research and development support of whole supply chain agribusiness networks	HORT/2021/143	Cambodia, Laos
Biosecurity planning	HORT/2021/151	Cambodia, Papua New Guinea
<b>Livestock Systems</b>		
Intensification of beef cattle production in upland cropping systems in Northwest Vietnam	LPS/2015/037	Vietnam
Investigating and developing interventions to mitigate food borne parasitic disease in production animals in Laos	LS/2014/055	Laos
Goat production systems and marketing in Laos and Vietnam	LS/2017/034	Laos, Vietnam
Asian chicken genetic gains: A platform for exploring, testing, delivering, and improving chickens for enhanced livelihood outcomes in South East Asia	LS/2019/142	Cambodia, Vietnam
Global burden of animal disease initiative: Indonesia case study	LS/2020/156	Indonesia
Bacterial enteropathy and nutrition study in poultry	LS/2021/126	Timor-Leste
Rapid transformation of Lao beef sector – biosecurity, trade and smallholders	LS/2021/128	Cambodia, Laos

Project title	Project code	Country
Global animal health governance: High-level consortium	LS/2021/157	Vietnam
Developing strategies to reduce brucellosis transmission in Timor-Leste based on One Health collaboration (ACIAR-IRDC One Health Research Program)	LS/2022/161	Timor-Leste
Policy support to the Philippines' national surveillance and control programs for African swine fever, avian influenza and antimicrobial resistance: A One Health systems approach (ACIAR-IRDC One Health Research Program)	LS/2022/162	Philippines
Livestock enhancement through ecohealth/One Health assessment in South-East Asia (ACIAR-IRDC One Health Research Program)	LS/2022/163	Indonesia, Laos, Philippines
<b>Social Systems</b>		
Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia	ASEM/2013/003	Cambodia
Enhancing livelihoods through forest and landscape restoration	ASEM/2016/103	Philippines
Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam	SSS/2018/139	Vietnam
Next generation agricultural extension: Social relations for practice change	SSS/2019/138	Cambodia
Policy impact in Laos: From research to practice	SSS/2020/142	Laos
Building the evidence base on the impacts of mobile financial services for women and men in farming households in Laos and Cambodia	SSS/2020/160	Cambodia, Laos
The role of agricultural and forest landscapes on human and environmental health in Cambodia (ACIAR-IRDC One Health Research Program)	SSS/2022/164	Cambodia
<b>Soil and Land Management</b>		
Improving community fire management and peatland restoration in Indonesia	FST/2016/144	Indonesia
Land management of diverse rubber-based systems in the southern Philippines	SLAM/2017/040	Philippines
Farmer options for crops under saline conditions in the Mekong River Delta, Vietnam	SLAM/2018/144	Vietnam
Crop health and nutrient management of shallot-chilli-rice cropping systems in coastal Indonesia	SLAM/2018/145	Indonesia
Managing heavy metals and soil contaminants in vegetable production to ensure food safety and environmental health in the Philippines	SLAM/2020/117	Philippines
Validating technologies for assessing and monitoring the impacts of re-wetting of peatland Indonesia using eddy flux towers coupled with the Chameleon sensors	SLAM/2020/118	Indonesia
Evaluation of livelihood zones, rural household trajectories, research and development partners and initiatives in Timor-Leste	SLAM/2021/108	Timor-Leste
Embedding knowledge and exploring future research opportunities in sloping land agricultural systems in northern Laos and Northwest Vietnam	SLAM/2021/152	Laos, Vietnam
Management practices for profitable crop livestock systems for Cambodia and Laos	SMCN/2012/075	Cambodia, Laos
Improving maize-based farming systems on sloping lands in Vietnam and Laos	SMCN/2014/049	Laos, Vietnam
Land suitability assessment and site-specific soil management for Cambodian uplands	SMCN/2016/237	Cambodia
<b>Water</b>		
Water for fish and irrigation in the Mekong	WAC/2021/135	Cambodia, Laos



# Cambodia



**A\$3.66** million  
**Budgeted funding**



**14**  
**Bilateral and regional  
research projects**



**3**  
**Small projects and  
activities**

**In late 2021, the Kingdom of Cambodia declared it would live with COVID-19, and reopened the country to business and tourism. While health measures remain in place, Cambodia has initiated its economic recovery plan.**

Cambodia has suffered critical shocks triggered by the global pandemic, and the economic impacts have been as severe as the health impacts. The GDP is however predicted to recover with growth of greater than 6% anticipated for 2023.

Poverty remains higher than pre-pandemic levels, with the lowest rate in Phnom Penh (4.2%) and the highest rate in rural areas (22.8%). About 76% of Cambodia's population lives in rural areas.

Cambodia's agricultural sector remains a key source of employment and accounted for approximately a quarter of the country's GDP in 2021. More than 60% of poverty reduction from 2007 to 2011 was attributed to positive developments in the agriculture sector and in 2020 the World Bank reported that it is the sector least affected by the global pandemic.

Recently, the Cambodian Minister of Agriculture, Forestry and Fisheries stated that 2 of the challenges Cambodia faces include the impact of severe droughts and floods, which increasingly threaten yields and incomes each year. According to the Global Climate Risk Index for 2000-2019, Cambodia ranked 14th in the world for countries most affected by climate-related extreme weather events.

Cambodia's agricultural production increased slightly in 2021, despite less favourable weather conditions. Wet season rice cultivation reached 2.6 million hectares, a 5.4% year-on-year increase. Wet season rice yield increased to 4.1 tonnes per hectare, up from 3.5 tonnes per hectare in 2020. Throughout the pandemic, the agriculture sector has benefited from increased labour availability due to layoffs in the services and industry sectors and the return of migrant workers from cities and abroad.

The Cambodia-China Free Trade Agreement came into effect in January 2022 and will likely provide a further boost to Cambodia's agricultural production and exports, especially to the Chinese market. The country's agricultural production and exports have expanded during the pandemic as demand increases.

The Ministry of Agriculture, Forestry and Fisheries is in the midst of implementing its 2019-25 Agriculture Sector Development Strategy, which aims at modernising the agriculture sector. This is an important step towards accelerating the transformation from subsistence farming to commercial agriculture.

## Country priorities

ACIAR and the Royal Government of Cambodia (represented by the Ministry of Agriculture, Forestry and Fisheries) have an ongoing 10-year agreement on the strategic priorities for research collaboration. From 2019 to 2029, research collaborations will focus on 3 domains to support the development of Cambodian agriculture:

- » sustainable intensification and diversification of agriculture, focusing on non-rice crops in traditional crop-rice systems and alternative cropping systems
- » sustainable intensification of market-oriented smallholder livestock production systems
- » sustainable intensification of freshwater aquaculture production systems for nutrition-rich species.

Research priorities over this time will also take into consideration cross-cutting themes that address challenges across the agriculture sector. These are:

- » gender equity, women's empowerment and nutrition – these are particularly important in the context of increasing labour migration that impacts women and children in rural Cambodia, and high rates of stunting and poor nutrition among women and children
- » climate variability mitigation and adaptation to climate change, taking into consideration climate variability and enabling climate-resilient farming systems
- » food safety and standards.

## 2022-23 research program

- » **17 ACIAR-supported projects in Cambodia**
- » **4 projects are specific to this country**
- » **13 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018-2027, as well as specific issues and opportunities identified by ACIAR and our partner organisations. The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Cambodia. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

### Agribusiness

Cassava witches' broom disease and Sri Lanka cassava mosaic virus are spreading rapidly in South-East Asia. A project led by Dr Jonathan Newby of the International Center for Tropical Agriculture is developing technically viable and economically and socially sustainable ways to improve the resilience of cassava production systems and value chains in Cambodia, Laos, Myanmar and Vietnam. The project will conclude in 2023 with researchers continuing on-farm testing of new agronomic practices and training of farmers and extension officers. The project team will also finalise their investigation of alternative models for public-private funding for core activities.<sup>1</sup>



Ms Pou Chanthea is a cassava farmer in Tboung Khmum province in central Cambodia. ACIAR-supported projects are working with farmers and agencies to identify and introduce agronomic practices and value chain management to reduce the impact of disease in cassava crops. Photo: Majken Soegaard

Catfish (*Pangasius* sp) farming and wild-caught catfish are important income generating activities for smallholder farmers in the Mekong River Basin and are a vital source of dietary protein for those countries' populations. The continued availability of catfish for human consumption is influenced by many factors including climate change, the COVID-19 pandemic, consumer perceptions on food and health safety provenance, and environmental and political changes. Dr Van Kien Nguyen of the Health and Agricultural Policy Research Institute leads a new project in Cambodia, Laos and Vietnam to identify food loss and waste along the catfish value chain; conduct foresight exercises to determine the uncertainties of catfish production for food systems; and develop solutions to reduce food loss in catfish production. This project is part of the ACIAR-IDRC Food Loss Research Program (page 23).<sup>2</sup>

### Crops

New crop establishment practices for rice, such as broadcasting and direct seeding (manually or mechanically), offer significant labour savings for growers. However, changed field conditions compared with traditional crop establishment methods, such as transplanting, increase the risk of weed infestations. A project in Cambodia and Laos, led by Dr Jaquie Mitchell of the University of Queensland, is developing weed management packages to address labour constraints and reduce the reliance on chemical control. The project is engaging with farmer groups and their advisers to determine knowledge gaps in weed management, and identify practical solutions to develop integrated weed management packages suitable for rainfed lowland rice production systems, specific to locations.<sup>3</sup>

### Fisheries

Floodplain development and the regulation of river flows for rice production across South-East Asia are affecting fisheries and fish migration, and the livelihoods of communities that depend on fish for protein and trade. Previous ACIAR-supported research showed that integrating fishways into water regulator designs, allowing passage of migratory fish up and down regulated rivers, can have lasting economic and social benefits for river communities. Professor Lee Baumgartner of Charles Sturt University leads a project to establish a stakeholder network to facilitate sound, cross-sector decision-making on fish passage construction programs across South-East Asia. During 2022–23, researchers will continue gathering data on fish migration and undertake an international review of draft guidelines and curriculum for a specially designed Graduate Certificate in Fisheries. An additional DFAT investment aims to broaden the projects outcomes to include scaling of fish passage technologies across Mekong countries.<sup>4</sup>

### Forestry

Increased trade, global movement and a changing climate increase the threat of emerging pests and diseases. The capability to detect and respond to forest pest and disease incursions is crucial to minimising their impacts. In South-East Asia, this capacity varies widely, but there is a general lack of preparedness. A project co-led by Dr Madaline Healey and Associate Professor Simon Lawson of the University of the Sunshine Coast will establish an effective and sustainable forest biosecurity network to improve risk management for invasive forest pests and diseases. The project will use shared field protocols and data as an entry point and foundation for coordinated biosecurity response. In 2022–23 activities will include launching resources to assist with in-country identification of pests and pathogens and delivering biosecurity awareness training.<sup>5</sup>



University of Queensland researchers are working with farmer groups and their advisers to develop integrated weed management packages suitable for rainfed lowland rice production systems. Photo: Sarina McFadyen



ACIAR-funded cattle research in Cambodia and Laos since the early 2000s will be reviewed to understand its relevance and application to the rapidly changing beef sector in the Mekong region. Photo: Harry Campbell-Ross

## Horticulture

Appropriate low-cost protected cropping provides an opportunity to develop inclusive economies around vegetable production using collaborative supply chains to grow and market traceable, safe, fresh vegetables. A new project led by Mr Jeremy Badgery-Parker of the University of Adelaide will address the technical and social challenges of year-round safe, reliable vegetable production through understanding the inputs and outputs of these production systems. The project will support smallholder farmers in Cambodia and Laos to be climate-resilient, sustain natural landscapes, minimise waste and emissions, and significantly increase yields leading to increased income.<sup>6</sup>

Mango production in the Asia-Pacific region accounts for about two-thirds of global production. Much of the crop is produced by smallholders, who achieve relatively modest yields and participate in traditional value-chain arrangements that offer little incentive to innovate or pursue higher quality. Some producers seek better returns by supplying higher-value export markets (such as Korea), but struggle to deliver fruit that meets market or regulatory standards. Dr Muhammad Sohail Mahzar of the Northern Territory Department of Primary Industry and Fisheries Industry, Tourism and Trade will lead a new project in Cambodia and the Philippines that aims to improve the ability of selected mango supply chains to deliver fruit that better meets consumer expectations of quality and value, and provide smallholder growers with a better return on investment.<sup>7</sup>

High-value vegetable crops are essential to improving livelihoods in the Pacific region and Cambodia. Extension services are not well equipped to assist farmers in dealing with pests and diseases, with insufficient staff training resulting in losses of up to 30–40%, primarily due to pests and diseases. Plant health clinics offer a solution to this problem. A new project led by Dr Michael Furlong of the University of Queensland will establish an effective information system supported by research on key emerging pests in these regions to better prepare farmers to detect, respond to and continue to manage their farming businesses, all the while contributing to regional biosecurity preparedness.<sup>8</sup>

## Livestock Systems

ACIAR has funded cattle research in Cambodia and Laos since the early 2000s. Despite this significant investment, the research outcomes have not been reflected in more significant development initiatives or government programs, which is a potential wasted opportunity for research impact. Furthermore, in the case of Laos, the Mekong beef sector has changed dramatically in the last 5 years, requiring an assessment of where existing research is relevant and what new research is needed. A new project led by Dr Rodd Dyer of FocusGroupGo Asia Pacific aims to assist in understanding the rapidly evolving situation in northern Laos beef markets. Researchers will identify areas where previous ACIAR-supported research could be valuable and future research areas in broader livestock investments.<sup>9</sup>

Poultry enterprises offer opportunities to improve the nutrition of households and economically empower women, who are the key custodians of smallholder poultry in South-East Asia. However, low-producing chicken genotypes typically dominate smallholder or family production systems. Dr Tadelles Dessie of the International Livestock Research Institute leads a project to test and make available high-producing, farmer-preferred genotypes of chickens to increase smallholder productivity as a pathway out of poverty in Cambodia and Vietnam. During 2022–23, the project continues activities to quantify smallholder chicken production systems and investigate promising breeds for the region. The project is also designing a breed improvement program in Cambodia.<sup>10</sup>

### Social Systems

A farmer's decision to adopt an agricultural technology or practice involves technical, local, financial, contextual and personal factors. Therefore, efforts to encourage adoption must prioritise farmers' perceptions of problems and solutions. A project led by Dr Brian Cook of the University of Melbourne has investigated the adoption of technologies and best practice for sustainable cassava production in north-western Cambodia, where the crop area is expanding rapidly and market returns are high. The final stage of the project will be completed in 2022 with the analysis of household interviews and village engagement activities. This will inform understanding of why some groups adopt new technologies, and identify barriers specific to poor, marginalised and female-headed households.<sup>11</sup>

The previous project found that extension does not overcome powerful social relations, especially credit and debt. Dr Brian Cook of the University of Melbourne leads a new project to analyse the social relations that farmers actively avoid, wish to avoid, or prefer and wish to strengthen as part of self-determined efforts to improve their livelihoods. Ultimately, the project seeks to define pathways that support farmers to benefit from agricultural development. In 2022–23, the project team will collect qualitative data by engaging with 2,100 households across 30 villages.<sup>12</sup>

In Laos and Cambodia, access to formal financial services is low. It is substantially lower among rural and remote communities, and lower again for women. Dr Erin Taylor of Western Sydney University leads a project that will review theoretical frameworks to understand how the approach to digital financial services in Laos and Cambodia compares with global trends, and what global lessons can be applied. The project will assess theories of change and impact methodologies that have been used around the world to introduce digital financial services to reduce poverty in rural areas and improve gender equality. In 2022–23 the project team will begin gathering qualitative data through focus groups and in-depth interviews with key informants.<sup>13</sup>

A new project will be established in Cambodia during 2022–23, as part of the ACIAR–IDRC Research Program on One Health. Led by the Royal University of Agriculture (Cambodia), the project will investigate the role of agricultural and forest landscapes on human and environmental health in Cambodia (page 24).<sup>14</sup>

### Soil and Land Management

Continued expansion of cultivation into unused or degraded land has been recognised as environmentally unsustainable by the Royal Government of Cambodia. Sustainable intensification, improved yields and diversification of cropping are priorities in areas where upland farming is being developed. A project led by Dr Wendy Vance of Murdoch University focuses on understanding Indigenous soil knowledge and suitable land use to develop site-specific soil management practices. The project concludes in 2022 with the delivery of simple tools to help farmers identify soil types and constraints, and soil data will be added to the Cambodian Agronomic Soils Classification system and the FAO World Reference Base for Soil Resources.<sup>15</sup>



The Cambodian upland landscape suffers from periods of drought, making rice farming difficult. ACIAR-supported research is enabling farmers to grow profitable crops with less water, such as rice farmer Phoun Phall, who is experimenting with growing forages instead of rice on his land. Photo: Majken Soegaard

Agricultural production in the lowlands of Cambodia and Laos is characterised by a high proportion of each nation's poorest and most food-insecure people. Their livelihoods generally rely on rainfed, low-input rice production and limited livestock keeping. A project led by Dr Matthew Denton of the University of Adelaide aims to strengthen and scale out knowledge that supports smallholder farmers in lowland areas to develop integrated forage systems on sandy soils. In 2022–23, the project team will translate their research results and information on best management practices for forages into easily understood and adoptable guidelines. They will seek to extend the knowledge gained through this project to farmers, extension agents and other stakeholders in livestock production value chains in Laos and Cambodia.<sup>16</sup>

## Water

Inland fisheries in South-East Asia have declined significantly in recent years due to the cumulative impacts of development on freshwater ecosystems. Solutions to integrate fisheries and irrigation need to consider engineering, agronomic, environmental and social interventions, and operate across scales from field to river basin. A scoping study, led by Mr Tarek Ketelsen of the Australia Mekong Partnership for Environmental Resources and Energy Systems, aims to establish an approach for communities in the Mekong region of Cambodia and Laos to co-design interventions and systems to integrate fisheries and irrigation for more sustainable and equitable outcomes. The study forms the basis for a major project to examine integration of fisheries and irrigation in a wide range of farming systems and social contexts across South-East Asia (Cambodia, Laos, Myanmar); linking with current work on fishways and broadening the focus to include threats beyond water control infrastructure.<sup>17</sup>

### Regional Manager, East & South-East Asia

Ms Dulce Carandang Simmanivong

### Research Program Managers

Agribusiness: Mr Howard Hall

Crops: Dr Eric Huttner

Fisheries: Prof Ann Fleming

Forestry: Dr Nora Devoe

Horticulture: Ms Irene Kernot

Livestock Systems: Dr Anna Okello

Social Systems: Dr Clemens Grünbühel

Soil and Land Management: Dr James Quilty

Water: Dr Neil Lazarow

See page 186 for contact details.

## Current and proposed projects

1. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
2. Food loss in the *Pangasius* catfish value chain of the Mekong River Basin (Food Loss Program) [Cambodia, Laos, Vietnam] (CS/2020/209)
3. Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos (CROP/2019/145)
4. FishTech: Integrating technical fisheries solutions into river development programs across South-East Asia [Cambodia, Indonesia, Laos, Vietnam, Thailand] (FIS/2018/153)
5. Building an effective forest health and biosecurity network in South-East Asia [Cambodia, Indonesia, Laos, Vietnam] (FST/2020/123)
6. Safe, fresh, year-round vegetables in Cambodia and Laos through research and development support of whole supply chain agribusiness networks (HORT/2021/143)
7. Improving mango crop management in Cambodia, the Philippines and Australia to meet market expectations (HORT/2016/190)
8. Biosecurity planning [Cambodia, Papua New Guinea] (HORT/2021/151)
9. Rapid transformation of Lao beef sector - biosecurity, trade and smallholders [Cambodia, Laos] (LS/2021/128)
10. Asian chicken genetic gains: A platform for exploring, testing, delivering, and improving chickens for enhanced livelihood outcomes in South East Asia [Cambodia, Vietnam] (LS/2019/142)
11. Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia (ASEM/2013/003)
12. Next generation agricultural extension: social relations for practice change [Cambodia] (SSS/2019/138)
13. Building the evidence base on the impacts of mobile financial services for women and men in farming households in Laos and Cambodia (SSS/2020/160)
14. The role of agricultural and forest landscapes on human and environmental health in Cambodia (ACIAR-IRDC One Health Research Program) (SSS/2022/164)
15. Land suitability assessment and site-specific soil management for Cambodian uplands (SMCN/2016/237)
16. Management practices for profitable crop livestock systems for Cambodia and Laos (SMCN/2012/075)
17. Water for fish and irrigation in the Mekong [Cambodia, Laos] (WAC/2021/135)

# Indonesia



**A\$5.05** million  
Budgeted funding



**19**  
Bilateral and regional  
research projects



**3**  
Small projects and  
activities

Indonesia's economy demonstrates impressive growth throughout 2022, recording of 5.44% (year on year) in the second quarter of 2022. This result aligns well with trends in economic recovery trends and is expected to continue in the years to come. The main strategy and relevant policies applied by the Government of Indonesia include reducing restrictions on movement of people, preparing the economy to move to a 'new normal' era, and driving affordability by providing better-targeted subsidies and social welfare supports.

Indonesia's agriculture, fisheries and forestry sectors have long been an integral part of the economy, with millions of hectares of arable land and extensive marine resources across the diverse archipelago. Although their contribution to Indonesia's GDP has declined in the past years, these sectors remain critical as they employ about one-third of the workforce. Smallholder farmers throughout rural Indonesia have proven to be the backbone of the sector, particularly during the prolonged COVID-19 crisis.

Agriculture has been one of Indonesia's most resilient sectors amidst the COVID-19 pandemic. During the COVID-19 recovery period in 2021, Indonesia's economy has started to recover gradually but unevenly across sectors. The positive performance of plantation commodities has supported the growth of the processing industry, especially the food and beverage industry. The global economic recovery is expected to boost Indonesia's agricultural exports.

Digital transformation and infrastructure development are a focus for future economic growth, driven by the increasing middle-class population, the agenda for human capital development, geographic position and positive progress in free trade agreements.

Indonesia has implemented strategies to achieve the goals of the UN 2030 Agenda for Sustainable Development, especially Sustainable Development Goal 2: Zero Hunger. The 2020-2024 National Medium-Term Development Plan includes a renewed focus on enhancement of small and medium-size enterprises and improving economic investment climate, agricultural digital transformation, land and irrigated water management and improving the governance of the national food system.



Under its nationally determined contributions submitted to the Paris Agreement, Indonesia committed to reducing greenhouse gas emissions by up to 29% with national efforts, and up to 41% with international support. A significant amount of the reductions is to come from land-based systems. To meet these commitments, Indonesia is working to enhance the use of new technologies in land management, increasing renewable technologies for energy generation, and restoring degraded peatlands. All of these initiatives have been raised with ACIAR as areas of potential collaboration.

The Indonesian Government recently established a super agency, the National Institute for Research and Innovation, which is an autonomous entity that will be responsible for R&D in all sectors. This massive reorganisation will transform the way we collaborate with Indonesia well into the future.

### Country priorities

Feeding a nation of around 270 million people, especially in the context of the COVID-19 pandemic, has been reasserted as a critical priority by the Indonesian Government. The prolonged pandemic has had severe economic and non-economic impacts on the population and economy, including the agriculture, fisheries and forestry sectors. As most communities still rely on these sectors, Indonesia faces a complicated situation as the pandemic continues, with impacts on both food production and livelihoods. This is also a high-risk situation for food security due to the decrease in purchasing power and food supply chains.

In the second term of President Widodo's administration (2019–24), agriculture has attained a higher strategic position, with line agencies tasked to achieve an advanced, modern and independent agricultural system. This has strong implications for ACIAR, as it is the first major reorientation of agricultural research priorities in Indonesia for a decade, and it is focused on both market linkages and alleviating poverty through improved family farming. While Indonesia retains a strong desire to sustain current research collaboration with us in the forestry, agriculture and fisheries sectors, our new short-term and medium-term priorities of significance include:

- » creating a single integrated data system to district level
- » strengthening agricultural financing facilities
- » improving corporate-based food crop production
- » strengthening the competitiveness of dedicated horticultural zones
- » improving the production, value-add and competitiveness of export crops (especially cocoa, coffee, rubber, palm oil and tea)
- » strengthening biosecurity
- » driving the productivity and genetic quality of livestock
- » the conservation and management of forestry agroecosystems (including peatland restoration and waste management)
- » improving seed systems.



Indonesia is working towards an advanced, modern and independent agricultural system, with a focus on both market linkages and alleviating poverty through improved family farming. Research priorities for collaboration with ACIAR will include driving the productivity and genetic quality of livestock in the beef and dairy sectors. Photo: Fitri Apriliyani



In 2021, a rapid assessment framework of Indonesia's Agricultural Innovation System was undertaken. The study was designed to support the Indonesian National Development Planning Ministry (BAPPENAS) in identifying policy options whereby the efficiency, effectiveness and impact of Indonesia's agricultural innovation system could be improved.

Another study is underway in 2022, which will provide key Indonesian Government agencies with a high-level 'roadmap' of high-impact initiatives and policies that could maximise the impact of digital technologies in agricultural value chains in Indonesia.

The priorities of the Ministry of Marine Affairs and Fisheries for 2021-24 are to maximise the revenue from the capture fisheries for small fishers' welfare; improve the productivity of some export-oriented commodities, especially shrimp, lobster and seaweed, supported by appropriate R&D programs; and develop aquaculture villages across Indonesia.

The integration process of R&D Agencies into the National Research and Innovation Agency (BRIN) is progressing. It provides the opportunity for ACIAR to re-calibrate its existing collaboration and explore potential areas for future partnership with technical ministries, universities, NGOs and BRIN. ACIAR will explore a new partnership model in line with Indonesia's improved economy and identify how Australia can contribute to improving Indonesia's agricultural sector.

The collaboration is identifying policy opportunities to support a major transformation of Indonesia's research, innovation and delivery systems to better support the transition of some sections of smallholder agriculture to more profitable small business enterprises, while sustaining food security for Indonesia's growing population. This collaboration is the first step towards setting new priorities and finding different ways of working together, once the constraints of the COVID-19 pandemic ease.

## 2022-23 research program

- » **22 ACIAR-supported projects in Indonesia**
- » **11 projects are specific to this country**
- » **11 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018-2027, as well as specific issues and opportunities identified by ACIAR and our partner organisations. The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Indonesia. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

## Agribusiness

Research agencies in Indonesia and the international development community have focused on promoting innovative farm technologies to sustain and improve agricultural productivity in upland catchments. However, literature reviews and evaluations suggest that adoption rates of these conservation-oriented land use practices are low. Professor Randy Stringer of the University of Adelaide leads a project that aims to advise the Indonesian Government on policy interventions that would enhance long-term agricultural productivity, reduce negative environmental externalities and improve household welfare in Indonesia's upland catchments. The project concludes in 2022 with an evaluation of the results of niche market interventions by sampling participating households and delivering final policy dialogue workshops with national-level stakeholders.<sup>1</sup>

Agriculture and tourism are interdependent sectors in Indonesia, yet there is a general absence of collaboration as they compete for local resources, including labour, land and water. Weak value chain integration limits the ability of agriculture, tourism, policy and planning entities to plan and respond to changing conditions and opportunities. A new project led by Mr Jeremy Badgery-Parker of Primary Principles Pty Ltd aims to improve the value creation of smallholders by using a network approach to understand the local agribusiness-tourism ecosystems, test consumer-based mechanisms as drivers of change and distil learnings into a transferable model. The project will lead to more resilient and economically stable communities.<sup>2</sup>

Smallholder farmers in South-East Asia often cannot access credit to invest in new crops or technologies, deal with risks and shocks, and safely carry wealth from harvest to planting. To help smallholders reach their production potential, a project led by Dr Alan de Brauw of the International Food Policy Research Institute aims to increase knowledge about how to design and implement innovative and inclusive agricultural value chain financing models in South-East Asia. During 2022-23, the project will analyse data to determine the impact of the project in each country and produce initial scientific reports and policy papers.<sup>3</sup>

Success in rural transformation is measured not only by income growth in the rural population, but also by the degree of inclusiveness in the society. A project in China, Bangladesh, Indonesia and Pakistan, led by Dr Chunlai Chen of the Australian National University, endeavours to understand the nature and drivers of rural transformation in order to provide better policy advice to underpin the success of transformation. During 2022-23, researchers will analyse and report on the results of their study into the components of success and the different impacts of rural transformation on women and men.<sup>4</sup>

Economic growth across South-East Asia has resulted in a growing urban middle class. This growth in affluence is driving demand for dairy-based products, and national dairy markets are growing rapidly. The increase in domestic dairy consumption in Indonesia and the Philippines presents an opportunity for significant growth in domestic dairy farming sectors, particularly for smallholder dairy farmers. A new project led by Dr Brad Granzin of Australasian Dairy Consultants aims to develop and pilot commercially viable, sustainable smallholder-inclusive dairy value chains. The project will capitalise on the growing domestic demand for short shelf-life dairy products and collaborate with partners to develop interventions to improve farm productivity, product quality and availability, and supply chain efficiencies.<sup>5</sup>

### Crops

Mungbean is an ideal rotation crop for smallholder farmers throughout the Indian Ocean Rim region. The International Mungbean Improvement Network, established through a project led by Dr Ramakrishnan Nair of the World Vegetable Center, helped realise the potential of mungbean to improve cropping system productivity and livelihoods by improving researchers' access to genetic material, and coordinating and providing technical support to variety development in Bangladesh, India, Myanmar and Australia. Phase 2 of the project extends the network to Kenya and Indonesia, expanding the source of germplasm to develop new mungbean varieties, as well as strengthening the capacity of more national mungbean breeding programs.<sup>6</sup>

### Fisheries

Floodplain development and the regulation of river flows for rice production across South-East Asia are affecting fisheries and fish migration, and the livelihoods of communities that depend on fish for protein and trade. Previous ACIAR-supported research showed that integrating fishways into water regulator designs, allowing passage of migratory fish up and down regulated rivers, can have lasting economic and social benefits for river communities. Professor Lee Baumgartner of Charles Sturt University leads a project to establish a stakeholder network to facilitate sound, cross-sector decision-making on fish passage construction programs across South-East Asia. During 2022–23, researchers will continue gathering data on fish migration and undertake an international review of draft guidelines and curriculum for a specially designed Graduate Certificate in Fisheries. An additional DFAT investment aims to broaden the projects outcomes to include scaling of fish passage technologies across Mekong countries.<sup>7</sup>

Indonesia is the world's largest producer of tuna, accounting for approximately 20% of global production. Its fishing fleet spans the eastern Indian Ocean and the western and central Pacific Ocean, and ranges from small-scale to industrial vessels. A project led by Dr Campbell Davies of CSIRO contributes to Indonesia's longer-term goal of improving the economic and social benefits of tuna fisheries, while reducing the conservation risks to regionally important fish stock. During the final year of the project, researchers will complete work with Indonesian fisheries scientists, industry and managers to evaluate harvest strategies and develop management capability for Indonesian tuna fisheries.<sup>8</sup>

Dependency on the tuna fishing industry is high in eastern Indonesia. Jobs in the tuna industry provide substantial sources of income and food, but many also carry significant safety risks and income insecurity. Conventional methods are typically not suitable for assessing how fisheries perform in terms of social welfare. A small research activity led by Dr Nick McClean of the University of Technology Sydney will develop and test methods for assessing harvest strategies for sustainable tuna fisheries in Indonesia, focusing on their impacts on the welfare of dependent communities. Findings will be integrated into the tuna harvest strategy being developed by the Government of Indonesia.<sup>9</sup>

Globally, growing momentum for nutrition-sensitive agricultural policy and development assistance is yet to have any impact on the small-scale artisanal fishery sector. To address this, the role and contribution of fish to livelihoods and nutrition security must be supported by rigorous data and communicated at global, national and local scales. A project in Timor-Leste and the East Nusa Tenggara province of Indonesia aims to identify the livelihood and nutrition benefits of fisheries and test nutrition-sensitive co-management systems for inshore fisheries. Led by Dr David Mills of the WorldFish Center, the project will evaluate the nutritional value of fisheries to households, identify the factors enabling or limiting fish consumption, and highlight the potential of fish to reduce malnutrition, particularly during early childhood. In 2022–23 activities will include data collection to understand household livelihood structures and decision-making and community training in healthy diets and child nutrition.<sup>10</sup>

### Forestry

Tropical peatlands are a critical global ecosystem; their environmental services provide important carbon storage. Indonesia hosts the greatest global extent of tropical peatlands, yet less than 7% of its natural-state peat swamp forest is classified as intact. Without focused management, these remnants will be lost. A new project led by Dr Laura Linda Bozena Graham of The Borneo Orangutan Survival Foundation will assess the internal, edge and external threats facing a large, intact peat swamp forest area in Central Kalimantan. Researchers will develop a quantitative and qualitative threat analysis, facilitating the development of a targeted conservation strategy for the area, and a methodological report to facilitate transfer to other sites.<sup>11</sup>

A project with activities in Indonesia and Vietnam will underpin good plant biosecurity practices in forestry. Led by Dr Caroline Mohammed of the University of Tasmania, researchers will work with government and industry partners to extend screening approaches developed for the fungus *Ceratocystis* in acacia to eucalypts, which have replaced acacias in plantations in areas of the wet tropics. Researchers will develop remote-sensing software applications for cheap and rapid forest health surveillance and, through geospatial modelling, deliver risk maps under current and future climates at a regional level for the highest-priority pests and pathogens. In 2022–23 activities will include building the capacity of local partners to access climate data and run distribution models, and identifying eucalypt parents for hybridisation.<sup>12</sup>

Increased trade, global movement and a changing climate increase the threat of emerging pests and diseases. The capability to detect and respond to forest pest and disease incursions is crucial to minimising their impacts. In South-East Asia, this capacity varies widely, but there is a general lack of preparedness. A project co-led by Dr Madaline Healey and Associate Professor Simon Lawson of the University of the Sunshine Coast will establish an effective and sustainable forest biosecurity network to improve risk management for invasive forest pests and diseases. The project will use shared field protocols and data as an entry point and foundation for coordinated biosecurity response. In 2022–23 activities will include launching resources to assist with in-country identification of pests and pathogens and delivering biosecurity awareness training.<sup>13</sup>

## Horticulture

Huánglóngbǐng, or citrus greening disease, is a destructive bacterial disease of citrus. It is spread mainly by the Asian citrus psyllid and infected propagation material. All commercially cultivated citrus varieties are susceptible to the disease and, currently, there is no cure. Effective management of the disease is the largest challenge ever faced by citrus industries worldwide. A project led by Dr Jianhua Mo of the NSW Department of Primary Industries will leverage international expertise to tackle the deficiencies in current huánglóngbǐng management practices. The trilateral project will enhance the sustainable management of huánglóngbǐng and the Asian citrus psyllid in Indonesia and China, and increase the preparedness of the Australian citrus industry for an incursion of both the disease and the vector. In 2022–23 activities will include the evaluation of huánglóngbǐng-tolerant rootstocks and transplanting of grafted seedlings to trial sites for evaluation.<sup>14</sup>

*Fusarium* wilt tropical race 4 (TR4), or Panama disease, has become widespread throughout South-East Asia. The disease is threatening smallholder banana production in Indonesia, the Philippines and, more recently, Laos. A project led by Dr Anthony Pattison of the Queensland Department of Agriculture and Fisheries aims to develop an integrated management response to the spread of the disease. The research will investigate the effects on banana production of altering the banana microbiome to suppress disease and increase plant resistance. During 2022–23, the project team will analyse completed field surveys of production systems and natural environments, and there will be ongoing development and training in statistics and experimental procedures for glasshouse and field experiments.<sup>15</sup>



The NSW Department of Primary Industries leads a trilateral project to enhance the sustainable management of huánglóngbǐng and the Asian citrus psyllid in Indonesia and China, as well as increasing the preparedness of the Australian citrus industry for an incursion of both the disease and the vector. Photo: Fitri Apriyani

About 40 tropical fruit fly species damage horticultural crops and impede trade throughout South-East Asia. A project in Indonesia and the Philippines builds on the success of previous ACIAR projects, and links to fruit-fly work in other ACIAR partner countries and Australia. The project, led by Mr Stefano De Faveri of the Queensland Department of Agriculture and Fisheries, aims to reduce fruit-fly infestation of mango crops through area-wide management of the pest, and improve pre-harvest and post-harvest practices. The ultimate aim is to improve the yield and quality of crops in order to improve livelihoods and trade opportunities. During 2022–23, focus areas for the project include training farmers and other stakeholders in area-wide management techniques, evaluation of techniques implemented in the field, and integration of techniques into best management practice.<sup>16</sup>

### Livestock Systems

The Global Burden of Animal Diseases program is an ambitious 10-year initiative funded by the Bill & Melinda Gates Foundation to develop a global metrics system for animal disease burden. The program will guide public and private investments in animal health and welfare to improve our understanding of the broader societal contributions of animals at global, national, sector and farm levels. Providing improved equability for livestock and aquatic producers on the margins, particularly women, is a key driving principle. Using the conceptual framework of the program, Dr Dianne Mayberry of CSIRO will lead an ACIAR-supported project team to conduct a Global Burden of Animal Diseases case study in Indonesia to prepare a resource for prioritisation and evaluation of investments related to animal health in Indonesia.<sup>17</sup>

A new project will be established in Indonesia, Laos and the Philippines during 2022–23, as part of the ACIAR-IDRC Research Program on One Health. Led by the University of the Philippines (Los Banos), the project will investigate the potential to enhance livestock production systems in South-East Asia using an EcoHealth/One Health approach (page 24).<sup>18</sup>

### Soil and Land Management

The smoke haze from indiscriminate burning of peatlands has become a major issue in South-East Asia in recent decades. Smoke haze negatively affects public health and the economy within Indonesia and other countries in the region. A multidisciplinary research program led by Dr Daniel Mendham of CSIRO supports Indonesia's commitment to restoring large areas of degraded peat and achieving sustainable livelihoods for communities living on peatland. The project concludes in 2023 with analysis, evaluation and dissemination of new knowledge to prevent fires in peatlands and improve peatland restoration practices, while enabling meaningful, profitable and sustainable alternative livelihoods.<sup>19</sup>

Peatland restoration efforts in Indonesia are progressing rapidly, but the success of these efforts is often low or undocumented. Two techniques trialled in previous ACIAR projects – eddy covariance flux towers and chameleon sensors – demonstrated their strong potential as tools to empower government and communities to monitor and help manage peatland restoration. These techniques monitor changes in the ecosystem's peat moisture levels and carbon and methane flux. A small research activity led by Dr Samantha Grover of RMIT University is using this data to work with communities, government agencies and other stakeholders to provide valuable information that supports decision-making in peatland restoration and fire management. Stakeholder engagement, which has commenced, is a major focus of this project.<sup>20</sup>

Coastal agricultural systems support the livelihoods of many people in Indonesia. These systems vary in intensity, from predominantly low-value rice production to highly intensive mixed rotations that include rice, shallot and chilli. Shallot and chilli are Indonesia's most significant vegetable commodities and are integral components of Indonesia's unique cuisine. A project led by Dr Stephen Harper of the University of Queensland addresses key soil and human health issues and challenges associated with the safe and sustainable production of high-value shallot and chilli cropping systems in coastal agroecosystems. In 2022–23 researchers will conduct experiments to compare crop productivity under different agronomic conditions and develop focused surveys to evaluate the use of pesticides in these systems and the impacts of salinity on vegetable production.<sup>21</sup>

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Ms Mirah Nuryati

#### Research Program Managers

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Crops: Dr Eric Huttner

Fisheries: Prof Ann Fleming

Forestry: Dr Nora Devoe

Horticulture: Ms Irene Kernot

Livestock Systems: Dr Anna Okello

Soil and Land Management: Dr James Quilty

See page 186 for contact details.

## Current and proposed projects


1. Agricultural policy research to support natural resource management in Indonesia's upland landscapes (ADP/2015/043)
2. Creating resilient communities through smallholder-inclusive tourism markets in Indonesia (AGB/2021/125)
3. Inclusive agriculture value chain financing [Indonesia, Myanmar, Vietnam] (AGB/2016/163)
4. Understanding the drivers of successful and inclusive rural regional transformation: Sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan (ADP/2017/024)
5. Evaluating supply chain interventions and partnerships to sustainably grow the smallholder dairy sectors of Indonesia and the Philippines (AGB/2021/124)
6. International Mungbean Improvement Network 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
7. FishTech: Integrating technical fisheries solutions into river development programs across South-East Asia [Cambodia, Indonesia, Laos, Vietnam, Thailand] (FIS/2018/153)
8. Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits (FIS/2016/116)
9. Developing social and economic monitoring and evaluation systems in Indonesian tuna fisheries to assess potential impacts of alternative management measures on vulnerable communities (FIS/2020/109)
10. A nutrition-sensitive approach to fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia (FIS/2017/032)
11. Retaining the jewels in the crown: Kalimantan peat forest remnants [Indonesia] (FST/2021/145)
12. Managing risk in South-East Asian forest biosecurity [Indonesia, Vietnam] (FST/2018/179)
13. Building an effective forest health and biosecurity network in South-East Asia [Cambodia, Indonesia, Laos, Vietnam] (FST/2020/123)
14. Preparedness and management of huánglóngbing (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia (HORT/2019/164)
15. An integrated management response to the spread of *Fusarium* wilt of banana in South-East Asia [Indonesia, Laos, Philippines] (HORT/2018/192)
16. Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region (HORT/2015/042)
17. Global burden of animal disease initiative: Indonesia case study (LS/2020/156)
18. Livestock enhancement through EcoHealth/One Health assessment in South-East Asia (ACIAR-IRDC One Health Research Program) [Indonesia, Laos, Philippines] (LS/2022/163)
19. Improving community fire management and peatland restoration in Indonesia (FST/2016/144)
20. Crop health and nutrient management of shallot-chilli-rice cropping systems in coastal Indonesia (SLAM/2018/145)
21. Validating technologies for assessing and monitoring the impacts of re-wetting of peatland Indonesia using eddy flux towers coupled with the Chameleon sensors (SLAM/2020/118)



A project led by the University of Queensland addresses the key soil and human health issues and challenges of shallot and chilli cropping systems. Photo: Adi Rahmatullah

# Laos

 **A\$4.2** million  
Budgeted funding

 **16**  
Bilateral and regional  
research projects

 **4**  
Small projects and  
activities

**The Lao economy has been slowed by containment measures introduced to address a second wave of COVID-19. The economic consequences of the pandemic exposed existing vulnerabilities and the country slumped into recession for the first time in more than 20 years.**

Up until mid-April 2021, Laos had one of the region's lowest rates of COVID-19 cases. However, the second outbreak led to the re-introduction of containment measures that have lasted longer than those introduced in 2020. These measures restrained mobility and affected economic activities. According to the World Bank, livelihood recovery in Laos had been robust, but largely imbalanced, before the second wave of COVID-19 hit.

In its August 2021 Economic Monitor, the World Bank cited that the Lao labour market had recovered from the first wave of COVID-19, primarily driven by the ability of the agriculture sector to absorb the surplus workforce affected by pandemic shocks. Agriculture proved more resilient to pandemic shocks compared to other sectors. However, the restrictions on mobility disrupted farming activities among 14% of farming households. Because of this, more than 25% of households were very concerned about food insecurity for people in their community, an increase from 16% before the second wave began.

The World Bank expects growth in agriculture to be strong due to external demands from neighbouring countries, including China. Agricultural output was projected to grow by 3.9% in 2021, relatively higher than the 3.2% in 2020. Expanded production and export of primary agricultural products such as banana, cassava, coffee beans, live animals and rubber will drive growth. These products accounted for nearly 90% of agricultural exports in January–May 2021.

Crops and livestock farming are key drivers for future agricultural growth. In addition, the agriculture sector will continue to absorb labour that left other sectors due to the pandemic. In late 2021, the Lao-China Railway started operating. The 414 km railway is part of the Belt and Road Initiative and is expected to increase trade flows (with estimates of almost 4 million tonnes of transit trade per year by 2030), attract more foreign investors, create new jobs, and accelerate economic growth in Laos. There are high expectations that the railway will contribute to improved transportation of farm products from Laos to China.

After the 2021 UN Food Systems Summit, the Ministry of Agriculture and Forestry launched a report, Pathways to Sustainable Food Systems, which identifies 4 critical thematic areas on which the Ministry will focus. One of these is related to boosting nature-positive production, which revolves around balancing sustainable agricultural practices, people's livelihoods, and economic competitiveness with neighbouring countries. This is consistent with earlier statements of the Ministry on building its reputation for having relatively green and clean agriculture products free from the chemicals used to produce many farm products in the region.

## Country priorities

In 2022-23, ACIAR will recalibrate its long-term strategic program priorities based on consultation with Lao stakeholders. The strategic priority outcomes that currently guide our investments in Laos are:

- » efficient and sustainable forestry industries, including non-timber products, with suitable climate-change resilience
- » innovative livestock systems that allow for intensification and land-use requirements, while raising animal health and biosecurity levels
- » increased fish habitat restoration and protection of fish migration routes
- » cost-effective and sustainable rice-based farming systems, through mechanisation, diversification and intensification, along with better crop quality, quarantine standards and value-adding for domestic and export markets
- » improved natural resource management that benefits livelihoods and food security by delivering land-use options to smallholders, with attention to both water and nutrient management within climate-change adaptation
- » improved institutional training and communication frameworks that enable smallholders to adopt and adapt new technologies, and increase the capacity development of researchers and educators.



## 2022-23 research program

- » **20 ACIAR-supported projects in Laos**
- » **5 projects are specific to this country**
- » **15 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018-2027, as well as specific issues and opportunities identified by ACIAR and our partner organisations. The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Laos. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

### Agribusiness

Cassava witches' broom disease and Sri Lanka cassava mosaic virus are spreading rapidly in South-East Asia. A project led by Dr Jonathan Newby of the International Center for Tropical Agriculture is developing technically viable and economically and socially sustainable ways to improve the resilience of cassava production systems and value chains in Cambodia, Laos, Myanmar and Vietnam. The project will conclude in 2023 with researchers continuing on-farm testing of new agronomic practices and training of farmers and extension officers. The project team will also finalise their investigation of alternative models for public-private funding for core activities.<sup>1</sup>

Catfish (*Pangasius* sp) farming and wild-caught catfish are important income generating activities for smallholder farmers in the Mekong River Basin and are a vital source of dietary protein for those countries' populations. The continued availability of catfish for human consumption is influenced by many factors including climate change, the COVID-19 pandemic, consumer perceptions on food and health safety provenance, and environmental and political changes. Dr Van Kien Nguyen of the Health and Agricultural Policy Research Institute leads a new project in Cambodia, Laos and Vietnam to identify food loss and waste along the catfish value chain; conduct foresight exercises to determine the uncertainties of catfish production for food systems; and develop solutions to reduce food loss in catfish production. This project is part of the ACIAR-IDRC Food Loss Research Program (page 23).<sup>2</sup>

ACIAR funds several projects to improve the productivity and resilience of cassava production systems and value chains, as cassava mosaic virus continues to affect crops across South-East Asia.

## Crops

New crop establishment practices for rice, such as broadcasting and direct seeding (manually or mechanically), offer significant labour savings for growers. However, changed field conditions compared with traditional crop establishment methods, such as transplanting, increase the risk of weed infestations. A project in Cambodia and Laos, led by Dr Jaquie Mitchell of the University of Queensland, is developing weed management packages to address labour constraints and reduce the reliance on chemical control. The project is engaging with farmer groups and their advisers to determine knowledge gaps in weed management, and identify practical solutions to develop integrated weed management packages suitable for rainfed lowland rice production systems, specific to locations.<sup>3</sup>



ACIAR-supported research has showed that integrating fishways into water regulator designs, allowing passage of migratory fish up and down regulated rivers, can have lasting economic and social benefits for river communities.

## Fisheries

Floodplain development and the regulation of river flows for rice production across South-East Asia are affecting fisheries and fish migration, and the livelihoods of communities that depend on fish for protein and trade. Previous ACIAR-supported research showed that integrating fishways into water regulator designs, allowing passage of migratory fish up and down regulated rivers, can have lasting economic and social benefits for river communities. Professor Lee Baumgartner of Charles Sturt University leads a project to establish a stakeholder network to facilitate sound, cross-sector decision-making on fish passage construction programs across South-East Asia. During 2022–23, researchers will continue gathering data on fish migration and undertake an international review of draft guidelines and curriculum for a specially designed Graduate Certificate in Fisheries. An additional DFAT investment aims to broaden the projects outcomes to include scaling of fish passage technologies across Mekong countries.<sup>4</sup>

The Xayaburi Power Company, responsible for designing and constructing the Xayaburi hydro-electric dam across the Mekong River in Laos, built a complex fishway system designed to enable the upstream and downstream passage of migratory fish. There are hundreds of species of fish in the Mekong River, varying in size from a few centimetres to more than one metre. A project team led by Professor Lee Baumgartner of Charles Sturt University is working with the Xayaburi Power Company to develop robust tools and techniques to assess the effectiveness of the Xayaburi Dam fish passage facilities and provide a standard for other hydro-electric dams planned for the mainstem Mekong River.<sup>5</sup>

## Forestry

Increased trade, global movement and a changing climate increase the threat of emerging pests and diseases. The capability to detect and respond to forest pest and disease incursions is crucial to minimising their impacts. In South-East Asia, this capacity varies widely, but there is a general lack of preparedness. A project co-led by Dr Madaline Healey and Associate Professor Simon Lawson of the University of the Sunshine Coast will establish an effective and sustainable forest biosecurity network to improve risk management for invasive forest pests and diseases. The project will use shared field protocols and data as an entry point and foundation for coordinated biosecurity response. In 2022–23 activities will include launching resources to assist with in-country identification of pests and pathogens and delivering biosecurity awareness training.<sup>6</sup>



Lao wood manufacturing industries are yet to adopt contemporary processing technologies used in neighbouring countries. Research led by Dr Hilary Smith of the University of Melbourne will complete the development of new processing capability and engineered wood products from small-diameter timbers. This research benefits wood manufacturing industries in Laos by increasing capacity and growing markets for timber from new plantations, and in Australia by increasing the use of underused plantation resources. During 2022–23, reports will be completed on the characterisation of the current plantation resource and options for modelling future wood supply, as well as prospective pathways for influence and change in relevant policy, governance and administrative environments.<sup>7</sup>

Laos has an ambitious target of 70% forest cover by 2030, but currently nearly half of the country is degraded or unstocked forest. The Government of Laos seeks to restore native forest while providing benefits to resident and neighbouring communities. A new project addresses the opportunity to shape reforestation policy and practice, determining how to fulfil the government requirements. Professor Patrick Baker of the University of Melbourne leads this project, which will test post-disturbance treatments to accelerate and channel forest recovery towards desired economic, social, and ecological outcomes. By testing ecosystem assembly theory, the project will advance the state of the art in forest restoration.<sup>8</sup>

### Horticulture

Appropriate low-cost protected cropping provides an opportunity to develop inclusive economies around vegetable production using collaborative supply chains to grow and market traceable, safe, fresh vegetables. A new project led by Mr Jeremy Badgery-Parker of the University of Adelaide will address the technical and social challenges of year-round safe, reliable vegetable production through understanding the inputs and outputs of these production systems. The project will support smallholder farmers in Cambodia and Laos to be climate-resilient, sustain natural landscapes, minimise waste and emissions, and significantly increase yields leading to increased income.<sup>9</sup>

*Fusarium* wilt tropical race 4 (TR4), or Panama disease, has become widespread throughout South-East Asia. The disease is threatening smallholder banana production in Indonesia, the Philippines and, more recently, Laos. A project led by Dr Anthony Pattison of the Queensland Department of Agriculture and Fisheries aims to develop an integrated management response to the spread of the disease. The research will investigate the effects on banana production of altering the banana microbiome to suppress disease and increase plant resistance. During 2022–23, the project team will analyse completed field surveys of production systems and natural environments, and there will be ongoing development and training in statistics and experimental procedures for glasshouse and field experiments.<sup>10</sup>

### Livestock Systems

ACIAR has funded cattle research in Cambodia and Laos since the early 2000s. Despite this significant investment, the research outcomes have not been reflected in more significant development initiatives or government programs, which is a potential wasted opportunity for research impact. Furthermore, in the case of Laos, the Mekong beef sector has changed dramatically in the last 5 years, requiring an assessment of where existing research is relevant and what new research is needed. A new project led by Dr Rodd Dyer of FocusGroupGo Asia Pacific aims to assist in understanding the rapidly evolving situation in northern Laos beef markets. Researchers will identify areas where previous ACIAR-supported research could be valuable and future research areas in broader livestock investments.<sup>11</sup>

Laos is a comparatively small producer of pork compared with Vietnam and China, but pork production has grown significantly in recent years. Improved safety of animal source foods that is free from zoonotic parasites such as *Taenia solium*, or pork tapeworm, is gaining greater attention in the region. Dr Amanda Ash of Murdoch University leads a project to identify and recommend interventions to mitigate the risk of disease from food-borne parasites in pigs, adding value to the growing cross-border pig trade between northern Laos and Vietnam. During 2022–23, the project will implement protocols to manage food-borne parasitic disease at the farm level, such as deworming and subsequent monitoring of livestock and human health; and determine the effectiveness of engagement and communication packages for education of people in high-risk villages.<sup>12</sup>

Goat production in Laos has more than doubled over the past 10 years, largely driven by high demand for goat meat from Vietnam. Traditional extensive goat-raising methods can result in overgrazing of feed resources, negative consequences for the environment and higher incidence of diseases and parasites in livestock. A project led by Professor Stephen Walkden-Brown of the University of New England is aiming to enhance income-generating opportunities for goats in Lao farming systems, while identifying sustainable production practices. Additionally, the project is seeking greater understanding of consumer preferences for goats in Vietnam to further develop market specifications, especially for premium meat. During 2022–23, the project will develop performance benchmarks and define best practice for smallholders, larger goat farmers and agroforestry systems. The project will also conduct market surveys to ascertain past, current and likely future demand for goats and goat meat, and factors affecting pricing and demand.<sup>13</sup>

A new project will be established in Indonesia, Laos and the Philippines during 2022–23, as part of the ACIAR-IDRC Research Program on One Health. Led by the University of the Philippines (Los Banos), the project will investigate the potential to enhance livestock production systems in South-East Asia using an EcoHealth/One Health approach (page 24).<sup>14</sup>

## Social Systems

In Laos and Cambodia, access to formal financial services is low. It is substantially lower among rural and remote communities, and lower again for women. Dr Erin Taylor of Western Sydney University leads a project that will review theoretical frameworks to understand how the approach to digital financial services in Laos and Cambodia compares with global trends, and what global lessons can be applied. The project will assess theories of change and impact methodologies that have been used around the world to introduce digital financial services to reduce poverty in rural areas and improve gender equality. In 2022–23 the project team will begin gathering qualitative data through focus groups and in-depth interviews with key informants.<sup>15</sup>

The Lao Government increasingly demands evidence to support policy development. The relationship between research-for-development and policy has not been clear-cut and there is an identified need for ACIAR projects to adopt more effective research-to-policy approaches in the Lao context. Dr Hilary Smith and Professor Peter Kanowski from the Australian National University will report on their analysis case studies and in-depth interviews with key stakeholders to identify the processes, practices and circumstances that facilitate or hinder the influence and uptake of ACIAR-commissioned research within Lao policy contexts.<sup>16</sup>

## Soil and Land Management

Agricultural production in the lowlands of Cambodia and Laos is characterised by a high proportion of each nation's poorest and most food-insecure people. Their livelihoods generally rely on rainfed, low-input rice production and limited livestock keeping. A project led by Dr Matthew Denton of the University of Adelaide aims to strengthen and scale out knowledge that supports smallholder farmers in lowland areas to develop integrated forage systems on sandy soils. In 2022–23, the project team will translate their research results and information on best management practices for forages into easily understood and adoptable guidelines. They will seek to extend the knowledge gained through this project to farmers, extension agents and other stakeholders in livestock production value chains in Laos and Cambodia.<sup>17</sup>

Strong market demand for concentrated livestock feeds to support livestock industries resulted in a maize boom in Vietnam and Laos and a rapid shift to annual cropping. Fluctuations in maize price, soil erosion and declining soil fertility have pressured governments and communities into looking for alternative land use options. A small research activity led by Professor Michael Bell of the University of Queensland proposes to use an established network of researchers, extension agents and traders as the basis for developing a Theory of Change focused on maize production areas in Vietnam and Laos. It will explore opportunities to link institutional research and private sector development capacity in these regions to stimulate and support the development of economically and environmentally sustainable, climate change resilient agricultural systems.<sup>18</sup>

Increasing numbers of smallholder farmers in Laos and northern Vietnam are growing maize on sloping land to meet demand for livestock feeds by poultry, pig and cattle industries in China and South-East Asia. A project led by Professor Michael Bell of the University of Queensland is helping farmers adopt maize-based farming systems that reduce soil degradation and improve smallholder livelihoods and economic viability. The project concludes in 2022 with the delivery of outreach models to support the adoption of more diversified maize-based farming systems and bioeconomic frameworks to structure the assessment of the sustainability and productivity of different crop and forage options.<sup>19</sup>

## Water

Inland fisheries in South-East Asia have declined significantly in recent years due to the cumulative impacts of development on freshwater ecosystems. Solutions to integrate fisheries and irrigation need to consider engineering, agronomic, environmental and social interventions, and operate across scales from field to river basin. A scoping study, led by Mr Tarek Ketelsen of the Australia Mekong Partnership for Environmental Resources and Energy Systems, aims to establish an approach for communities in the Mekong region of Cambodia and Laos to co-design interventions and systems to integrate fisheries and irrigation for more sustainable and equitable outcomes. The study forms the basis for a major project to examine integration of fisheries and irrigation in a wide range of farming systems and social contexts across South-East Asia (Cambodia, Laos, Myanmar); linking with current work on fishways and broadening the focus to include threats beyond water control infrastructure.<sup>20</sup>

### Regional Manager, East & South-East Asia

Ms Dulce Carandang Simmanivong

### Research Program Managers

Agribusiness: Mr Howard Hall

Crops: Dr Eric Huttner

Fisheries: Prof Ann Fleming

Forestry: Dr Nora Devoe

Horticulture: Ms Irene Kernot

Livestock Systems: Dr Anna Okello

Social Systems: Dr Clemens Grünbühel

Soil and Land Management: Dr James Quilty

Water: Dr Neil Lazarow

See page 186 for contact details.



A project led by the University of Adelaide aims to strengthen and scale out knowledge that supports smallholder farmers in lowland areas to develop integrated forage systems on sandy soils.

## Current and proposed projects

1. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
2. Food loss in the *Pangasius* catfish value chain of the Mekong River Basin (Food Loss Program) [Cambodia, Laos, Vietnam] (CS/2020/209)
3. Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos (CROP/2019/145)
4. FishTech: Integrating technical fisheries solutions into river development programs across South-East Asia [Cambodia, Indonesia, Laos, Vietnam, Thailand] (FIS/2018/153)
5. Assessing upstream fish migration measures at Xayaburi Dam in Laos (FIS/2017/017)
6. Building an effective forest health and biosecurity network in South-East Asia [Cambodia, Indonesia, Laos, Vietnam] (FST/2020/123)
7. Advancing enhanced wood manufacturing industries in Laos and Australia (FST/2016/151)
8. Forest restoration for economic outcomes (FST/2020/137)
9. Safe, fresh, year-round vegetables in Cambodia and Laos through research and development support of whole supply chain agribusiness networks (HORT/2021/143)
10. An integrated management response to the spread of *Fusarium* wilt of banana in South-East Asia [Indonesia, Laos, Philippines] (HORT/2018/192)
11. Rapid transformation of Lao beef sector - biosecurity, trade and smallholders [Cambodia, Laos] (LS/2021/128)
12. Investigating and developing interventions to mitigate food borne parasitic disease in production animals in Laos (LS/2014/055)
13. Goat production systems and marketing in Laos and Vietnam (LS/2017/034)
14. Livestock enhancement through EcoHealth/One Health assessment in South-East Asia (ACIAR-IRDC One Health Research Program) [Indonesia, Laos, Philippines] (LS/2022/163)
15. Building the evidence base on the impacts of mobile financial services for women and men in farming households in Laos and Cambodia (SSS/2020/160)
16. Policy impact in Laos: From research to practice (SSS/2020/142)
17. Management practices for profitable crop livestock systems for Cambodia and Laos (SMCN/2012/075)
18. Embedding knowledge and exploring future research opportunities in sloping land agricultural systems in northern Laos and northwest Vietnam (SLAM/2021/152)
19. Improving maize-based farming systems on sloping lands in Vietnam and Laos (SMCN/2014/049)
20. Water for fish and irrigation in the Mekong [Cambodia, Laos] (WAC/2021/135)

# Myanmar



**A\$0.79** million  
Budgeted funding



**3**  
Bilateral and regional  
research projects

**A year after the coup that overthrew Myanmar's elected civilian government, the World Bank estimated that Myanmar's economy shrank 18% in 2021 and forecasted that continuing political instability and the COVID-19 pandemic would slow recovery in 2022.**

The Myanmar Economic Monitor reports that the share of Myanmar's population living in poverty has doubled compared to pre-COVID-19 levels. The report also states that ongoing economic pressures are substantially affecting vulnerability and food security, particularly for the poor, whose savings have been drained because of recent shocks. This is consistent with findings reported under the Myanmar Agriculture Policy Support Activity supported by the International Food Policy Research Institute (IFPRI). In September 2021, IFPRI reported 48% of their respondents cited food supply problems (compared to 32% in May 2021) and 41% cited loss of jobs or income (compared to 31% in May 2021).

Prior to the political turmoil and the COVID-19 pandemic, more than one-third of Myanmar's population was already in poverty, and 6% were in extreme poverty. Almost 70% of Myanmar's 54 million people live in rural areas and rely on crop production and fisheries or livestock for their livelihoods and incomes. The fishery and livestock sectors are considered the most important, after agriculture, to meet the protein needs of the population, enhance food security, and provide employment for rural communities. The agriculture sector used to contribute about 30% of Myanmar's GDP. The political instability and a devastating third wave of the COVID-19 pandemic caused the price of critical inputs such as fertiliser to soar while crop prices have fallen.

Poverty and food insecurity are soaring in Myanmar's Central Dry Zone and Ayeyarwady Delta regions, the country's agricultural heartland. The rising food insecurity and poverty in these regions will have far-reaching repercussions in Myanmar, which relies heavily on the agricultural sector.

## Country priorities

In 2020, research priorities for the ACIAR program in Myanmar aligned with 2 of the 3 focuses of Myanmar's Agricultural Development Strategy and Investment Plan (2018–2023): productivity, and market linkages and competitiveness. Specifically, the ACIAR program in Myanmar is focused on:

- » increasing net production of food and cash incomes of rural households in the Central Dry Zone and Ayeyarwady Delta, through improvements in, and adoption of, production and post-harvest technologies in agriculture, including livestock and fisheries

- » building capacity in agricultural, livestock and fisheries research, development and evaluation through program activities and postgraduate and short-term training
- » providing technical assistance and advice on policy strengthening to relevant Government of Myanmar departments
- » linking Myanmar regionally through multi-country research collaborations.

Following the rapid global spread of the COVID-19 from early 2020, Australia's program of development cooperation pivoted quickly to respond to the challenges being faced by the Indo-Pacific region, with a focus on health security, stability and (of particular importance to ACIAR) economic recovery. Specifically, as part of Australia's Myanmar COVID-19 Response Plan, ACIAR committed to continuing to support improvements in food production and rural incomes through improvements in agriculture, livestock and fisheries.

The political instability sparked by the military coup of February 2021 has resulted in Australia's development program with Myanmar being redirected to support the immediate humanitarian needs of the most vulnerable and poor, with non-government partners coordinating implementation.

## 2022-23 research program

- » **3 ACIAR-supported projects in Myanmar**
- » **3 projects are part of regional projects**

ACIAR is not supporting any new research collaborations in 2022-23. However, ACIAR continues to work with each of the current projects, in consultation with international partners, to identify how collaboration might continue consistent with Australian government guidelines.

### Agribusiness

Cassava witches' broom disease and Sri Lanka cassava mosaic virus are spreading rapidly in South-East Asia. A project led by Dr Jonathan Newby of the International Center for Tropical Agriculture is developing technically viable and economically and socially sustainable ways to improve the resilience of cassava production systems and value chains in Cambodia, Laos, Myanmar and Vietnam. The project will conclude in 2023 with researchers continuing on-farm testing of new agronomic practices and training of farmers and extension officers. The project team will also finalise their investigation of alternative models for public-private funding for core activities.<sup>1</sup>

Smallholder farmers in South-East Asia often cannot access credit to invest in new crops or technologies, deal with risks and shocks, and safely carry wealth from harvest to planting. To help smallholders reach their production potential, a project led by Dr Alan de Brauw of the International Food Policy Research Institute aims to increase knowledge about how to design and implement innovative and inclusive agricultural value chain financing models in South-East Asia. During 2022-23, the project will analyse data to determine the impact of the project in each country and produce initial scientific reports and policy papers.<sup>2</sup>

### Crops

Mungbean is an ideal rotation crop for smallholder farmers throughout the Indian Ocean Rim region. The International Mungbean Improvement Network, established through a project led by Dr Ramakrishnan Nair of the World Vegetable Center, helped realise the potential of mungbean to improve cropping system productivity and livelihoods by improving researchers' access to genetic material, and coordinating and providing technical support to variety development in Bangladesh, India, Myanmar and Australia. Phase 2 of the project extends the network to Kenya and Indonesia, expanding the source of germplasm to develop new mungbean varieties, as well as strengthening the capacity of more national mungbean breeding programs.<sup>3</sup>

#### Regional Manager, East & South-East Asia

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#### Research Program Managers

Agribusiness: Mr Howard Hall

Crops: Dr Eric Huttner


See page 186 for contact details.

## Current and proposed projects

1. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
2. Inclusive agriculture value chain financing [Indonesia, Myanmar, Vietnam] (AGB/2016/163)
3. International Mungbean Improvement Network 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)

# Philippines

 **A\$4.47** million  
Budgeted funding

 **14**  
Bilateral and regional  
research projects

 **1**  
Small projects and  
activities

The Philippine economy is steadily recovering from the 9.5% contraction in 2020 brought about by natural disasters such as volcanic eruptions and strong typhoons, and the COVID-19 pandemic. The Philippines was heavily impacted by one of the world's longest and strictest enforced periods of community quarantine, which led to many businesses shutting down, increased unemployment and loss of income among workers in the informal sector, and a reduction in domestic consumption and purchasing power.

In 2021, with the calibrated reopening of businesses and mass transportation and the relaxation of quarantine restrictions, economic activities gradually resumed, resulting in a 5.6% economic growth, moving closer to the pre-pandemic average growth rates over the last decade of about 6%. While the agriculture sector remained resilient in early 2020, the lingering African swine fever and many strong typhoons have eroded the gains and made recovery efforts challenging.

Food insecurity remains a significant issue for the poorest and most vulnerable. To address this, the Philippine government is working on increasing food sufficiency levels through various initiatives such as the Rice Competitiveness Enhancement Fund, loan programs and farm-to-market assistance and disease management.

The Department of Science and Technology - Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD) is the main government partner of ACIAR in the Philippines. In support of national efforts to mitigate the impacts of the pandemic on agriculture and food systems, PCAARRD initiated a COVID-19 response program, GALING-PCAARRD, which assists communities around the country through technology information sharing, food product distribution, and provision of food production technologies and livelihood opportunities. It also focuses on enabling innovative research and development and integrating the different DOST agencies' initiatives in partnership with the State Universities and Colleges to enhance the food value chain for selected commodities in the regions towards food resilience.

Since the launch of the National Food Policy in January 2021, which directed all public-led initiatives related to hunger, food security, nutrition and sustainable agriculture, to be well coordinated and responsive across national and regional levels, there have been modest improvements in the hunger rate from 21.1% in 2020 to 11.8% by the end of 2021. The Inter-Agency Task Force for Zero Hunger created a roadmap that addresses the fragmented agriculture supply chain prone to disruptions, massive food waste, huge losses for farmers, higher costs and lower quality for consumers. However, while these efforts are laudable, there is still a lot to be done to further reduce hunger rates to pre-pandemic levels and, ultimately, end hunger.

The Philippines is one of Australia's longest-standing bilateral relationships, celebrating 76 years of diplomatic relationship in 2022. Bilateral cooperation is underpinned by the Philippines–Australia Comprehensive Partnership and the Philippines–Australia General Agreement on Development Cooperation. As one of the major bilateral partners for the Philippines, Australia remains committed to collaborate with the Philippine Government on recovery efforts and the country's development.

## Country priorities

ACIAR has worked with the Philippine Government, research and academic institutions, private sector and civil society partners for 4 decades, governed by the Memorandum of Agreement for Philippine–Australian collaboration in agriculture and forestry research. Country partnerships have evolved in recent years with significant co-investment from our main bilateral partner, DOST-PCAARRD, and with a deepening of the partnership as defined in the 2018 Record of Partnering Arrangements between PCAARRD and ACIAR for Scientific and Technical Cooperation for Agriculture, Aquatic and Natural Resources.

Our program in the Philippines focuses on research to make agricultural products more marketable and internationally competitive and to build the resilience of smallholder farmers, fishers and their households from impacts of natural disasters, climate change and external shocks such as the COVID-19 pandemic. Higher-value products and market competitiveness would improve food security by enabling smallholder farmers and traders to increase their income and access to other basic services and economic opportunities.

We work with the Philippine Government to progress the Harmonised National Research and Development Agenda for Agriculture, Aquatic and Natural Resources to promote prosperity, reduce poverty, and enhance stability. We do this through research for development that aims to:

- » improve agriculture and food production systems
- » make agricultural products more competitive in the market
- » enable competitive and sustainable fisheries and aquaculture
- » improve land and water resource management for profitable and sustainable agriculture
- » build resilience to climate change and other natural shocks
- » increase adoption of technology through community engagement, enabling extension services and support to policy development.

These priorities remain relevant, and the underlying issues have been compounded considering the COVID-19 pandemic.



The ACIAR program in the Philippines focuses on research to make agricultural products more marketable and internationally competitive and to build the resilience of smallholder farmers, fishers and their households. Photo: Ryam Yap

During 2020, ACIAR examined food systems in the Philippines to identify vulnerabilities exposed or amplified by the COVID-19 shock. This information, published in ACIAR Technical Report 96 *COVID-19 and food systems in the Indo-Pacific: An assessment of vulnerabilities, impacts and opportunities for action*, continues to be relevant in informing research and development to support food systems resilience in the Philippines. In particular, the assessment helped identify focus areas for research collaboration in the Philippines that will contribute to increasing food systems resilience in the face of future shocks.

Capacity building is closely linked to our research initiatives. Opportunities include the John Allwright Fellowship, the John Dillon Fellowship, the Meryl William Fellowships and other initiatives under the alumni engagement plan. Each program focuses on leadership and career development through short and medium-term support for Philippine partners. In August 2022, ACIAR and the Department of Science and Technology (DOST) entered into a new partnership to pilot a joint fellowship program with co-investments from both organisations to send Filipino researchers to Australia for their PhD.

In recent years, ACIAR has introduced innovations to deliver our learning and development programs. One example is the Philippine Agribusiness Masterclass, which successfully brought together a cohort of researchers, academics, farmer leaders and representatives from the private sector to collaborate. This course has now been integrated as a regular course offering of the DOST-PCAARRD, with a second cohort starting in the program last August 2022. In 2021, the John Dillon Fellowship was redesigned and is currently being delivered in-country to a cohort of up to 20 participants with a strong focus on cross-organisational collaboration and strengthening ties with Australian collaborators. The first in-country fellowship program commenced in the Philippines in May 2021, with participants from key government and research partners. The fellows are currently focused on their research projects which are expected to be completed before the end of 2022.

Australian Alumni play an important role as partners in research for development. ACIAR supported the establishment of the first Agriculture, Aquatic and Natural Resources Community of Practice in the Philippines in 2022, with an initial membership of 27 ACIAR alumni who are committed to 'best fit' solutions and approaches to the challenges in the sector.

Outreach and communications are increasingly important as a means to strengthen understanding and awareness of the impact of our programs as part of Australia's aid program in the Philippines, to support and strengthen relationships between in-country project partners and stakeholders and to share knowledge generated from ACIAR supported research programs to the public and policymakers.

## 2022-23 research program

- » **15 ACIAR-supported projects in the Philippines**
- » **9 projects are specific to this country**
- » **6 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018-2027, as well as specific issues and opportunities identified by ACIAR and our partner organisations. The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in the Philippines. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

### Agribusiness

Economic growth across South-East Asia has resulted in a growing urban middle class. This growth in affluence is driving demand for dairy-based products, and national dairy markets are growing rapidly. The increase in domestic dairy consumption in Indonesia and the Philippines presents an opportunity for significant growth in domestic dairy farming sectors, particularly for smallholder dairy farmers. A new project led by Dr Brad Granzin of Australasian Dairy Consultants aims to develop and pilot commercially viable, sustainable smallholder-inclusive dairy value chains. The project will capitalise on the growing domestic demand for short shelf-life dairy products and collaborate with partners to develop interventions to improve farm productivity, product quality and availability, and supply chain efficiencies.<sup>1</sup>

ACIAR-supported research in the southern Philippines showed that integrating vegetable and coffee value-chain development and community engagement leads to improved innovation, competitiveness, quality and value. However, success occurred at very local scales and, in general, most smallholder horticulture growers in the Philippines cannot compete in higher-value, more-demanding markets. A project led by Dr Lily Lim-Camacho of CSIRO will identify opportunities for inclusive agribusiness-led market development, evaluate opportunities for digital technologies to increase competitiveness and farm-to-market linkages, and evaluate models for public-private learning alliances and innovative co-investment with agribusiness firms. In 2022-23, researchers will conduct participatory community and vegetable and coffee farming systems analysis.<sup>2</sup>



## Fisheries

In the Philippines, the successful restoration of damaged coral reefs in experimental plots has led to notable increases in reef fish abundance and fish species richness, compared with control plots where coral was not restored. A project led by Professor Peter Harrison of the Southern Cross University has established rigorous protocols and long-term monitoring and evaluation of the impacts on fish communities and other reef resources from coral restoration in the northern Luzon region. The project concludes in 2022 with training courses for local communities, reef managers and researchers to build capacity for future fish surveys, reef restoration programs and best-practice reef fisheries management.<sup>3</sup>

Previous ACIAR research partnerships successfully demonstrated rapid coral population recovery, re-establishment of breeding populations and increased fish abundance from larval coral restoration interventions. Professor Peter Harrison of the Southern Cross University leads a 5-year project to significantly increase the scale of restoration interventions. Techniques established in previous projects will be refined for application in large-scale restoration trials in 4 regions of the Philippines. Trials will be monitored to quantify coral reproduction success. In 2022-23 the project team will continue working with communities, researchers and local governments to establish coral restoration networks in the trial regions to support local restoration activities. Heat-stress experiments will be conducted to quantify larval production, settlement and recruitment rates to identify heat-tolerant adult coral genotypes that are resilient under future climate-change scenarios.<sup>4</sup>

Coral reef ecosystems provide important livelihood opportunities to coastal communities in the Philippines, but they are threatened by climate change, overfishing, destructive fishing practices and pollution. While the success of coral restoration using larval reseeded techniques has been confirmed by previous and ongoing ACIAR-supported projects, significant challenges remain regarding the integration of this technology with existing maritime policy and governance to ensure the sustainability of restored reefs. Associate Professor Michael Fabinyi of the University of Technology Sydney leads a project funded by DFAT that aims to improve the institutional effectiveness of coral reef restoration by understanding political-economic influences and drivers at multiple scales, and applying lessons learned through a marine governance network-based approach.<sup>5</sup>

Dried sea cucumbers are highly valued in markets across China and South-East Asia. Overfishing and poor fisheries management throughout the Asia-Pacific region have resulted in serious declines of sea cucumber stocks and even led to fishery closures, reducing income-generating opportunities for coastal communities. A project led by Professor Paul Southgate of the University of the Sunshine Coast is developing culture methods that support pond-based sea cucumber farming in Vietnam and sea-based farming in the Philippines. In 2022-23 activities will include assessing potential predator mitigation measures, continuing field experiments and developing protocols for the responsible use and transfer of sandfish.<sup>6</sup>



Dried sea cucumbers are highly valued in markets across China and South-East Asia. A project led by the University of the Sunshine Coast is developing culture methods that support sea cucumber farming in the Philippines and Vietnam. Photo: Mark Anthony Perandos

## Horticulture

*Fusarium* wilt tropical race 4 (TR4), or Panama disease, has become widespread throughout South-East Asia. The disease is threatening smallholder banana production in Indonesia, the Philippines and, more recently, Laos. A project led by Dr Anthony Pattison of the Queensland Department of Agriculture and Fisheries aims to develop an integrated management response to the spread of the disease. The research will investigate the effects on banana production of altering the banana microbiome to suppress disease and increase plant resistance. During 2022–23, the project team will analyse completed field surveys of production systems and natural environments, and there will be ongoing development and training in statistics and experimental procedures for glasshouse and field experiments.<sup>7</sup>

About 40 tropical fruit fly species damage horticultural crops and impede trade throughout South-East Asia. A project in Indonesia and the Philippines builds on the success of previous ACIAR projects, and links to fruit-fly work in other ACIAR partner countries and Australia. The project, led by Mr Stefano De Faveri of the Queensland Department of Agriculture and Fisheries, aims to reduce fruit-fly infestation of mango crops through area-wide management of the pest, and improve pre-harvest and post-harvest practices. The ultimate aim is to improve the yield and quality of crops in order to improve livelihoods and trade opportunities. During 2022–23, focus areas for the project include training farmers and other stakeholders in area-wide management techniques, evaluation of techniques implemented in the field, and integration of techniques into best management practice.<sup>8</sup>

Vegetable consumption is low in the Philippines for several reasons, including the perception that vegetables are of poor quality and unsafe. Vegetable farmers are not well trained in the appropriate use of pesticides, resulting in pesticide residues above permissible limits in harvested crops, exposure of farm workers to pesticide poisoning and contamination of soil and water. Dr Gordon Rogers of Applied Horticultural Research leads a project to improve vegetable supply chains to meet consumer expectations in terms of quality, food safety, nutritional value and price. During 2022–23, the project will continue to measure the social and economic impact of adopting new vegetable good agricultural practice (GAP) protocol and continue training key support personnel, including leading farmers.<sup>9</sup>

Mango production in the Asia-Pacific region accounts for about two-thirds of global production. Much of the crop is produced by smallholders, who achieve relatively modest yields and participate in traditional value-chain arrangements that offer little incentive to innovate or pursue higher quality. Some producers seek better returns by supplying higher-value export markets (such as Korea), but struggle to deliver fruit that meets market or regulatory standards. Dr Muhammad Sohail Mahzar of the Northern Territory Department of Primary Industry and Fisheries Industry, Tourism and Trade will lead a new project in Cambodia and the Philippines that aims to improve the ability of selected mango supply chains to deliver fruit that better meets consumer expectations of quality and value, and provide smallholder growers with a better return on investment.<sup>10</sup>

## Livestock Systems

A new project will be established in Indonesia, Laos and the Philippines during 2022–23, as part of the ACIAR-IDRC Research Program on One Health. Led by the University of the Philippines (Los Banos), the project will investigate the potential to enhance livestock production systems in South-East Asia using an EcoHealth/One Health approach (page 24).<sup>11</sup>

The University of the Philippines will also lead a second project in the program to develop a policy approach to support the Philippines' national surveillance and control programs for African swine fever, avian influenza and antimicrobial resistance.<sup>12</sup>

## Social Systems

More than 24 million people in the Philippines, most of whom live below the poverty line and rely on subsistence agriculture, especially in the country's rural uplands. Deforestation and land degradation in the uplands are major national environmental and social issues. A project led by Dr Nestor Gregorio of the University of the Sunshine Coast focuses on forest landscape restoration to enhance the livelihoods of low-income residents of rural areas. During 2022–23, information from pilot testing of designs for woodlots, agroforestry systems and woodlot/crop systems suited to smallholders and communities will be used to produce manuals on smallholder-based tree-crop farming systems. Guidelines also will be published to assist the formulation of forest and landscape restoration policy within the Asia-Pacific region.<sup>13</sup>

## Soil and Land Management

Rubber is the fourth largest crop in the poorest province of the southern Philippines, Agusan del Sur. Only 50% of the total rubber area planted is productive or tappable, and average yield in the province is much lower than the national average. By introducing improved profitable rubber-based intercropping systems and sustainable management regimes, a project led by Professor Chengrong Chen of Griffith University aims to boost household incomes for Indigenous smallholder subsistence farmers. During 2022–23, the project team will finalise intervention strategies to ensure gender equity, report on the best nutrient and fertiliser management schemes for increasing soil fertility, and continue delivering capacity building activities to promote resilient market-oriented rubber-based intercropping systems with low risk and high productivity and profitability.<sup>14</sup>

Vegetable production systems of upland farming areas of the Philippines are intensively managed and suffer problems including severe soil acidity, undiagnosed micronutrient deficiencies, excessive accumulation of copper and zinc, excessive application of fertilisers and manures, and erosion. Serious soil-borne pathogens also affect productivity in these intensive farming systems. Dr Stephen Harper of the University of Queensland leads a new project to develop management strategies that mitigate, remediate and reduce the risks of contaminants in soils across 3 major vegetable production regions. The project starts with research to provide a clear understanding and validation of the current soil nutrient status, including excesses and deficiencies, and potential short-term and long-term impacts of accumulation of essential heavy metals, particularly copper and zinc, on vegetable production.<sup>15</sup>

### Country Manager, The Philippines

Ms Hazel Aniceto

### Research Program Managers

Agribusiness: Mr Howard Hall

Fisheries: Prof Ann Fleming

Horticulture: Ms Irene Kernot

Livestock: Dr Anna Okello

Social Systems: Dr Clemens Grünbühel

Soil and Land Management: Dr James Quilty

See page 186 for contact details.

## Current and proposed projects

1. Evaluating supply chain interventions and partnerships to sustainably grow the smallholder dairy sectors of Indonesia and the Philippines (AGB/2021/124)
2. Agribusiness-led inclusive value chain development for smallholder farming systems in the Philippines (AGB/2018/196)
3. Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration [Philippines] (FIS/2018/128)
4. Regional coral restoration networks and appropriate technologies for larger-scale coral and fish habitat restoration in the Philippines and Australia (FIS/2019/123)
5. Institutional effectiveness and political economy of coral reef restoration in the Philippines (FIS/2021/112)
6. Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines (FIS/2016/122)
7. An integrated management response to the spread of *Fusarium* wilt of banana in South-East Asia [Indonesia, Laos, Philippines] (HORT/2018/192)
8. Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region (HORT/2015/042)
9. Developing vegetable value chains to meet evolving market expectations in the Philippines (HORT/2016/188)
10. Improving mango crop management in Cambodia, the Philippines and Australia to meet market expectations (HORT/2016/190)
11. Livestock enhancement through EcoHealth/One Health assessment in South-East Asia (ACIAR-IRDC One Health Research Program) [Indonesia, Laos, Philippines] (LS/2022/163)
12. Policy support to the Philippines' national surveillance and control programs for African swine fever, avian influenza and antimicrobial resistance: A One Health systems approach (ACIAR-IRDC One Health Research Program) (LS/2022/162)
13. Enhancing livelihoods through forest and landscape restoration [Philippines] (ASEM/2016/103)
14. Land management of diverse rubber-based systems in the southern Philippines (SLAM/2017/040)
15. Managing heavy metals and soil contaminants in vegetable production to ensure food safety and environmental health in the Philippines (SLAM/2020/117)

# Timor-Leste



**A\$1.98** million  
Budgeted funding



**5**  
Bilateral and regional  
research projects



**1**  
Small projects and  
activities

Before the COVID-19 pandemic, food systems in Timor-Leste were already under stress from many factors, including seasonally recurring food shortages, input supply challenges, low productivity, pests and diseases, and limited access to capital. As the situation is now stabilising, ACIAR will establish a new long-term partnership with Timor-Leste to help develop the research system for the benefit for the rural poor. The partnership will be strengthened by the opening of an ACIAR Country Office in Dili, in mid-2022.

While Timor-Leste has made strong progress in recent years, some development indicators remain stubbornly entrenched. With 70% of the population living in rural areas, there is a heavy reliance on incomes from semi-subsistence and seasonal food cropping, mixed with small-scale animal husbandry and varying degrees of foraging for wild crops and game. Despite many recent improvements in a range of essential services, there is a high prevalence of poverty, with more than 50% of the population facing some level of food and food nutritional insecurity. Improving productivity, diversity and returns from agriculture, livestock and fisheries, as well as the functioning of food systems, will remain crucial to overcoming these challenges, with the aim for rural populations to generate sufficient reliable income from agriculture to improve their living conditions and livelihood opportunities.

The reasons for constrained on-farm crop and animal production and productivity are complex and varied. They include highly variable weather conditions affecting crop establishment and subsequent yields, infertile soils, limited availability of and access to agricultural inputs (especially given a weak private sector), low capital for investment, pests and insects causing crop losses pre-harvest and post-harvest, labour constraints at critical times and limited market demand for agricultural products beyond local consumption. Critically, lack of access to credible, locally relevant and implementable science-based advice is a key constraint cutting across all areas.

## Country priorities

Since 2001, ACIAR has had a strong program of projects in Timor-Leste, some of which have been long-term (such as Seeds of Life). The time is now right to pivot our relationship to one based on a research partnership between the two countries, not just a series of projects. To achieve this, ACIAR has opened a country office in Dili and during 2022–23 will work with key partners in Timor-Leste to establish the basis of the new and long-term partnership, using as a starting point the analysis of food systems vulnerabilities published in November 2020. This identified opportunities for future research to contribute to the greater resilience of Timor-Leste food systems, including:

- » improved social protection measures for vulnerable households
- » a renewed focus on the productivity of smallholder agriculture with gradual intensification and improved feed and biosecurity regimes
- » greater efforts to expand private sector market developments and increase employment
- » greater focus on education and relevant technical training to increase the availability of skilled graduates.

The opportunities for ACIAR to support these priorities will be investigated in more detail this year. Focus sectoral areas may include research in coastal fisheries, agroforestry, livestock (especially cattle and poultry) and cropping systems, as well as seeking opportunities for trilateral research collaboration with Indonesia.

## 2022–23 research program

- » **6 ACIAR-supported projects in Timor-Leste**
- » **4 projects are specific to this country**
- » **2 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our partner organisations. The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Timor-Leste. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

### Crops

Many rural households in Timor-Leste do not generate sufficient reliable income from agriculture to improve the living conditions and livelihood opportunities of their families. A new project, led by Associate Professor Louise Barton of the University of Western Australia, will build on previous ACIAR-funded projects to improve productivity of agricultural systems by introducing accessible technologies and improved agronomic practices to overcome soil-related constraints and increase opportunities for diversification and intensification. At the core of the project is capacity development of in-country partners in research practice, research management and agronomic extension services, as well as the development and implementation of business models supporting biochar. The assessment of the viability of sandalwood for smallholders in Timor-Leste will continue, including making recommendations related to barriers to recognising the value of this asset.<sup>1</sup>



The ACIAR program in Timor-Leste will identify opportunities to contribute to the resilience of food systems, such as gradual intensification and improved biosecurity of smallholder agriculture, and greater efforts to expand private sector markets.

## Fisheries

Globally, growing momentum for nutrition-sensitive agricultural policy and development assistance is yet to have any impact on the small-scale artisanal fishery sector. To address this, the role and contribution of fish to livelihoods and nutrition security must be supported by rigorous data and communicated at global, national and local scales. A project in Timor-Leste and the East Nusa Tenggara province of Indonesia aims to identify the livelihood and nutrition benefits of fisheries and test nutrition-sensitive co-management systems for inshore fisheries. Led by Dr David Mills of the WorldFish Center, the project will evaluate the nutritional value of fisheries to households, identify the factors enabling or limiting fish consumption, and highlight the potential of fish to reduce malnutrition, particularly during early childhood. In 2022–23 activities will include data collection to understand household livelihood structures and decision-making and community training in healthy diets and child nutrition.<sup>2</sup>

Fish-based livelihoods play a critical role in the economies of coastal communities in Solomon Islands and Timor-Leste, and participation in catching, processing or trading of fish is an important pathway to poverty reduction. A project led by Dr Hampus Eriksson of the University of Wollongong will identify and support community-identified opportunities for innovation within the coastal fisheries post-harvest sector, focusing on income benefits. This new approach addresses the historic lack of success at the community level of large state-led investments in fisheries sector infrastructure and advanced technologies. It seeks to influence policy on how fisheries institutions can support remote communities through appropriate community-led infrastructure and skill development investments. In 2022–23 activities will include monitoring fish distribution and marketing, documenting livelihood experiences and building the capacity of women in safe aquatic food handling practices.<sup>3</sup>

## Livestock Systems

There is a growing body of evidence highlighting a causal linkage between foodborne illness due to enteric bacterial infections and malnutrition. Children exposed to damaging enteropathies at an early age may have little chance at realising their full development potential, despite improved diets later in life. Studies in Timor-Leste highlighted the need to better consider the role of food safety in food systems thinking, particularly in the Pacific region where increased consumption of animal-source protein is promoted to address childhood malnutrition and stunting. A new project led by Dr Samantha Colquhoun of the Australian National University, will investigate infant and child dietary practices, food safety and environmental hygiene in relation to community poultry production, with a focus on the risk of *Campylobacter* and *Salmonella* infection. The research will be supported by targeted interventions in urban and rural settings through a One Health approach.<sup>4</sup>

A new project will be established in Timor-Leste during 2022–23, as part of the ACIAR-IDRC Research Program on One Health. Led by the Menzies School of Health Research, the project aims to develop strategies to reduce brucellosis transmission in Timor-Leste based on One Health collaboration (page 24).<sup>5</sup>

## Soil and Land Management

A small research activity led by Dr Leigh Vial of Charles Darwin University forms the first stage of a planned large-scale project to improve smallholder farm and livelihood productivity in Timor-Leste. The research will provide an understanding of the biophysical and socioeconomic characteristics of the prospective areas for further targeted research, including an assessment of food security and sovereignty, relevant technical assistance histories, current development status and outlook of each location. These indicators will inform the future design, development and implementation of interventions, technologies and initiatives aimed at lifting rural productivity and resilience in ways that align with expressed community interests.<sup>6</sup>

### Country Manager, Vietnam

Mr Luis de Almeida

### Research Program Managers

Crops: Dr Eric Huttner

Fisheries: Prof Ann Fleming

Livestock Systems: Dr Anna Okello

Soil and Land Management: Dr James Quilty

See page 186 for contact details.

## Current and proposed projects

1. Agricultural Innovations for Communities - Intensified and Diverse Farming Systems for Timor-Leste (AI-Comm 2) (CROP/2021/131)
2. A nutrition-sensitive approach to fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia (FIS/2017/032)
3. Innovating fish-based livelihoods in the community economies of Timor-Leste and Solomon Islands (FIS/2019/124)
4. Bacterial enteropathy and nutrition study in poultry [Timor-Leste] (LS/2021/126)
5. Developing strategies to reduce brucellosis transmission in Timor-Leste based on One Health collaboration (ACIAR-IRDC One Health Research Program) (LS/2022/161)
6. Evaluation of livelihood zones, rural household trajectories, research and development partners and initiatives in Timor-Leste (SLAM/2021/108)

# Vietnam



**A\$5.02** million  
Budgeted funding



**18**  
Bilateral and regional  
research projects



**7**  
Small projects and  
activities

**The Vietnam agriculture sector gained an impressive annual growth rate of 2.9% in 2021, higher than the economy's overall growth of 2.6%. Vietnam has set high ambitions and a strong vision for its agricultural development, but obstacles to reaching those targets remain.**

In 2021, the COVID-19 pandemic severely impacted all socio-economic aspects of Vietnam. While many sectors experienced disruptions and adverse outcomes, agricultural production continued to maintain and actively contribute to the country's stability and food security. It also contributed impressively to export revenue and proved to be one of the strongest pillars of the economy.

Vietnam has a stated ambition to become a country with world-class agriculture, prosperous rural areas, modern infrastructure, efficient use and sustainable protection of agricultural resources, and resilience to climate change. In agriculture specifically, Vietnam aims to be in the top 15 agricultural developed countries and rank tenth in agricultural processing technology by 2030. To achieve these goals, Vietnam has prioritised focusing on export commodities that meet good agricultural practices and other quality standards and by value-adding to products through new technologies.

In February 2022, Vietnam launched a national strategy for sustainable agriculture and rural development, Vietnam Issues Green Growth Strategy 2021–2030 Vision to 2050. The Strategy is an important policy document for Vietnam's economic growth and sustainable development, with specific goals related to reducing greenhouse gas emissions. The plan aims to retain forest cover at 43% and apply advanced water-saving irrigation methods to at least 60% of the total irrigated dry crop area. At COP26, Vietnam committed to a 30% reduction in methane emissions by 2030. This will translate directly into options to reduce methane emissions from rice production and livestock and opportunities for carbon storage in forestry, agroforestry and soils.

The strategy also maps out foundations for re-organising production to further develop agriculture and rural areas and increase climate change resilience in the sector. By 2050 Vietnam is expected to have a modern, efficient and environmentally friendly agriculture and developed rural areas with residents' living conditions and incomes matching those of the urban area.

One Health is an area of increasing interest involving agriculture in Vietnam. Vietnam's One Health Partnership framework for zoonoses, for the 2021–25 period, aims to minimise the risk that zoonotic pathogens and environmental agents will cross species barriers and reduce the occurrence of antimicrobial resistance in human and animal pathogens by improving multi-sectoral One Health collaboration in Vietnam.

Within that context, Vietnam sees research-for-development (especially the application of 4.0 technology) as the key to achieving its ambitions to improve efficiency and productivity and increase the competitiveness of agricultural products. Research for rural development continues to be vital, especially linking poorer rural areas to exports. The main challenges to achieving these ambitions in the coming years remain to be climate change, water shortage, soil degradation, lack of market access for agricultural produce and development gaps of ethnic minorities and women in rural areas.

## Country priorities

ACIAR has sustained a program of research collaboration with Vietnam for the past 28 years. The strategy for research collaboration between Vietnam and ACIAR from 2017 to 2027 was developed on the basis of mutual acknowledgment that the relationship between ACIAR and Vietnam has evolved from donor-recipient to partnership, co-investment and, possibly, through this period, to trilateral collaboration. The strategy confirms the desire of both parties to join with the private sector wherever possible to create opportunities for poorer residents in rural and urban areas through inclusive agribusiness systems. It also focuses on transformational opportunities for women in research and agribusiness systems and on farms.

The key ambitions of the strategy are to:

- » improve the capacity of Vietnamese researchers, research managers and development partners to support sustainable and equitable farming and livelihood systems in the Mekong River Delta, Central Highlands and Northwest regions and in the fisheries and aquaculture sector
- » improve the skills, livelihoods and incomes of smallholder farmers, including ethnic minorities in the mountainous areas of the Central Highlands and Northwest regions, supported by knowledge networks that allow profitable engagement in domestic and international markets
- » improve human health and nutrition through research on integrated farming systems, nutrition-sensitive agriculture and One Health
- » improve the quality and safety of meat, fish, vegetables and fruit for domestic consumption
- » develop a deeper knowledge of markets to help prevent and reduce economic shocks for participants in agricultural supply chains
- » reduce inputs of chemicals and fertiliser for a cleaner environment, safer produce, improved soil health and more-profitable sustainable production systems
- » improve resource use efficiency to produce more food with fewer resources
- » implement practices and inform policymakers to manage climate-change impacts on agriculture.

In June 2022, Vietnam and ACIAR reaffirmed these priorities as being the key focus for our partnership. We also reaffirmed the commitment to:

- » co-fund 75% of projects during the 10-year period
- » develop research into climate change, especially drought-tolerant cropping systems in the Mekong River Delta and the Central Highlands, and saline-cropping systems for the Mekong River Delta.

## 2022–23 research program

- » **25 ACIAR-supported projects in Vietnam**
- » **13 projects are specific to this country**
- » **12 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our partner organisations. The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Vietnam. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.



The strategy for research collaboration between Vietnam and ACIAR (2017–27) is based on partnership and co-investment, the intention to partner with the private sector wherever possible to create opportunities for poorer residents in rural and urban areas through inclusive agribusiness systems.



## Agribusiness

Cassava witches' broom disease and Sri Lanka cassava mosaic virus are spreading rapidly in South-East Asia. A project led by Dr Jonathan Newby of the International Center for Tropical Agriculture is developing technically viable and economically and socially sustainable ways to improve the resilience of cassava production systems and value chains in Cambodia, Laos, Myanmar and Vietnam. The project will conclude in 2023 with researchers continuing on-farm testing of new agronomic practices and training of farmers and extension officers. The project team will also finalise their investigation of alternative models for public-private funding for core activities.<sup>1</sup>

Catfish (*Pangasius* sp) farming and wild-caught catfish are important income generating activities for smallholder farmers in the Mekong River Basin and are a vital source of dietary protein for those countries' populations. The continued availability of catfish for human consumption is influenced by many factors including climate change, the COVID-19 pandemic, consumer perceptions on food and health safety provenance, and environmental and political changes. Dr Van Kien Nguyen of the Health and Agricultural Policy Research Institute leads a new project in Cambodia, Laos and Vietnam to identify food loss and waste along the catfish value chain; conduct foresight exercises to determine the uncertainties of catfish production for food systems; and develop solutions to reduce food loss in catfish production. This project is part of the ACIAR-IDRC Food Loss Research Program (page 24).<sup>2</sup>

Smallholder farmers in South-East Asia often cannot access credit to invest in new crops or technologies, deal with risks and shocks, and safely carry wealth from harvest to planting. To help smallholders reach their production potential, a project led by Dr Alan de Brauw of the International Food Policy Research Institute aims to increase knowledge about how to design and implement innovative and inclusive agricultural value chain financing models in South-East Asia. During 2022-23, the project will analyse data to determine the impact of the project in each country and produce initial scientific reports and policy papers.<sup>3</sup>

Unmanaged expansion of coffee and pepper production in the Central Highlands region has resulted in deforestation and production on unsuitable land. Increasingly, the region is subject to the impacts of climate change, with increasing temperatures and erratic rains. There has also been misuse and overuse of mineral fertilisers, irrigation water and synthetic pesticides. A project led by Dr Estelle Bienabe of the World Agroforestry Centre aims to enhance smallholder livelihoods, including vulnerable populations, by improving the sustainability of coffee and black pepper farming systems and value chains. In 2022-23, researchers will evaluate integrated farming practices in on-farm trials to inform farming system design, initiate simple practice changes, and assess barriers to adopting recommended good farming practices.<sup>4</sup>

About 1.5 million smallholder farmers in the Mekong River Delta region rely on rice for their livelihood. Rice is grown on small farms, with 2 or 3 crops produced each year. The industry faces issues such as reduced returns to farmers, soil degradation, environmental pollution and declining seed purity and grain quality. In 2017, the Government of Vietnam developed a policy to encourage reduced total rice production and a focus on high quality, with the aim of exporting to premium markets. A new 4-year project, led by Dr Jaquie Mitchell of the University of Queensland, aims to establish a highly productive, sustainable, traceable and quality-assured value chain for tropical medium-grain rice in the Mekong River Delta for the benefit of rice-farming households and to meet established market requirements of the partnering global marketer. The project is a public private partnership, co-funded by ACIAR and Ricegrowers Limited, an Australian company operating a recently refurbished state-of-the-art rice mill in the Mekong Delta and global markets for higher value specialty rice products.<sup>5</sup>

A new project led by Dr Stephen Ives of the University of Tasmania will investigate new collaborative approaches between smallholder farming households and commercial intensive agricultural systems with a focus on beef supply chains. The project aims to establish and pilot best practice smallholder inclusive business models based on these new approaches. These new approaches and business models will be mutually beneficial, enabling improved livelihoods for smallholder farming households and improved productivity and performance for commercial supply chains in Vietnam.<sup>6</sup>

Previous ACIAR-funded projects helped establish a new safe vegetable industry in the Son La province of Northwest Vietnam, worth A\$70 million per year. The new value chain follows the VietGAP quality assurance protocol and supplies a range of vegetables to modern retail and traditional markets, mainly in Hanoi. However, challenges remain along the value, the most significant being traceability, compliance with VietGAP and product quality. A small research activity, led by Dr Gordon Rogers of Applied Horticultural Research, will develop and pilot low-cost digital tools (such as QR codes, temperature sensors and GPS locators) to help small and medium-sized vegetable farmers, and other value chain participants, to improve VietGAP compliance and manage the quality and safety of vegetables delivered to market.<sup>7</sup>



## Climate Change

Australia is a world leader in greenhouse gas mitigation research in agriculture. This project assists Vietnam in strengthening its national greenhouse gas accounting systems to identify, quantify and report on rice management options that reduce emissions. Led by Professor Peter Grace of Queensland University of Technology, the project team will work with government institutions in Vietnam and will help grow capability in the data management, analyses, reporting and cross-Ministerial governance needed to support current and future emissions reduction commitments under the Paris Agreement. The team will also collaborate with a number of others who are working to support development of Vietnam's greenhouse gas inventory systems.<sup>8</sup>

The impact of climate change on the Mekong River Delta's coastal areas is such that current food production systems, particularly shrimp aquaculture, are already unsustainable and increasingly at risk. Mangrove poly-culture systems have the potential to provide a large-scale alternative, expanding inland as sea-level rise and extensive inundation with sea water increase. They can also contribute to carbon sequestration and support the national government's priorities for growing modern agribusinesses in the delta region. Led by Dr Pham Thu Thuy of CIFOR, in collaboration with Can Tho University and CSIRO, a new project will work alongside existing restoration efforts, building the capacity of farmers, governments and development partners to maximise the success of current mangrove-based food production and co-developing pathways for a more transformative approach linked to agri-business development.<sup>9</sup>

## Fisheries

Floodplain development and the regulation of river flows for rice production across South-East Asia are affecting fisheries and fish migration, and the livelihoods of communities that depend on fish for protein and trade. Previous ACIAR-supported research showed that integrating fishways into water regulator designs, allowing passage of migratory fish up and down regulated rivers, can have lasting economic and social benefits for river communities. Professor Lee Baumgartner of Charles Sturt University leads a project to establish a stakeholder network to facilitate sound, cross-sector decision-making on fish passage construction programs across South-East Asia. During 2022-23, researchers will continue gathering data on fish migration and undertake an international review of draft guidelines and curriculum for a specially designed Graduate Certificate in Fisheries. An additional DFAT investment aims to broaden the projects outcomes to include scaling of fish passage technologies across Mekong countries.<sup>10</sup>

Dried sea cucumbers are highly valued in markets across China and South-East Asia. Overfishing and poor fisheries management throughout the Asia-Pacific region have resulted in serious declines of sea cucumber stocks and even led to fishery closures, reducing income-generating opportunities for coastal communities. A project led by Professor Paul Southgate of the University of the Sunshine Coast is developing culture methods that support pond-based sea cucumber farming in Vietnam and sea-based farming in the Philippines. In 2022-23 activities will include assessing potential predator mitigation measures, continuing field experiments and developing protocols for the responsible use and transfer of sandfish.<sup>11</sup>



Australia's Commission for International Research and Policy Advisory Council, and ACIAR staff visited a mangrove area in Soc Trang province during their in-country annual meeting in Vietnam, June 2022, to view mangrove poly-culture systems, which are potentially a large-scale alternative to traditional shrimp aquaculture systems that are increasingly at risk to the impacts of climate change. Photo: Patrick Cape

Marine bivalves, such as mussels, clams and oysters, are known to sequester carbon in their shells. There is interest in the potential for bivalves to mitigate the effects of climate change. In northern Vietnam, a small research activity led by Dr Sarah Ugalde of the University of Tasmania examines the role of the Portuguese oyster (*Crassostrea angulata*) aquaculture industry in the carbon cycle and rates of carbon sequestration. This new information will be used to evaluate the potential value for oyster carbon farming to reduce climate-change impacts through shell recycling and value-adding, including using carbon crediting mechanisms.<sup>12</sup>

Hybrid grouper farming is Vietnam's most profitable marine fish aquaculture sector, involving over 400 hatchery operators and grow-out farmers. The Directorate of Fisheries aims to increase small and medium enterprises in marine aquaculture, but the hybrid grouper sector is constrained by its reliance on a nutritionally poor and variable supply of 'trash' fish. Farmers report they are willing to use more sustainable, cost-effective formulated feeds, but a lack of data on suitable feed formulations has constrained development. A project funded by DFAT and led by Dr Leo Nankervis of James Cook University will deliver nutritional data required to formulate cost-effective feeds that promote superior growth and survival and so attract smallholder farmers to switch to formulated feeds. Cooperation with large feed mills in Vietnam's private sector will support the local supply of cost-effective diets for hybrid grouper and underpin broad-scale adoption of commercial pelleted feeds.<sup>13</sup>



A project funded by DFAT and led by James Cook University is determining the nutritional data required to formulate cost-effective feeds for hybrid groupers to promote superior growth and survival. Photo: Khanh Long

Unique among Pacific island countries is the production of half-pearls, or mabé, in Tonga from the winged pearl oyster. Although half-pearls are generally less valuable than round pearls, an individual oyster can produce multiple half-pearls (unlike round pearls). With appropriate training, pearl production can be accomplished by community members over a 10-month culture period, compared to approximately 2 years for round pearls. Professor Paul Southgate of the University of the Sunshine Coast completes a project in 2023 that is supporting further expansion of community-based pearl farming and handicraft production in Tonga and demonstrating the feasibility of similar development in Vietnam.<sup>14</sup>

### Forestry

A project with activities in Indonesia and Vietnam will underpin good plant biosecurity practices in forestry. Led by Dr Caroline Mohammed of the University of Tasmania, researchers will work with government and industry partners to extend screening approaches developed for the fungus *Ceratocystis* in acacia to eucalypts, which have replaced acacias in plantations in areas of the wet tropics. Researchers will develop remote-sensing software applications for cheap and rapid forest health surveillance and, through geospatial modelling, deliver risk maps under current and future climates at a regional level for the highest-priority pests and pathogens. In 2022–23 activities will include building the capacity of local partners to access climate data and run distribution models, and identifying eucalypt parents for hybridisation.<sup>15</sup>

Northwest Vietnam is among Vietnam's poorest regions. It is mountainous, deforested and severely eroded. A project led by Associate Professor Doland Nichols of Southern Cross University will increase tree cover in Muong La District by developing a farmers' cooperative nursery producing and selling fruit and timber trees and subsidising members' tree planting. A linked silvics experiment in Muong La Nature Reserve will use farmer-produced seedlings to provide knowledge responsive to the Vietnamese Government's directive to develop climate-resilient, native timber production for its processing industries. Both activities will provide research training for Tay Bac University faculty and students and contribute to post-flood local restoration.<sup>16</sup>

Increased trade, global movement and a changing climate increase the threat of emerging pests and diseases. The capability to detect and respond to forest pest and disease incursions is crucial to minimising their impacts. In South-East Asia, this capacity varies widely, but there is a general lack of preparedness. A project co-led by Dr Madaline Healey and Associate Professor Simon Lawson of the University of the Sunshine Coast will establish an effective and sustainable forest biosecurity network to improve risk management for invasive forest pests and diseases. The project will use shared field protocols and data as an entry point and foundation for coordinated biosecurity response. In 2022–23 activities will include launching resources to assist with in-country identification of pests and pathogens and delivering biosecurity awareness training.<sup>17</sup>

## Livestock Systems

Poultry enterprises offer opportunities to improve the nutrition of households and economically empower women, who are the key custodians of smallholder poultry in South-East Asia. However, low-producing chicken genotypes typically dominate smallholder or family production systems. Dr Tadelles Dessie of the International Livestock Research Institute leads a project to test and make available high-producing, farmer-preferred genotypes of chickens to increase smallholder productivity as a pathway out of poverty in Cambodia and Vietnam. During 2022–23, the project continues activities to quantify smallholder chicken production systems and investigate promising breeds for the region. The project is also designing a breed improvement program in Cambodia.<sup>18</sup>

Goat production in Laos has more than doubled over the past 10 years, largely driven by high demand for goat meat from Vietnam. Traditional extensive goat-raising methods can result in overgrazing of feed resources, negative consequences for the environment and higher incidence of diseases and parasites in livestock. A project led by Professor Stephen Walkden-Brown of the University of New England is aiming to enhance income-generating opportunities for goats in Lao farming systems, while identifying sustainable production practices. Additionally, the project is seeking greater understanding of consumer preferences for goats in Vietnam to further develop market specifications, especially for premium meat. During 2022–23, the project will develop performance benchmarks and define best practice for smallholders, larger goat farmers and agroforestry systems. The project will also conduct market surveys to ascertain past, current and likely future demand for goats and goat meat, and factors affecting pricing and demand.<sup>19</sup>

Market demand for beef is increasing rapidly in Vietnam, outstripping current levels of domestic production. A project led by Dr Stephen Ives of the University of Tasmania is investigating and implementing whole-farm solutions for smallholder cattle producers in the highlands of Northwest Vietnam. This will help smallholder farmers shift from extensive to more-intensive production systems so they can meet market specifications, increase market linkages and improve profitability. In 2022, project will complete capacity building activities for stakeholders in the beef value chain, including key advisory and extension staff, and design an up-scaling strategy for a sustainable crop-livestock system.<sup>20</sup>

A review of key thematic areas of animal health governance considered regulation, the veterinary workforce, ethics and welfare, surveillance, innovation, biosecurity, trans-boundary trade and service delivery. The review found that significant gaps existed in knowledge and engagement, especially when compared to the human health sector. Dr Kevin Bardosh leads a project to address recommendations from the review to strengthen and support the animal health sector in low and middle-income countries. The recommendations include establishing and convening a network of social and political scientists working on animal health governance; and conducting a systematic review of the social and political science literature in the global animal health field.<sup>21</sup>



A project led by the University of Tasmania is investigating and implementing whole-farm solutions for smallholder cattle producers in the highlands of Northwest Vietnam to shift from extensive to more-intensive production systems, to meet rapidly growing market demand and specifications, increase market linkages and improve profitability. Photo: Vu Khanh Long

## Social Systems

A small research activity will report on its analysis of gender transformative tools designed to support ethnic minorities in the Technologically Enhanced Agricultural Livelihoods (2018-2022) project operated by CARE International in the northern uplands of Vietnam. The project, led by Dr Rochelle Spencer of Murdoch University, determined how the tools contribute to changing gender relations and empowering women, and to what extent. The project will complete training of in-country partners and 10 early-career social science researchers in mixed-method research, including participatory methods and project-level Women's Empowerment in Agriculture Index.<sup>22</sup>

## Soil and Land Management

Strong market demand for concentrated livestock feeds to support livestock industries resulted in a maize boom in Vietnam and Laos and a rapid shift to annual cropping. Fluctuations in maize price, soil erosion and declining soil fertility have pressured governments and communities into looking for alternative land use options. A small research activity led by Professor Michael Bell of the University of Queensland proposes to use an established network of researchers, extension agents and traders as the basis for developing a Theory of Change focused on maize production areas in Vietnam and Laos. It will explore opportunities to link institutional research and private sector development capacity in these regions to stimulate and support the development of economically and environmentally sustainable, climate change resilient agricultural systems.<sup>23</sup>

Increasing numbers of smallholder farmers in Laos and northern Vietnam are growing maize on sloping land to meet demand for livestock feeds by poultry, pig and cattle industries in China and South-East Asia. A project led by Professor Michael Bell of the University of Queensland is helping farmers adopt maize-based farming systems that reduce soil degradation and improve smallholder livelihoods and economic viability. The project concludes in 2022 with the delivery of outreach models to support the adoption of more diversified maize-based farming systems and bioeconomic frameworks to structure the assessment of the sustainability and productivity of different crop and forage options.<sup>24</sup>

Sea-level rise and changes to seasonal rainfall patterns due to climate change result in decreased freshwater availability and higher saline intrusion of the Mekong River Delta during the dry season. To maintain productivity and profitability, farmers require better soil-management techniques and profitable alternative crops to grow in the dry season. A project led by Dr Jason Condon of Charles Sturt University is providing evidence-based options for profitable crop diversification in the rice production areas of the Mekong River Delta. The project aims to increase production and profitability through diversification of saline-affected rice-based cropping systems and create a capacity legacy to enable these systems to adapt to ongoing climate change.<sup>25</sup>



ACIAR Research Program Manager, Soil and Land Management, Dr James Quilty (right), inspects salinity affected soil in the Mekong Delta region of Vietnam with local soil experts Quach Kim Hoa (left) from the Soc Trang Provincial Department for Agriculture and Rural Development, and Dr Chau Minh Khoi (middle) the ACIAR Country Coordinator from Can Tho University. Photo: Patrick Cape

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See page 186 for contact details.

## Current and proposed projects

1. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
2. Food loss in the *Pangasius* catfish value chain of the Mekong River Basin (Food Loss Program) [Cambodia, Laos, Vietnam] (CS/2020/209)
3. Inclusive agriculture value chain financing [Indonesia, Myanmar, Vietnam] (AGB/2016/163)
4. Increasing the sustainability, productivity and economic value of coffee and black pepper farming systems and value chains in the Central Highlands region of Vietnam (AGB/2018/175)
5. Planning and establishing a sustainable (SRP) smallholder rice chain in the Mekong Delta [Vietnam] (AGB/2019/153)
6. Integrating smallholder households and farm production systems into commercial beef supply chains in Vietnam (AGB/2020/189)
7. Piloting digital monitoring of VietGAP compliance and quality in Vietnam vegetable value chains (AGB/2021/153)
8. Supporting greenhouse gas inventories and targeted rice mitigation options for Vietnam (CLIM/2019/150)
9. Preparing for mangrove-based climate and agribusiness transformation in the Mekong Delta [Vietnam] (CLIM/2021/138)
10. FishTech: Integrating technical fisheries solutions into river development programs across South-East Asia [Cambodia, Indonesia, Laos, Vietnam, Thailand] (FIS/2018/153)
11. Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines (FIS/2016/122)
12. Blue economy: Valuing the carbon sequestration potential in oyster aquaculture [Vietnam] (FIS/2020/175)
13. Supporting grouper farming smallholders in Vietnam to improve their SME businesses by engaging with aquafeed companies to produce commercial feeds [Vietnam] (FIS/2021/121)
14. Half-pearl industry development in Tonga and Vietnam (FIS/2016/126)
15. Managing risk in South-East Asian forest biosecurity [Indonesia, Vietnam] (FST/2018/179)
16. Vietnamese native tree species for improved livelihoods [Vietnam] (FST/2020/134)
17. Building an effective forest health and biosecurity network in South-East Asia [Cambodia, Indonesia, Laos, Vietnam] (FST/2020/123)
18. Asian chicken genetic gains: A platform for exploring, testing, delivering, and improving chickens for enhanced livelihood outcomes in South East Asia [Cambodia, Vietnam] (LS/2019/142)
19. Goat production systems and marketing in Laos and Vietnam (LS/2017/034)
20. Intensification of beef cattle production in upland cropping systems in Northwest Vietnam (LPS/2015/037)
21. Global animal health governance: High-level consortium [Vietnam] (LS/2021/157)
22. Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam (SSS/2018/139)
23. Embedding knowledge and exploring future research opportunities in sloping land agricultural systems in northern Laos and northwest Vietnam (SLAM/2021/152)
24. Improving maize-based farming systems on sloping lands in Vietnam and Laos (SMCN/2014/049)
25. Farmer options for crops under saline conditions (FOCUS) in the Mekong River Delta, Vietnam (SLAM/2018/144)

