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.

For the past decade, the region has shown a decline in poverty and income inequality, along with improvements in the Human Development Index for countries in the region. 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.

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 vast and rapid spread of COVID-19 means that the economic outlook in the region remains highly uncertain. Various groups, including the Organisation for Economic Co-operation and Development (OECD) and the World Bank, forecast that growth in South-East Asia will be low (falling from 44.4% to 1%), and that 9.6 million people will become extremely poor due to the pandemic. Several countries in the region (for example, Laos and Cambodia) have high debt levels and low foreign currency reserves, increasing their risk of financial crisis.

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
- Myanmar
- Philippines
- Vietnam

Photo: University of Southern Mindanao

Drivers of regional collaboration

The principal driver of regional collaboration in the East and South-East Asia region is 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 pandemic, geopolitics and transboundary concerns.

Trade and investment are the major drivers of economic growth in the region, aided by overseas development assistance. Assistance to ASEAN countries has increased, with the most notable being China's Belt and Road Initiative.

In the agricultural research sector, ACIAR is supporting regional collaboration through support to 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. In 2020, the COVID-19 pandemic 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 has 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 in regard to 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.

In 2020, ACIAR supported an assessment of food system security, resilience and emerging risks in the Indo-Pacific in the context of COVID-19. This assessment identified a range of possible actions that could be taken by governments and other food systems stakeholders to increase food systems resilience in the face of future shocks. While the assessment included the whole region, there was a particular focus on Indonesia and Philippines as case studies.

ACIAR East and South-East Asia region program

The ACIAR program in East and South-East Asia remains the largest across the 4 regions in which we operate. The nature of our engagement within the region is strongly bilateral, based on robust partnerships with national research systems, longstanding 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 (listed on page 75). 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 (see page 22), the Asian Institute of Technology and the FAO regional office. We also include Thai expertise on projects of regional significance when opportunities arise.

In 2021–22, 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 85 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 in 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.

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 2021–22, 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 & South-East Asia region program 2021–22

Partner country	No. projects
Cambodia	15
China	2
Indonesia	25
Laos	16
Myanmar	12
Philippines	15
Vietnam	26

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.

Research portfolio

16
Agribusiness projects

1
Climate Change project

3
Crops projects

14
Fisheries projects

7
Forestry projects

5
Horticulture projects

14
Livestock Systems projects

9
Social Systems projects

10
Soil and Land Management projects

0
Water projects

Table 5.2 Current and proposed projects in the East and South-East Asia region, 2021–22

Project title	Project code	Country
Agribusiness		
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
Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains	AGB/2010/099	Indonesia
Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam	AGB/2012/061	Vietnam
Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia	AGB/2012/099	Indonesia
Improving livelihoods in Myanmar and Vietnam through vegetable value chains	AGB/2014/035	Myanmar, Vietnam
Inclusive agriculture value chain financing	AGB/2016/163	Indonesia, Vietnam
Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines	AGB/2017/039	Philippines
Strengthening leadership, coordination and economic development of the temperate fruit industry in northern Vietnam	AGB/2018/171	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
Research to support agricultural policy and strategic planning: research to assist the Vietnam Government with the formulation of the 2021–2030 Agricultural Development Strategy for Vietnam	AGB/2019/185	Vietnam
Agriculture for tourism: research to advance a synergistic development pathway for local agribusiness value chains and tourism in Bali, with application to similar high intensity regional tourism hubs throughout Indonesia	AGB/2020/121	Indonesia
Food loss in the catfish value chain of the Mekong River Basin (Food Loss Program)	CS/2020/209	Cambodia, Laos, Vietnam
Climate Change		
Improving greenhouse gas inventory systems to support the mitigation ambitions of Fiji and Vietnam	WAC/2019/150	Fiji, Vietnam
Crops		
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
Sustainable intensification and diversification in the lowland rice system in Northwest Cambodia	CSE/2015/044	Cambodia
Fisheries		
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
Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia	FIS/2016/130	Cambodia, Indonesia
Development of rice fish systems in the Ayeyarwady Delta, Myanmar	FIS/2016/135	Myanmar
Assessing upstream fish migration measures at Xayaburi Dam in Laos	FIS/2017/017	Laos

Project title	Project code	Country
A nutrition-sensitive approach to coastal 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
Translating fish passage research outcomes into policy and legislation across South-East Asia	FIS/2018/153	Cambodia, Indonesia, Laos
Regional coral restoration networks and appropriate technologies for larger-scale coral and fish habitat restoration in the Philippines and Australia	FIS/2019/123	Philippines
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 small-medium enterprise businesses by engaging with aquafeed companies to produce commercial feeds	FIS/2021/121	Vietnam
Forestry		
Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi2)	FST/2016/141	Indonesia
Advancing enhanced wood manufacturing industries in Laos and Australia	FST/2016/151	Laos
Developing and promoting market-based agroforestry and forest rehabilitation options for northwest Vietnam	FST/2016/152	Vietnam
Reducing forest biosecurity threats in South-East Asia	FST/2018/179	Indonesia, Vietnam
Supporting agroforestry through tree improvement and gene conservation in Laos	FST/2020/119	Laos
Building effective forest health and biosecurity networks in South-East Asia	FST/2020/123	Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam
Forest restoration for economic outcomes	FST/2020/137	Laos
Horticulture		
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 Fusarium wilt of banana in South-East Asia	HORT/2018/192	Indonesia, Laos, Philippines
Preparedness and management of huánglóngbìng (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia	HORT/2019/164	Indonesia, China
Livestock Systems		
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
Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar	LS/2014/056	Myanmar
Improving cattle production in the Myanmar Central Dry Zone through improved animal nutrition, health and management	LS/2016/132	Myanmar
Safe Pork: market-based approaches to improving the safety of pork in Vietnam	LS/2016/143	Vietnam

Project title	Project code	Country
Goat production systems and marketing in Laos and Vietnam	LS/2017/034	Laos, Vietnam
Evaluating zoonotic malaria transmission and agricultural and forestry land use in Indonesia	LS/2019/116	Indonesia
Collaboration on One Health economic research for systems	LS/2019/118	Cambodia
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, Myanmar, Vietnam
Global burden of animal disease initiative: Indonesia case study	LS/2020/156	Indonesia
COVID-19: gendered risks, impact and response in the Indo-Pacific: rapid research and policy guidance	LS/2020/203	Myanmar, Papua New Guinea, Philippines
Rapid assessment of the impact of COVID-19 on wet market reforms: case studies from Vietnam, Kenya and the Philippines	LS/2020/204	Kenya, Philippines, Vietnam
Vulnerability in the Anthropocene: a prospective analysis of the need for social protection	LS/2020/206	Myanmar, Vietnam
Livestock climate lens Part 1: data landscape analysis	LS/2020/207	Myanmar, Vanuatu
Social Systems		
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
Building institutions for the sustainable management of artesian groundwater in Myanmar	SSS/2018/135	Myanmar
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
Understanding agrichemical use in South-East Asian agriculture	SSS/2020/143	Laos, Vietnam
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
Assessment of Indonesia's agricultural innovation system	SSS/2021/100	Indonesia
Soil and Land Management		
Improving community fire management and peatland restoration in Indonesia	FST/2016/144	Indonesia
Land management of diverse rubber-based systems in 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
Soil-based challenges for cropping in Shan State (nutrient acquisition)	SLAM/2018/190	Myanmar
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
Reducing uncertainty in greenhouse gas emissions from Indonesian peatfire	SLAM/2020/140	Indonesia
Management practices for profitable crop livestock systems for Cambodia and Laos	SMCN/2012/075	Cambodia, Laos
Land suitability assessment and site-specific soil management for Cambodian uplands	SMCN/2016/237	Cambodia

Notes: More details (including project leader, commissioned organisation and partner organisations) are provided in the appendixes. The project list was compiled in June 2021. Additional projects not listed in this table may be commissioned during 2021–22.

Cambodia

A$3.3 million
Budgeted funding

15
Bilateral and regional research projects

In 2020, the Kingdom of Cambodia largely avoided a health crisis due to swift actions to detect and contain local COVID-19 outbreaks. However, Cambodia still suffered critical shocks triggered by the global pandemic, and the economic impacts were more severe than the health impacts.

During the last 2 decades, Cambodia was the fastest growing country in East Asia, averaging a 7.7% real growth rate. The nation's key growth drivers were construction, tourism and merchandise exports, which accounted for more than 70% of growth and 39% of total paid employment, but these were severely affected by the global pandemic. Prior to COVID-19, poverty in Cambodia was reported to be less than 10%.

About 76% of Cambodia's population lives in rural areas and agriculture remains the main source of employment. Agriculture contributed 21% to national GDP in 2019. More than 60% of poverty alleviation from 2007 to 2011 was attributed to positive developments in the agriculture sector, and in 2020 the World Bank reported that the agriculture sector was the least affected by the global pandemic. During the pandemic, agriculture benefited from increased labour availability due to layoffs in the services and industry sectors and the return of migrant workers from cities and abroad.

Wet season rice cultivation increased to 2.3 million hectares (7.2% increase) in 2020 due to better weather conditions. Dry season rice harvesting also increased by 39%. Rice exports continue to increase, with milled rice now being exported to 41 countries around the world. China is the biggest market (56%), followed by 19 countries in Europe and 3 ASEAN countries (Malaysia, Singapore and the Philippines).

Crop production, especially rice, continues to account for most (60%) agricultural GDP. In addition to traditional exports of rice, cassava and rubber, emergent agricultural export products such as bananas and mangoes are promising. However, there are opportunities for Cambodia to develop and strengthen its agriculture sector through diversification, higher value-added crops, fisheries and livestock. Currently development is limited by relatively slow adoption of modern agricultural technology, including input use and irrigation.

Border closures, travel restrictions and business shutdowns during the pandemic hit the complex web of agricultural supply chains, affecting input suppliers, producers, collectors, processors and consumers in Cambodia. Food supply, demand disruptions and market uncertainties strained critical supply chains and posed threats to food systems in the country. Movement restrictions, lack of in-country transportation and the existing debt with microfinance institutions prevented farmers from accessing agricultural services and inputs for the next planting season.

There were other concerns too. Domestic livestock production covers about 82% of domestic demand for animal products. Although measures have been put in place by the Ministry of Agriculture, Forestry and Fisheries to avoid disruptions to the supply chains due to the COVID-19 pandemic, there were pre-existing influences, for example the African swine fever outbreak, that were already reducing production.

In December 2019, the Ministry of Agriculture, Forestry and Fisheries launched the 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.

2021–22 research program

- **15 ACIAR-supported projects in Cambodia**
- **5 projects are specific to this country**
- **10 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.

Cambodian and Indonesian fisheries research organisations are working together to enhance the skills of Cambodian researchers in fish nutrition, hatchery production and fish health. Ultimately, the project supports livelihoods of about 2 million people in Cambodia, including fish farmers such as Mrs Yit Sophea (pictured). Photo: Majken Soegaard. ACIAR project: FIS/2016/130

Agribusiness

Catfish (*Pangasius* sp) farming and wild caught catfish are important income generating activities for smallholder farmers in the Mekong River Basin and are an extremely important source of dietary protein for those countries' populations. The continued availability of catfish for human consumption is influenced by many factors including the impacts of 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 (see page 8).[1]

Agribusiness | Crops

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. During 2021–22, the project will continue testing and evaluation of virus-free planting material and resistant varieties, and on-farm testing of new agronomic practices and training of farmers and extension officers. The establishment of facilities using innovative methods for rapid multiplication of clean planting material continues, funded in joint ventures with private firms and non-government organisation in multiple countries.[2]

Crops

Sustainable intensification and diversification of rainfed lowland rice production systems in north-western Cambodia has the potential to increase farm income and business resilience. Associate Professor Daniel Tan of the University of Sydney leads a project that has evaluated innovative crop management practices, such as machine planting of direct-seeded rice, using high-quality seed at lower seed rates. Having established growers' confidence to purchase more expensive high-quality seed, the project is now concluding its investigation of scale-up and scale-out models for adoption at village and community level. The project is building the capacity of farming communities, tertiary agricultural education institutions and agricultural input suppliers to support new technologies beyond the life of the project.[3]

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, aims to develop weed management packages to address labour constraints and reduce the reliance on chemical control. New weed control options will enable rice farmers to adopt and benefit from mechanisation and sustainable intensification and conservation agriculture practices. Appropriate weed management will also improve grain quality and enable growers to participate in high-value markets.[4]

ACIAR is supporting a regional project to develop technically viable and economically and socially sustainable ways to improve the resilience of cassava production systems and value chains. Photo: Majken Soegaard. ACIAR project: AGB/2018/172

Fisheries

In Cambodia, about 80% of the animal protein consumed comes from freshwater fisheries, which provide work for about 2 million people. The development of finfish mariculture in Cambodia has been accelerated through a south–south cooperative research partnership with Indonesia in a project led by Dr Mike Rimmer and Professor Nicholas Paul of the University of the Sunshine Coast, and in partnership with Cambodian and Indonesian fisheries research organisations. In 2021, experienced researchers from Indonesia will conduct final training activities to enable Cambodian researchers to gain skills in fish nutrition, hatchery production and fish health.[5]

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 is leading a project to establish a stakeholder network to facilitate sound, cross-sector decision-making on fish passage construction programs across South-East Asia. During 2021–22, researchers will work with donor bodies and government sectors to determine the factors that drive investment decisions, and to support locally generated national guidelines and university curriculum in Cambodia, Laos and Indonesia.[6]

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 among countries, but there is a general lack of preparedness to respond to invasive pests and diseases. A new project will establish an effective and sustainable forest biosecurity network in South-East Asia to improve risk management for invasive forest pests and diseases. Associate Professor Simon Lawson of the University of the Sunshine Coast will lead the project, which will use shared field protocols and data as an entry point and foundation for coordinated biosecurity response. The project will develop science tools to support and sustain the forest biosecurity network and develop coordinated forest biosecurity policies for South-East Asia.[7]

Horticulture

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.[8]

Livestock Systems

Several issues threaten regional, and potentially global, health security in the Mekong region: fast economic growth rates, marked climate and other environmental disruptions, and shifting human and animal geographies. Zoonotic disease outbreaks such as SARS (severe acute respiratory syndrome) and the current outbreak of COVID-19 are thought to be attributed, in part, to these converging issues. Professor Barbara McPake of the Nossal Institute for Global Health leads a project to identify opportunities to improve collaboration between human and animal health sectors and use incentive-based regulation to intervene in veterinary markets in the region, to improve health security and livestock productivity.[9]

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 Tadelle Dessie of the International Livestock Research Institute leads a project that is testing and making available high-producing, farmer-preferred genotypes of chickens to increase smallholder productivity as a pathway out of poverty in Cambodia, Myanmar and Vietnam. The project is also strengthening the capacity of young scientists in the project countries to conduct high-quality research on village poultry systems, for the benefit of smallholder farmers.[10]

Social Systems

A farmer's decision to adopt an agricultural technology or practice involves technical, local, financial, contextual and personal factors. Efforts to encourage adoption must therefore 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 2021 with the analysis of household interviews and village engagement activities. This will inform understanding on why some groups adopt new technologies, and identify barriers specific to poor, marginalised and female-headed households.[11]

The previous project found that extension does not overcome powerful social relations, especially credit and debit. Dr Brian Cook of the University of Melbourne also leads a new project that will 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.[12]

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. The project aims to identify best practices and suggest improvements to methodologies, potentially highlighting the need for new models.[13]

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 is a priority 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 to be added to the Cambodian Agronomic Soils Classification system and the FAO World Reference Base for Soil Resources.[14]

Cambodian cattle farmer Sar Samoul on her way to the field where her herd grazes. She has planted forages as a part of a project investigating how farmers can grow more profitable crops with less water. Photo: Majken Soegaard. ACIAR project SMCN/2012/075

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 are generally reliant on rainfed, low-input rice production and limited livestock keeping. Practices to increase the overall productivity by introducing managed forage production in these farming systems have been investigated in a project led by Dr Matthew Denton of the University of Adelaide. The project will report on soil and water management practices to improve sustainability, productivity and profitability, and on social and economic impacts of adoption of forages. Farmers will be provided with practical information and technologies from the research, and local scientists and extension officers will be trained to conduct ongoing research and promote outcomes.[15]

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Rice farming on the lowlands of Cambodia is difficult due to periods of drought. ACIAR supports research where farmers are experimenting with other crops to make the system more sustainable. Photo: Majken Soegaard. ACIAR project SMCN/2012/075

Current and proposed projects

1. Food loss in the catfish value chain of the Mekong River Basin (Food Loss Research Program) [Cambodia, Lao PDR, Vietnam] (CS/2020/209)
2. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
3. Sustainable intensification and diversification in the lowland rice system in Northwest Cambodia (CSE/2015/044)
4. Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos (CROP/2019/145)
5. Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia (FIS/2016/130)
6. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos] (FIS/2018/153)
7. Building effective forest health and biosecurity networks in South-East Asia [Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam] (FST/2020/123)
8. Improving mango crop management in Cambodia, the Philippines and Australia to meet market expectations (HORT/2016/190)
9. Collaboration on One Health economic research for systems [Cambodia] (LS/2019/118)
10. Asian chicken genetic gains: a platform for exploring, testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia [Cambodia, Myanmar, 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. Land suitability assessment and site-specific soil management for Cambodian uplands (SMCN/2016/237)
15. Management practices for profitable crop livestock systems for Cambodia and Laos (SMCN/2012/075)

China

A$0.1 million
Budgeted funding

2
Bilateral and regional research projects

China's rapid economic growth and investment in research capability along with the changing dynamics of its relationship with Australia have created an opportunity for a radically refreshed research relationship with ACIAR for mutual benefit.

China's third white paper on foreign aid, released in January 2021, introduced a new focus on trilateral aid cooperation. Given that our program of bilateral research collaboration with China came to an end in 2020, the white paper creates an opportunity to explore new modes of collaboration off the platform of strong and longstanding research partnerships.

Country priorities

ACIAR research collaboration with China commenced in 1984 and for more than 10 years it was the largest ACIAR country program, reflecting the huge challenges that existed in addressing rural poverty that affects hundreds of millions of people. Outcomes of research in forestry, cropping systems and livestock have had lasting impacts on researchers, farmers and systems. The dramatic transformation of the Chinese economy resulted in a reorientation of the ACIAR program in the mid-2000s to focus on geographies and themes where collaboration with Australian researchers would have the greatest impacts.

ACIAR-supported projects in Tibet and Inner Mongolia Autonomous Regions ended in 2020. For the first time since 1984, we have no bilateral activities in China. This provided an opportunity for us to reassess our relationship with China. The Commission of the International Agricultural Research strongly endorsed the position for ACIAR to refresh its relationship with China, building on the foundation of decades of trusted research relationships. During 2020–21, we will therefore engage with senior leaders in the Chinese research system to discuss what form that collaboration might take, noting that whether it be bilateral, trilateral or both, it will need to be based on principles of substantial co-investment (either in the form of parallel investments and/or trilateral collaboration) and mutual benefits for both countries.

Our key partners in China currently include the Chinese Academy of Agricultural Sciences, the Chinese Academy of Tropical Agricultural Sciences, Inner Mongolia Agricultural University, China Agricultural University, the Chinese Academy of Agricultural Sciences, Lanzhou University and Gansu Agricultural University.

2021–22 research program

- **2 ACIAR-supported projects in China**
- **Both 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 China. The projects are grouped according to research program.

Agribusiness

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. With a focus on grain-based agriculture, during 2021–22 the project will select study regions and collect data to understand the components of success and the different impacts of rural transformation on women and men.

Project: Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan (ADP/2017/024)

Horticulture

Huanglongbing, 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 is considered the largest challenge ever faced by citrus industries worldwide. A new project led by Dr Jianhua Mo of the NSW Department of Primary Industries will leverage international expertise to tackle the deficiencies in current huanglongbing management practices. A trilateral project with partners from Australia, Indonesia and China will be conducted to enhance the sustainable management of huanglongbing 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.

Project: Preparedness and management of huanglongbing (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia (HORT/2019/164)

Country Manager, China
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A trilateral project aims to enhance the sustainable management of huanglongbing 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. ACIAR project: HORT/2019/164

Indonesia

A$6.5 million
Budgeted funding

20
Bilateral and regional research projects

5
Small projects and activities

Indonesia is a major emerging market economy, predicted to be the fourth largest globally by 2050. The agriculture, fisheries and forestry sectors are key drivers of economic growth and also the foundation of poverty reduction. Indonesia is one of the most important and long-term partners of ACIAR.

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.

During 2020, disruption caused by the COVID-19 pandemic prompted the government to divert capital from infrastructure developments to help manage the crisis response. Indonesia's economy remained relatively strong and maintained a steady growth rate based on robust domestic consumption and ongoing efforts of policy reforms as well as simplification of investment procedures.

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 goals of the 2030 Agenda for Sustainable Development, especially SDG 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 are 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 if 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.

During 2020, we examined food systems in the Indo-Pacific region to identify vulnerabilities that were exposed or amplified by the COVID-19 shock. This information, published in our report *COVID-19 and food systems in the Indo-Pacific: An assessment of vulnerabilities, impacts and opportunities for action (ACIAR Technical Report 96)*, will be used to inform future research and development to support food systems resilience in the Indo-Pacific region. Food systems assessments were undertaken at 5 locations, including 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.

Given the major reorganisation of Indonesia's research structure, it is timely that we are working with the National Development Planning Ministry (Bappenas) and Ministry of Agriculture in a rapid assessment of agricultural research systems in Indonesia. 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.

2021–22 research program

- **25 ACIAR-supported projects in Indonesia**
- **14 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 has studied socioeconomic and environmental impacts of existing national and local policies. In 2022, the project will produce policy advice and recommendations for national and district-level decision-makers, develop and support decision-support tools to enhance long-term agricultural productivity, facilitate improved connections between farmers and markets, improve through-chain processes, reduce negative environmental impacts and improve household incomes and livelihoods.[1]

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. With a focus on grain-based agriculture, during 2021–22 the project will select study regions and collect data to understand the components of success and the different impacts of rural transformation on women and men.[2]

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 2021–22, the project will review, research and trial innovative financing models for agricultural value chains and evaluate specific chain finance interventions in Indonesia and Vietnam.[3]

Coffee and cocoa are Indonesia's third and fourth most important sources of agricultural export earnings. Smallholder farmers are the main producers of these crops, with around 2 million households involved. While many value-chain approaches to development have been applied to the industry, there has been little research on the effectiveness of these approaches for improving rural livelihoods, achieving broader development goals and encouraging sustainability. A project led by Dr Jeff Neilson of the University of Sydney will report on the impacts of certification schemes, buyer linkages, geographical indicators and downstream processing on smallholder livelihoods and environmental sustainability.[4]

The IndoDairy project aims to improve the research capacity of lead agencies and identify extension models to enhance the adoption of profitable management practices and technologies to increase on-farm profitability. In 2019, dairy researchers from Indonesia visited a dairy farm in Queensland. Photo: Patrick Cape. ACIAR project AGB/2012/099

Domestic demand for milk in Indonesia significantly outstrips supply and growth of the domestic dairy sector. Historically, most milk production occurred on Java, so the Government of Indonesia has identified 12 additional provinces for dairy development. A project led by Professor Wendy Umberger of the University of Adelaide conducted a comprehensive analysis, research and interventions in collaboration with cooperatives and a dairy processor in the smallholder dairy sector in west Java and north Sumatra. In its final year, the project will encourage ongoing sector development, policy dialogue and industry advocacy. The objectives are to improve the research capacity of lead agencies and identify profitable management practices and extension models to enhance the adoption of technologies and increase on-farm profitability. There will also be a comprehensive evaluation of project achievements and outcomes for smallholder farming families and consumers.[5]

The rapid growth of tourism in Bali and the consequent demand for large quantities of safe, high-quality food are not matched by the capacity and capability of local agricultural production and agribusiness. This threatens the social and natural values of the island. Additionally, the impact of COVID-19 on agriculture, tourism and the local economy demonstrates the urgent need for a measured and collaborative agribusiness growth plan. Mr Jeremy Badgery-Parker of Primary Principles will conduct a small research activity to prepare a strategic pathway to guide engagement and investment in collaborative agribusiness value chains. This will support livelihoods, and reliably and sustainably deliver safe, high-quality produce to nearby markets in the tourism sector in Bali.[6]

Crops

Mungbean is an ideal rotation crop for smallholder farmers. 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 network continues variety development for another 5 years, and extends the network to Kenya and Indonesia, providing access to new genetic material characterised for important traits, and improving cropping options for smallholder farmers in eastern Africa and South-East Asia.[7]

Fisheries

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.[8]

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 Professor Kate Barclay of the University of Technology Sydney will develop and test methods for assessing harvest strategies for sustainable tuna fisheries in Indonesia, in terms of their impacts on the welfare of dependent communities. This information will be integrated into the tuna harvest strategy being developed by the Government of Indonesia.[9]

In Cambodia, about 80% of the animal protein consumed comes from freshwater fisheries, which provide work for about 2 million people. The development of finfish mariculture in Cambodia has been accelerated through a south–south cooperative research partnership with Indonesia in a project led by Dr Mike Rimmer and Professor Nicholas Paul of the University of the Sunshine Coast, and in partnership with Cambodian and Indonesian fisheries research organisations. In 2021, experienced researchers from Indonesia will conduct final training activities to enable Cambodian researchers to gain skills in fish nutrition, hatchery production and fish health.[10]

Globally, growing momentum for nutrition-sensitive agricultural policy and development assistance is yet to have any impact in 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 and identify the factors enabling or limiting the consumption of fish. It will highlight the potential of fish to reduce malnutrition, particularly during early childhood. Through a south–south collaboration, lessons learned for sustainable inshore management in Indonesia will guide policy development in Timor-Leste that benefits poor households.[11]

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 is leading a project to establish a stakeholder network to facilitate sound, cross-sector decision-making on fish passage construction programs across South-East Asia. During 2021–22, researchers will work with donor bodies and government sectors to determine the factors that drive investment decisions, and to support locally generated national guidelines and university curriculum in Cambodia, Laos and Indonesia.[12]

Forestry

Smallholder farmers in eastern Indonesia have long based their livelihoods on the production of timber and non-timber forest products. However, constraints ranging from silvicultural practices to lack of market access has limited productivity and profitability. Mr Aulia Perdana of the World Agroforestry Centre leads a project that aims to improve the production and marketing of timber and non-timber forest products and foster better extension and policy approaches. During 2021, the project will report on results and learnings to increase scientific understanding of smallholder agroforestry and identify policies and regulations that act as disincentives to smallholders. The project will also identify appropriate business models to develop and commercialise bamboo products.[13]

A new project in 2021–22, with activities in Indonesia and Vietnam, will underpin good plant biosecurity practices in forestry. With government and industry partners, the project led by Dr Caroline Mohammed of the University of Tasmania will extend screening approaches developed for the fungus *Ceratocystis* in acacia to eucalypts, which have replaced acacias in plantations in the wet tropics. It will develop remote-sensing software applications for cheap and rapid forest health surveillance and, through geospatial modelling, deliver establishment (suitability and survival) risk maps under current and future climates at a regional level for the highest-priority pests and pathogens.[14]

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 among countries, but there is a general lack of preparedness to respond to invasive pests and diseases. A new project will establish an effective and sustainable forest biosecurity network in South-East Asia to improve risk management for invasive forest pests and diseases. Associate Professor Simon Lawson of the University of the Sunshine Coast will lead the project, which will use shared field protocols and data as an entry point and foundation for coordinated biosecurity response. The project will develop science tools to support and sustain the forest biosecurity network and develop coordinated forest biosecurity policies for South-East Asia.[15]

Scientists from Institute of Forest Tree Improvement and Biotechnology viewing samples of wood with the fungus, *Ceratocystis*. ACIAR continues its support of development of technologies to underpin good plant biosecurity practices in forestry. Photo: Adi Rahmatullah. ACIAR project FST/2018/179

Horticulture

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 2021–22, 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.[16]

Fusarium wilt tropical race 4 (TR4), or Panama disease, has become widespread throughout South-East Asia. The disease is threatening smallholder banana production in countries including 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 2021–22, field surveys of production systems and natural environments will be conducted, and there will be ongoing development and training in statistics and experimental procedures for glasshouse and field experiments.[17]

Huanglongbing, 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 is considered the largest challenge ever faced by citrus industries worldwide. A new project led by Dr Jianhua Mo of the NSW Department of Primary Industries will leverage international expertise to tackle the deficiencies in current huanglongbing management practices. A trilateral project with partners from Australia, Indonesia and China will be conducted to enhance the sustainable management of huanglongbing 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.[18]

Livestock Systems

Agricultural expansion and deforestation have resulted in land-use change that is linked to the altered dynamics and distribution of malaria and other vector-borne diseases globally. While substantial gains have been made towards eliminating 2 major parasites that cause malaria in humans in South-East Asia, there are increasing cases of malaria in humans due to zoonotic *Plasmodium knowlesi* from macaques, which is transmitted by certain mosquito species. Associate Professor Matthew Grigg of the Menzies School of Health Research leads a project to strengthen the surveillance of zoonotic malaria in Indonesia, and evaluate the disease burden, agricultural practices and mosquito vectors associated with transmission. The findings will inform public health control efforts and sustainable agricultural development.[19]

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 societal outcomes from 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.[20]

Social Systems

ACIAR has a longstanding partnership with the Indonesian Agency for Agricultural Research and Development (IAARD). The relationship has been almost exclusively through research projects, capacity building and communications/publications. At the request of the Ministry for National Development Planning (Bappenas), ACIAR is supporting a small research activity implemented by ABT Associates Pty Ltd and PT Mitra Asia Lestari to identify opportunities for strengthening Indonesia's agricultural innovation system. The project comprises a rapid assessment and then identification of recommendations for Indonesia to start a pilot program in 2022, aiming to better enable transformation of the agriculture sector in support of more profitable small-scale enterprises and food security for Indonesia's growing population.[21]

Soil and Land Management

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 new 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 of Indonesia.[22]

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 program of research led by Dr Daniel Mendham of CSIRO supports Indonesia's commitment to restore large areas of degraded peat and achieve sustainable livelihoods for communities living on peatland. The project concludes in 2022 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.[23]

Changing climates are resulting in severe drought conditions in Indonesia, particularly during El Niño events. Under these conditions, there has been an unprecedented increase in peat fires. The thick smoke and air pollution from the fires has affected much of South-East Asia. Dr Liubov Volkova of the University of Melbourne is working with stakeholders and the Government of Indonesia to improve the knowledge base of parameters for calculating greenhouse gas emissions from peat fires in increasingly degraded peatland areas. This work will enable the government to include peat fire emissions in their international reporting to the UN Framework Convention on Climate Change and claim emission reduction benefits over time.[24]

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 to peat moisture levels and carbon and methane flux from the ecosystem. This 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 already commenced, is a major focus of this project.[25]

A farmer checks her chilli plants in the coastal farming area of Yogyakarta. Shallot and chilli cropping systems provide a high-value enterprise for farmers in coastal agroecosystems. ACIAR supports research to ensure safe and sustainable production of these crops. Photo: Adi Rahmatullah. ACIAR project SLAM/2018/145

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Horticulture: Ms Irene Kernot
Livestock Systems: Dr Anna Okello
Social Systems: Dr Clemens Grünbühel
Soil and Land Management: Dr James Quilty

See page 197 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. Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan (ADP/2017/024)
3. Inclusive agriculture value chain financing [Indonesia, Vietnam] (AGB/2016/163)
4. Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains (AGB/2010/099)
5. Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia (AGB/2012/099)
6. Agriculture for tourism: research to advance a synergistic development pathway for local agribusiness value chains and tourism in Bali, with application to similar high intensity regional tourism hubs throughout Indonesia (AGB/2020/121)
7. International Mungbean Improvement Network 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
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. Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia (FIS/2016/130)
11. A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia (FIS/2017/032)
12. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos] (FIS/2018/153)
13. Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi2) (FST/2016/141)
14. Reducing forest biosecurity threats in South-East Asia [Indonesia, Vietnam] (FST/2018/179)
15. Building effective forest health and biosecurity networks in South-East Asia [Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam] (FST/2020/123)
16. Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region [Indonesia, Philippines] (HORT/2015/042)
17. An integrated management response to the spread of Fusarium wilt of banana in South-East Asia [Indonesia, Laos, Philippines] (HORT/2018/192)
18. Preparedness and management of huánglóngbìng (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia (HORT/2019/164)
19. Evaluating zoonotic malaria transmission and agricultural and forestry land use in Indonesia (LS/2019/116)
20. Global burden of animal disease initiative: Indonesia case study (LS/2020/156)
21. Assessment of Indonesia's agricultural innovation system (SSS/2021/100)
22. Crop health and nutrient management of shallot-chilli-rice cropping systems in coastal Indonesia (SLAM/2018/145)
23. Improving community fire management and peatland restoration in Indonesia (FST/2016/144)
24. Reducing uncertainty in greenhouse gas emissions from Indonesian peatfire (SLAM/2020/140)
25. 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)

Laos

A$3.8 million
Budgeted funding

13
Bilateral and regional research projects

3
Small projects and activities

Laos has made substantial progress in reducing poverty from 25% in 2012–13 to 18% in 2018–19. However, poverty in rural areas is more than 3 times higher than in urban areas, and reduction of rural poverty remains a high priority of the Lao Government.

In 2020, the Lao Government imposed COVID-19 containment measures that helped avert a health crisis. However, the restrictions resulted in disruptions to the labour market and supply chains that deliver inputs to export-oriented manufacturing industries and the construction sector. Since the outbreak, more than 200,000 Lao migrant workers have returned from abroad, resulting in a loss of remittance income for many households. The World Bank has warned that the economic shock due to COVID-19 could push as many as 214,000 people into poverty.

To date, the livelihoods of farming households have only been moderately affected by the pandemic. Family farming is the main source of income for approximately 75% of households and 92% of these households were able to operate their family farms unaffected by the pandemic. The agriculture sector acted as a buffer during this time and absorbed workers that had been laid off in other sectors. About 10% of workers laid off in manufacturing and wholesale and retail trade were re-employed in agriculture.

Disruptions in transportation and weak demand for agricultural products were the common challenges for commercial farmers in 2020. Declining agricultural exports and business closures in other economic sectors, such as hotels and restaurants, led to a reduction in market outlets for many commercial farmers. Disruptions in transportation increased the cost of production inputs and caused delays in transporting farm products.

In 2019, the Ministry of Agriculture and Forestry outlined plans to ensure the country is on track to meet the goals of its agriculture development strategy. The 5-year development plan aims to support greater than 3% growth in the agriculture and forestry sector. These sectors are expected to contribute 19% to the national economy. The newly amended Forestry Law continues to drive national priorities, given government commitment to protect forest cover while making the forestry sector able to support livelihoods of its people. Also guiding the strategic priorities of the Ministry of Agriculture and Forestry is the Lao Government's National Nutrition Strategy (2015–2025), which aims to reduce chronic malnutrition (stunting) in children under 5 from the current rate of 33% to 25% by 2025.

ACIAR-supported research shows that integrating fishways to allow passage of migratory fish up and down regulated rivers has lasting economic and social benefits for river communities. Research is now focused on facilitating sound, cross-sector decision-making on fish passage construction programs. Photo: Candice Bartlett. ACIAR project FIS/2018/153

Country priorities

In 2021–22, if the COVID-19 pandemic status is favourable, ACIAR will recalibrate our long-term strategic program priorities based on consultation with Lao stakeholders. In the meantime, 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.

2021–22 research program

- **16 ACIAR-supported projects in Laos**
- **6 projects are specific to this country**
- **10 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

Catfish (*Pangasius* sp) farming and wild caught catfish are important income generating activities for smallholder farmers in the Mekong River Basin and are an extremely important source of dietary protein for those countries' populations. The continued availability of catfish for human consumption is influenced by many factors including the impacts of 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 (see page 8). [1]

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. During 2021–22, the project will continue testing and evaluation of virus-free planting material and resistant varieties, and on-farm testing of new agronomic practices and training of farmers and extension officers. The establishment of facilities using innovative methods for rapid multiplication of clean planting material continues, funded in joint ventures with private firms and non-government organisation in multiple countries.[2]

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, aims to develop weed management packages to address labour constraints and reduce the reliance on chemical control. New weed control options will enable rice farmers to adopt and benefit from mechanisation and sustainable intensification and conservation agriculture practices. Appropriate weed management will also improve grain quality and enable growers to participate in high-value markets.[3]

Fisheries

The Xayaburi Power Company, which is responsible for the design and construction of 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.[4]

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 is leading a project to establish a stakeholder network to facilitate sound, cross-sector decision-making on fish passage construction programs across South-East Asia. During 2021–22, researchers will work with donor bodies and government sectors to determine the factors that drive investment decisions, and to support locally generated national guidelines and university curriculum in Cambodia, Laos and Indonesia.[5]

Dr Monthathip Chanphengsay, Director General of National Agriculture and Forestry Research Institute (far left) and Dulce Carandang Simmanivong, ACIAR Regional Manager, East and South-East Asia (next left), plant the casssava mosaic disease resistant plantlets in Laos.
Photo: Khounkham Douangphachone. ACIAR project AGB/2018/172

Students working in a wood-processing workshop at the Faculty of Forestry at the National University of Laos. New processing capability and development of engineered wood products from an ACIAR-supported project have enhanced the capacity of wood manufacturing industries and grown markets for plantation timber in Laos, as well as created a use for underused plantation resources in Australia. Photo: Majken Soegaard. ACIAR project FST/2016/151

Forestry

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 is benefiting 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 2021–22, 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.[6]

The Lao Government has set ambitious targets to restore forest cover in the country. Agroforestry will befundamental to this process by allowing joint cultivation of trees and agricultural crops across the landscape and reducing logging pressure on residual natural forests while not adversely affecting food security. A small research activity led by Associate Professor Mark Dieters of the University of Queensland will build on the achievements of previous ACIAR projects. The project will provide genetically improved planting materials of teak through clonal propagation and development of improved seed sources. Provenance stands will be established for Mai Tae Kha and Mai Du.[7]

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 among countries, but there is a general lack of preparedness to respond to invasive pests and diseases. A new project will establish an effective and sustainable forest biosecurity network in South-East Asia to improve risk management for invasive forest pests and diseases. Associate Professor Simon Lawson of the University of the Sunshine Coast will lead the project, which will use shared field protocols and data as an entry point and foundation for coordinated biosecurity response. The project will develop science tools to support and sustain the forest biosecurity network and develop coordinated forest biosecurity policies for South-East Asia.[8]

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 also 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.[9]

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 countries including 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 2021–22, field surveys of production systems and natural environments will be conducted, and there will be ongoing development and training in statistics and experimental procedures for glasshouse and field experiments.[10]

Livestock Systems

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 2021–22, research and activities will focus on informing and developing protocols to manage food-borne parasitic disease at the farm level.[11]

Goat production in Lao 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 Dr 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.[12]

Social Systems

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 examine ACIAR-commissioned research projects through an analysis of 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.[13]

Agrichemicals are an important tool for increasing agricultural yields and a necessary contributor to food and nutrition security. However, off-label use can have significant impacts on human and environmental health. A small research activity, led by Dr Liana Williams and Dr Lucy Carter of CSIRO, is using a human-centred approach to understand the interplay between agrichemical use and the institutional and regulatory frameworks that are intended to safeguard against off-label use, as well as networks for access to chemicals, information and training. Agrichemical use will be analysed through case studies in selected crops in Laos and Vietnam. Understanding gained from the study will serve as a foundation for future ACIAR research.[14]

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. The project aims to identify best practices and suggest improvements to methodologies, potentially highlighting the need for new models.[15]

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 are generally reliant on rainfed, low-input rice production and limited livestock keeping. Practices to increase the overall productivity by introducing managed forage production in these farming systems have been investigated in a project led by Dr Matthew Denton of the University of Adelaide. The project will report on soil and water management practices to improve sustainability, productivity and profitability, and on social and economic impacts of adoption of forages. Farmers will be provided with practical information and technologies from the research, and local scientists and extension officers will be trained to conduct ongoing research and promote outcomes.[16]

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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

See page 197 for contact details.

Current and proposed projects

1. Food loss in the catfish value chain of the Mekong River Basin (Food Loss Research Program) [Cambodia, Lao PDR, Vietnam] (CS/2020/209)
2. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
3. Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos (CROP/2019/145)
4. Assessing upstream fish migration measures at Xayaburi Dam in Laos (FIS/2017/017)
5. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos] (FIS/2018/153)
6. Advancing enhanced wood manufacturing industries in Laos and Australia (FST/2016/151)
7. Supporting agroforestry through tree improvement and gene conservation in Laos (FST/2020/119)
8. Building effective forest health and biosecurity networks in South-East Asia [Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam] (FST/2020/123)
9. Forest restoration for economic outcomes [Laos] (FST/2020/137)
10. An integrated management response to the spread of Fusarium wilt of banana in South-East Asia [Indonesia, Laos, Philippines] (HORT/2018/192)
11. Investigating and developing interventions to mitigate food borne parasitic disease in production animals in Laos (LS/2014/055)
12. Goat production systems and marketing in Laos and Vietnam (LS/2017/034)
13. Policy impact in Laos: from research to practice (SSS/2020/142)
14. Understanding agrichemical use in South-East Asia agriculture [Laos, Vietnam] (SSS/2020/143)
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. Management practices for profitable crop livestock systems for Cambodia and Laos (SMCN/2012/075)

ACIAR is supporting research to increase the overall productivity of crop and livestock systems in Laos and Cambodia by introducing managed forage production to these farming systems. ACIAR project SMCN/2012/075

Myanmar

A$1.7 million
Budgeted funding

8
Bilateral and regional research projects

4
Small projects and activities

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.

Prior to the COVID-19 pandemic of 2020, Myanmar was steadily catching up economically with its ASEAN neighbours, with the economy growing at around 6% per annum in recent years. Despite that impressive growth, more than one-third of Myanmar's population is in poverty, and 6% are in extreme poverty. In 2018, Myanmar was strongly reliant on intra-ASEAN trade of agricultural products, and was both the largest exporter and importer within ASEAN countries in the region. The agriculture sector contributed about 30% of Myanmar's GDP. While ASEAN neighbours were among its top investors in recent years, China had the largest economic footprint in the country.

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 that was 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 implementation through non-government partners.

2021–22 research program

- **12 ACIAR-supported projects in Myanmar**
- **5 projects are specific to this country**
- **7 projects are part of regional projects**

ACIAR is not supporting any new research collaborations in 2021–22. Although the following sections describe individual ACIAR-supported projects in Myanmar, all these projects have largely or fully ceased functioning. ACIAR is working with each of the current projects, in consultation with international partners, to identify those that can continue to operate in line with Australia's policy of engagement with Myanmar.

Agribusiness

Smallholders who produce high-value vegetables in the Moc Chau district of Northwest Vietnam have a new supply channel to modern retail markets in Hanoi as a result of a previous ACIAR-supported project. A subsequent project, led by Dr Gordon Rogers of Applied Horticultural Research, has addressed research and development gaps in Vietnam to ensure the new vegetable chains are reliable, inclusive, sustainable and scalable. The research experience and knowledge developed through these projects in Vietnam was applied to rapidly identify, develop and evaluate a pilot high-quality vegetable chain in Myanmar. The project concludes in 2021–22, with the consolidation of effective frameworks and approaches to establish and develop resilient smallholder vegetable chains in northern Vietnam and Myanmar.[1]

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. During 2021–22, the project will continue testing and evaluation of virus-free planting material and resistant varieties, and on-farm testing of new agronomic practices and training of farmers and extension officers. The establishment of facilities using innovative methods for rapid multiplication of clean planting material continues, funded in joint ventures with private firms and non-government organisation in multiple countries.[2]

Crops

Mungbean is an ideal rotation crop for smallholder farmers. 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 network continues variety development for another 5 years, and extends the network to Kenya and Indonesia, providing access to new genetic material characterised for important traits, and improving cropping options for smallholder farmers in eastern Africa and South-East Asia.[3]

The International Mungbean Improvement Network provides access to genetic material and supports variety development to improve cropping options for smallholder farmers in eastern Africa, South Asia and South-East Asia. Australian farmers also benefit from the network. ACIAR project CROP/2019/144

Fisheries

Rice and fish are key components of diets in Myanmar, as well as being major agriculture sectors. Rice–fish systems encompass a spectrum of farming and fishing practices from traditional capture of fish in rice-dominated landscapes to controlled farming of fish in ponds within rice fields. With recent policy shifts in Myanmar, farmers are encouraged to diversify farming systems in agriculture, livestock and fisheries, presenting an opportunity for more productive rice–fish systems. A project led by Dr Michael Akester of the WorldFish Center is findings ways to improve rice–fish systems in the Ayeyarwady Delta to enhance production and management, and support policymakers develop enabling policy for land use. The last phase of the project will analyse data, consolidate learnings and include a closing workshop with partners.[4]

Livestock Systems

Small ruminants, such as goats and sheep, are an important income source and asset for rural and peri-urban smallholders in many parts of the world, including Myanmar. Cattle are often kept for draught power, but small ruminants are a source of income and food for many households. A project led by Dr Angus Campbell of the University of Melbourne is helping farmers in Myanmar improve goat production, transforming their herd from an opportunistic, low-input/low-output activity to a profitable market-focused enterprise, through more efficient management of animal production and health.[5]

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. ACIAR project LS/2019/142

About half of Myanmar's 15 million cattle are in the Central Dry Zone. Their primary use is to provide draught power, transportation and manure for fertiliser. Myanmar is undergoing significant transformation, and mechanisation is expected to quickly reduce the need for draught animals over the next decade. This provides a unique opportunity for smallholder farmers to move from keeping draught animals to producing beef cattle. Dr Dianne Mayberry of CSIRO Agriculture and Food leads a project to support smallholder farmers to identify the opportunities and constraints for developing a beef enterprise, developing management systems to meet production goals and quantifying potential impacts of improved forage and animal management packages on livelihoods.[6]

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 Tadelle Dessie of the International Livestock Research Institute leads a project that is testing and making available high-producing, farmer-preferred genotypes of chickens to increase smallholder productivity as a pathway out of poverty in Cambodia, Myanmar and Vietnam. The project is also strengthening the capacity of young scientists in the project countries to conduct high-quality research on village poultry systems, for the benefit of smallholder farmers.[7]

It is widely reported that the impact of COVID-19 on food systems across the Indo-Pacific is exacerbating gendered inequalities in the region, such as unequal access to productive resources, markets and institutions for women. Professor Sara Davies of Griffith University leads a small research activity to develop an evidence-based approach to identify and understand the specific gendered impacts of COVID-19 responses on food security and socioeconomic outcomes in Myanmar, the Philippines and Papua New Guinea. These insights will be used to outline opportunities and design approaches that will begin to mitigate the harm caused by the COVID-19 disruption at the individual, household and community level. This project contributes to stage 3 of the ACIAR assessment of COVID-19 impacts on food systems in our region.[8]

The COVID-19 pandemic exposed multiple failures in economy and society, and it is clear that the costs of the global shock have not been equally distributed. Also contributing to the ACIAR COVID-19 impacts assessment is a small research activity led by Dr Paulo Santos of Monash University aims to understand what drives vulnerability to poverty among agricultural households in Myanmar and Vietnam, and what research needs to originate from such analysis. The research analyses existing expenditure and consumption data to quantify the relative importance of different shocks on poverty.[9]

The Australian and New Zealand governments share a common interest in investing and assisting partner countries to improve livestock production and productivity, including the potential to reduce greenhouse emissions from livestock production systems. A small research activity led by Dr Paul Cheng of the University of Melbourne is assessing what data exists for calculation of greenhouse gas emissions for selected smallholder livestock projects supported by ACIAR and the New Zealand Ministry of Foreign Affairs and Trade. The study will focus on livestock systems in Vanuatu and Myanmar. It will provide an understanding of the opportunities and challenges for incorporating livestock monitoring, reporting and verification data collection and/or analysis in development projects in the longer term. The study will also provide an understanding of the attitudes and interest of project partners to participate in such activities into the future.[10]

Social Systems

About 300,000 people derive their livelihoods within artesian groundwater zones of the Central Dry Zone of Myanmar. However, both the pressure and flow rate of this naturally pressurised water source are declining due to overexploitation. The Irrigation and Water Utilization Management Department has highlighted the urgent need to rehabilitate both private and public free-flowing artesian tube wells. A project led by Dr Sonali Senaratna-Sellamuttu and Mr Sanjiv de Silva of the International Water Management Institute will develop and test socially inclusive and technically appropriate institutional arrangements, and support targeted communication strategies to restore artesian pressure in the Central Dry Zone.[11]

Soil and Land Management

Agriculture in Shan State, Myanmar, has enormous potential to help lift people out of poverty, but productivity and efficiency are constrained by many factors. Soil-based challenges include poor nutrient acquisition by plants, infertile soil due to ineffective nutrient management and removal of nutrients in residues, and continual erosion of topsoil. Dr Terry Rose of Southern Cross University leads a small research activity that will explore opportunities to arrest soil degradation with a particularly focus on reducing erosion on sloping lands. The project will assess previous research and development efforts aimed at addressing soil degradation in Shan State, and gain an understanding of potential barriers to adoption of legume-based pastures, livestock in farming systems and uptake of new agronomic methods and technologies.[12]

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Soil and Land Management: Dr James Quilty

See page 197 for contact details.

Current and proposed projects

1. Improving livelihoods in Myanmar and Vietnam through vegetable value chains (AGB/2014/035)
2. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
3. International Mungbean Improvement Network 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
4. Development of rice fish systems in the Ayeyarwady Delta, Myanmar (FIS/2016/135)
5. Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar (LS/2014/056)
6. Improving cattle production in the Myanmar Central Dry Zone through improved animal nutrition, health and management (LS/2016/132)
7. Asian chicken genetic gains: a platform for exploring, testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia [Cambodia, Myanmar, Vietnam] (LS/2019/142)
8. COVID-19: gendered risks, impact and response in the Indo-Pacific: rapid research and policy guidance (COVID-19 impacts program) [Myanmar, Papua New Guinea, Philippines] (LS/2020/203)
9. Vulnerability in the Anthropocene: a prospective analysis of the need for social protection (COVID-19 impacts program) [Myanmar, Vietnam] (LS/2020/206)
10. Livestock climate lens Part 1: data landscape analysis [Myanmar, Vanuatu] (LS/2020/207)
11. Building institutions for the sustainable management of artesian groundwater in Myanmar (SSS/2018/135)
12. Soil-based challenges for cropping in Shan State (nutrient acquisition) [Myanmar] (SLAM/2018/190)

Philippines

A$4.4 million
Budgeted funding

11
Bilateral and regional research projects

4
Small projects and activities

The Philippines experienced strong economic growth over the last decade to 2019, buoyed by robust domestic consumption, low inflation, improving labour market conditions, and steady remittances from overseas Filipino workers. Associated with this has been a major increase in funding support to research in the agriculture and fisheries sectors.

In 2020, the country's economic growth significantly slowed down because of natural disasters such as volcanic eruptions and strong typhoons, and the COVID-19 pandemic, which virtually ceased economic activities due to one of the world's longest and strictest enforced periods of community quarantine.

The Philippines continues to be heavily impacted more than a year since the pandemic started. Many businesses have shut down, unemployment has increased, particularly among workers in the informal sector, and domestic consumption and purchasing power have been considerably reduced. Efforts to reopen the economy following a hard lockdown early in the pandemic resulted in high infection rates due to movement restrictions being eased.

While the agriculture sector has shown some resilience and even grew in the first 3 quarters of 2020, these gains were overturned by the devastation brought about by strong typhoons late in 2020.

Food insecurity remains a significant issue for the poorest and most vulnerable, especially in urban areas, and there is potential for further food shortages due to impacts on supply chains and export restrictions in supply markets.

To address the challenges to food security, particularly on availability and access, the Philippine Government has focused its efforts at the national and local level on providing financial assistance to vulnerable families, distributing food aid, and promoting alternative production and sources of food including through home gardening. The government has also provided assistance to food producers, including:

- financial assistance
- bulk buying of fruits, vegetables and livestock for distribution as food aid
- coordination of logistics and movement of supply, creating local hubs and markets
- improving post-harvest facilities
- e-retailing
- disease management, particularly for African swine fever and fall armyworm.

The Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) is ACIAR's main government partner 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 amidst the current challenges of the pandemic, and hopefully beyond.

The Philippine Government scaled up efforts to address hunger and to ensure all public-led initiatives are coordinated, responsive and effective. In January 2021, the government launched the National Food Policy, which aims to strengthen government agencies, both at the national and regional levels, and local government units to provide citizens necessary programs and interventions to end hunger, achieve food security, improve nutrition and attain sustainable agriculture.

The Philippines is one of Australia's longest-standing bilateral relationships and we will celebrate 75 years of diplomatic ties in 2021. Bilateral cooperation is underpinned by the Philippines-Australia Comprehensive Partnership. As the second largest bilateral grants partner for the Philippines, Australia will collaborate with the Philippine Government to help manage and recover from COVID-19.

Country priorities

ACIAR has worked with the Philippine Government, research and academic institutions, private sector and civil society partners for almost 4 decades. The partnership has evolved with significant co-investment from our main bilateral partner, PCAARRD, in recent years.

Our program in the Philippines focuses on research to make agricultural products more productive, marketable and internationally competitive, and to build resilience of smallholder farmers, fishers and their households from impacts of natural disasters and climate change, including 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 their access to other basic services and economic opportunities.

We work with the Philippine Government to promote prosperity, reduce poverty and enhance stability, and to help respond to the Philippines' agricultural research and development priorities by:

- making horticultural products more competitive in the market
- ensuring competitive and sustainable fisheries and aquaculture
- managing land and water resources for profitable and sustainable agriculture
- improving returns from low-input livestock production systems
- mitigating the effects of climate change on the rural poor
- increasing adoption of technology, through understanding and addressing constraints and extension with poor Indigenous households in the southern Philippines.

These priorities remain relevant, and the underlying issues have been compounded in light of the COVID-19 pandemic. During 2020, ACIAR examined food systems in the Indo-Pacific region to identify vulnerabilities that were exposed or amplified by the COVID-19 shock. This information, published in our report *COVID-19 and food systems in the Indo-Pacific: An assessment of vulnerabilities, impacts and opportunities for action (ACIAR Technical Report 96)*, will be used to inform future research and development to support food systems resilience in the Indo-Pacific region. Food systems assessments were undertaken at 5 locations, including the Philippines. 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. This priority area has a greater focus on leadership and career development through short-term and medium-term support for Philippine partners. Whenever possible, we encourage our partners to participate the John Allwright Fellowship, the John Dillon Fellowship, the Meryl William Fellowships and other initiatives under the alumni engagement plan.

In recent years, ACIAR has introduced innovations to how we deliver our learning and development programs. One example is the Philippine Agribusiness Masterclass that successfully brought together a cohort of researchers, academics, farmer leaders and representatives from the private sector to collaborate. In 2021, the John Dillon Fellowship was redesigned and in the coming year it will be 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.

Outreach and communications are also becoming increasingly important to strengthen understanding and awareness of the impact of our programs as part of Australia's aid program in the Philippines, and to support and strengthen relationships between in-country project partners and stakeholders.

2021–22 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

Fruit and vegetable production are important economic activities in the southern Philippines but are limited by small farm size, poor adoption of technology, low productivity and product quality, and high post-harvest losses. Improving the performance of smallholder value chains for fruit and vegetables, and building community capacity, is the focus of a project led by Dr Gomathy Palaniappan of the University of Queensland. During 2020–21, there will be ongoing facilitation of farmer-to-farmer learning alliances with private sector and grower groups, and between communities, governments and research stakeholders to improve smallholders' income and community livelihoods through the value-chain improvements implemented.[1]

ACIAR-supported research in the southern Philippines showed that integrating vegetable value-chain development and community engagement leads to improved innovation, competitiveness, quality and value. However, success occurred at very local scales and, in general, the majority of smallholder horticulture growers in the Philippines are not able to compete in higher-value, more-demanding markets. A new project 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. Led by Dr Lilly Lim-Camacho of CSIRO, the project will work with producers of coffee and high-value fruits and vegetables in the southern Philippines. This project aligns directly with 2 research priorities of PCAARRD.[2]

Fisheries

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. During 2021–22, the project will be training hatchery staff in new methods, continuing field experiments and feeding trials, and refining pond culture methods.[3]

Improving the performance of smallholder value chains for fruit and vegetables, and building community capacity, is the focus of a project in the southern Philippines. Photo: Chris Maglangit. ACIAR project AGB/2017/039

Buidling on successful research in coral restoration techniques, ACIAR is now funding work to improve institutional effectiveness and build networks to support restoration programs. Photo: University of the Philippines. ACIAR project FIS/2019/123

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. This 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 finishes in 2021 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.[4]

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 sexual 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 new project that aims to improve the institutional effectiveness of coral reef restoration in the Philippines by understanding political-economic influences and drivers at multiple scales, and applying lessons learned through a marine governance network-based approach.[5]

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. The project will work 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.[6]

Horticulture

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 2021–22, 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.[7]

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 2021–22, 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.[8]

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.[9]

Fusarium wilt tropical race 4 (TR4), or Panama disease, has become widespread throughout South-East Asia. The disease is threatening smallholder banana production in countries including 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 2021–22, field surveys of production systems and natural environments will be conducted, and there will be ongoing development and training in statistics and experimental procedures for glasshouse and field experiments.[10]

Panama disease has become widespread in banana plantations throughout South-East Asia. ACIAR supports a project to develop an integrated management response to the spread of the disease throughout the region. Photo: Conor Ashleigh. ACIAR project HORT/2018/192

Livestock Systems

The animal origins of COVID-19 have again placed concerns about zoonotic diseases in the global policy limelight. Wet markets in Asia were singled out as a source of global pandemic risk and there were calls to close, ban, regulate and reform them. While some wet markets centre heavily on wild animals, many do not sell wildlife or bushmeat. More commonly, a wet market is a fresh-food market where live animals (poultry, ruminants, seafood and wildlife) are kept, slaughtered and sold to consumers alongside fruits, vegetables and/or grains. Dr Kevin Bardosh and Associate Professor Cecily Maller of RMIT University leads a rapid assessment to understand how the COVID-19 pandemic has impacted wet markets in Vietnam, Kenya and the Philippines, specifically in relation to biosecurity reforms, food security, and women's economic empowerment. This project contributes to stage 3 of the ACIAR assessment of COVID-19 impacts on food systems in our region.[11]

It is widely reported that the impact of COVID-19 on food systems across the Indo-Pacific is exacerbating gendered inequalities in the region, such as unequal access to productive resources, markets and institutions for women. Also contributing the ACIAR assessment of COVID-19 impacts, Professor Sara Davies of Griffith University leads a small research activity to develop an evidence-based approach to identify and understand the specific gendered impacts of COVID-19 responses on food security and socioeconomic outcomes in Myanmar, the Philippines and Papua New Guinea. These insights will be used to outline opportunities and design approaches that will begin to mitigate the harm caused by the COVID-19 disruption at the individual, household and community level.[12]

Social Systems

More than 24 million people in the Philippines, most of whom live below the poverty line, 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 John Herbohn of the University of the Sunshine Coast focuses on forest landscape restoration to enhance the livelihoods of low-income residents of rural areas. During 2021–22, pilot testing of designs for woodlots, agroforestry systems and woodlot/crop systems suited to smallholders and communities will be completed. Three manuals on smallholder-based tree-crop farming systems will be produced for extension and instruction. Based on several studies within the project, guidelines will be published to assist the formulation of forest and landscape restoration policy within the Asia-Pacific region.[13]

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 2021–22, key soil constraints and the most suitable lands for rubber-based cropping systems will be identified. Demonstration sites and capacity building are underway to promote resilient market-oriented rubber-based intercropping systems with low risk, high productivity and profitability.[14]

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. A range of 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.[15]

Country Manager, The Philippines
Position vacant at the time of publication

Research Program Managers
Agribusiness: Mr Howard Hall
Fisheries: Prof Ann Fleming
Horticulture: Ms Irene Kernot
Livestock Systems: Dr Anna Okello
Social Systems: Dr Clemens Grünbühel
Soil and Land Management: Dr James Quilty

See page 197 for contact details.

Current and proposed projects

1. Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines (AGB/2017/039)
2. Agribusiness-led inclusive value chain development for smallholder farming systems in the Philippines (AGB/2018/196)
3. Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines (FIS/2016/122)
4. Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration [Philippines] (FIS/2018/128)
5. Institutional effectiveness and political economy of coral reef restoration in the Philippines (FIS/2021/112)
6. Regional coral restoration networks and appropriate technologies for larger-scale coral and fish habitat restoration in the Philippines and Australia (FIS/2019/123)
7. Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region (HORT/2015/042)
8. Developing vegetable value chains to meet evolving market expectations in the Philippines (HORT/2016/188)
9. Improving mango crop management in Cambodia, the Philippines and Australia to meet market expectations (HORT/2016/190)
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 assessment of the impact of COVID-19 on wet market reforms: case studies from Vietnam, Kenya and the Philippines (COVID-19 impacts program) (LS/2020/204)
12. COVID-19: gendered risks, impact and response in the Indo-Pacific: rapid research and policy guidance (COVID-19 impacts program) [Myanmar, Papua New Guinea, Philippines] (LS/2020/203)
13. Enhancing livelihoods through forest and landscape restoration [Philippines] (ASEM/2016/103)
14. Land management of diverse rubber-based systems in 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)

Vietnam

A$4.8 million
Budgeted funding

18
Bilateral and regional research projects

8
Small projects and activities

Vietnam contained COVID-19 very effectively through 2020 and into 2021. As a result, it was one of only a few countries in the world with positive economic growth during that period. The agriculture sector remained a firm foundation for that growth, contributing 15% to the country's GDP.

Despite the good performance of agriculture, the sector experienced a range of difficulties. These included disruptions of traditional value chains due to travel restrictions in the pandemic, the impact of African swine fever and the extreme events associated with natural disasters, such as the terrible flood in the central region, saline intrusion in the Mekong Delta and hail storms in the northern mountainous areas.

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 is aiming 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 focus on export commodities that meet good agricultural practice and other quality standards, and by value-adding to products through new technologies.

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

As a country vulnerable to climate change, Vietnam's agriculture sector has identified climate change mitigation and adaptation as a long-term mission. Measures to adapt or mitigate the negative impacts of climate change have been proposed, especially restructuring crop choices and times with the specific conditions, improving land and water management and applying technology for farming activities, and diversifying occupations for people in the rural areas.

Since 2020, One Health (the interface between human, animal, and environmental health) has drawn more attention than ever. Vietnam's One Health partners (including Australia) recently pledged to support a partnership framework for the 2021–2025 period, focusing on zoonotic diseases and antimicrobial resistance. Soil health and the relationship between soil fertility, crop nutrition, and pests and diseases (especially soil-borne diseases) are also priorities.

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 early 2020, 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.

2021–22 research program

- **26 ACIAR-supported projects in Vietnam**
- **12 projects are specific to this country**
- **14 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.

Farmer Leo Van Lech in Son La province, Vietnam, has implemented a new agroforestry systems on his sloping land and is obtaining better production and fruit quality. As director of a local cooperative, he is encouraging other farmers to apply the new technique.
Photo: Huong Nguyen. ACIAR project FST/2016/152

Agribusiness

Mango production makes a significant contribution to Vietnam's economy, with nearly half of the crop produced in the Mekong River Delta region. New opportunities in the fresh and processed mango value chain will be identified to improve net income and livelihoods of smallholder mango growers in southern Vietnam in a project led by Associate Professor Robin Roberts of Griffith University. The research has also focused on roles and opportunities for women in the industry. The project will conclude in 2021–22, identifying opportunities to improve through-chain operations and chain competitiveness, and reporting on options to overcome ongoing barriers to competitiveness and ways to improve capacity, industry stakeholder linkages and knowledge sharing.[1]

Smallholders who produce high-value vegetables in the Moc Chau district of Northwest Vietnam have a new supply channel to modern retail markets in Hanoi as a result of a previous ACIAR-supported project. A subsequent project, led by Dr Gordon Rogers of Applied Horticultural Research, has addressed research and development gaps in Vietnam to ensure the new vegetable chains are reliable, inclusive, sustainable and scalable. The research experience and knowledge developed through these projects in Vietnam was applied to rapidly identify, develop and evaluate a pilot high-quality vegetable chain in Myanmar. The project concludes in 2021–22, with the consolidation of effective frameworks and approaches to establish and develop resilient smallholder vegetable chains in northern Vietnam and Myanmar.[2]

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. During 2021–22, the project will continue testing and evaluation of virus-free planting material and resistant varieties, and on-farm testing of new agronomic practices and training of farmers and extension officers. The establishment of facilities using innovative methods for rapid multiplication of clean planting material continues, funded in joint ventures with private firms and non-government organisation in multiple countries.[3]

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 new 4-year project aims to enhance smallholder livelihoods, including vulnerable populations, by improving the sustainability of coffee and black pepper farming systems and value chains. Research led by Dr Estelle Bienabe of the World Agroforestry Centre will start with an investigation of soil-borne pests and diseases, on-farm and in nurseries, and the use of bio-inoculants with soil remediation strategies.[4]

To combat serious diseases of cassava, ACIAR supports a project that is evaluating virus-free planting material and resistant varieties, and conducting on-farm testing of new agronomic practices and training of farmers and extension officers. Photo: Huong Nguyen. ACIAR project AGB/2018/172

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. During 2017, the Government of Vietnam developed a policy to encourage reduced total rice production but 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.[5]

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 2021–22, the project will review, research and trial innovative financing models for agricultural value chains and evaluate specific chain finance interventions in Indonesia and Vietnam.[6]

The most important constraint to the development of a temperate fruit industry in northern Vietnam is the lack of coordination between farmers and stakeholders in the private sector (seedling producers, growers, traders and retailers), and between the private sector and local government. This small research activity led by Mr Oleg Nicetic of the University of Queensland has established an inclusive multi-stakeholder industry association, imported new varieties from Australia and completed the first harvest of imported varieties in field trials. Externally funded monitoring and guidance of association governance, commercial scale multiplication and release of varieties to participating farmers will continue beyond the project term.[7]

Vietnam has experienced excellent growth in agriculture, value-added agriculture and farm incomes over recent decades. However, the sector faces a number of challenges, including outdated technologies, inadequate food safety and fragmented supply chains. A small research activity led by Associate Professor Tiho Ancev of the University of Sydney will support the Ministry of Planning and Investment and the Vietnamese Government to set up an adequate framework for the Agricultural and Rural Development Strategy and formulate concrete strategic directions for the sector.[8]

Catfish (*Pangasius* sp) farming and wild caught catfish are important income generating activities for smallholder farmers in the Mekong River Basin and are an extremely important source of dietary protein for those countries' populations. The continued availability of catfish for human consumption is influenced by many factors including the impacts of 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 (see page 8).[9]

Climate Change

Australia is a world leader in greenhouse gas mitigation research in agriculture. This project provides the opportunity to assist partner countries to strengthen their national greenhouse gas accounting systems towards the same high standard used by Australia, and to use these systems to identify, quantify and implement on-farm management options that reduce emissions. Led by Professor Peter Grace of Queensland University of Technology, the project team will work with government institutions in Fiji and Vietnam, and will help grow capability in the data management, analyses and reporting needed to support current and future emissions reduction commitments under the Paris Agreement. The team will also collaborate with a sister project, led by the New Zealand Agricultural Greenhouse Gas Research Centre, which is pursuing the same approach in Kenya and Indonesia.[10]

Fisheries

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. During 2021–22, the project will be training hatchery staff in new methods, continuing field experiments and feeding trials, and refining pond culture methods.[11]

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 2021 that is supporting further expansion of community-based pearl farming and handicraft production in Tonga and demonstrating the feasibility of similar development in Vietnam.[12]

Hybrid grouper farming is the most profitable marine fish aquaculture sector in Vietnam, 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 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 the development of commercial feeds in Vietnam is constrained by a lack of data on suitable feed formulations. This project, 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 compared with 'trash' fish, 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.[13]

Hybrid grouper farming is the most profitable marine fish aquaculture sector in Vietnam. ACIAR-supported research is finding nutritional data to formulate cost-effective feeds that promote superior growth and survival, which can be sustainably sourced. Photo: Khanh Long. ACIAR project FIS/2021/121

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 is examining 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 through the use of carbon crediting mechanisms.[14]

Forestry

The development of market-based agroforestry in Northwest Vietnam provides an opportunity for farmers to diversify, achieve higher incomes and reduce erosion of mountainous landscapes. A project led by Dr La Nguyen of the World Agroforestry Centre will finalise research on the development and adoption of locally appropriate, market-based agroforestry systems and the rehabilitation of degraded forests. Working closely with the Department of Agricultural and Rural Development offices in Son La, Yen Bai and Dien Bien provinces, the project will implement exemplar landscapes to support adoption of the new systems and improve livelihood options for the H'mong and Thai ethnic minorities living in these provinces.[15]

A new project in 2021–22, with activities in Indonesia and Vietnam, will underpin good plant biosecurity practices in forestry. With government and industry partners, the project led by Dr Caroline Mohammed of the University of Tasmania will extend screening approaches from prior research into the impact of the *Ceratocystis* fungus on acacias to eucalypts that have replaced acacias in the wet tropics. It will develop remote-sensing software applications for cheap and rapid forest health surveillance and, through geospatial modelling, deliver establishment (suitability and survival) risk maps under current and future climates at a regional level for the highest-priority pests and pathogens.[16]

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 among countries, but there is a general lack of preparedness to respond to invasive pests and diseases. A new project will establish an effective and sustainable forest biosecurity network in South-East Asia to improve risk management for invasive forest pests and diseases. Associate Professor Simon Lawson of the University of the Sunshine Coast will lead the project, which will use shared field protocols and data as an entry point and foundation for coordinated biosecurity response. The project will develop science tools to support and sustain the forest biosecurity network and develop coordinated forest biosecurity policies for South-East Asia.[17]

Livestock Systems

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 the final year, the project will focus on capacity building of stakeholders in the beef value chain, including key advisory and extension staff. A working group will be established to design an up-scaling strategy for a sustainable crop-livestock system.[18]

Asia is a major global producer of pork, with South-East Asia and southern China currently providing the majority of regional production. Food safety is a significant and growing concern in Vietnam, and a barrier to smallholder farmers wishing to sell product in high-value domestic and export markets. Through market-based approaches, the Safe Pork project, led by Dr Fred Unger of the International Livestock Research Institute, aims to reduce the burden of bacterial food-borne disease across informal pork markets in Vietnam. In the final year of the project, researchers will deliver a roadmap based on evaluations of approaches to food safely and recommendations that could lead to impact at scale.[19]

Goat production in Lao 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 Dr 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.[20]

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 Tadelle Dessie of the International Livestock Research Institute leads a project that is testing and making available high-producing, farmer-preferred genotypes of chickens to increase smallholder productivity as a pathway out of poverty in Cambodia, Myanmar and Vietnam. The project is also strengthening the capacity of young scientists in the project countries to conduct high-quality research on village poultry systems, for the benefit of smallholder farmers.[21]

The Safe Pork project aims to reduce the burden of bacterial foodborne disease across informal pork markets in Vietnam. Photo: ILRI Vietnam.
ACIAR project LS/2016/143

The animal origins of COVID-19 have again placed concerns about zoonotic diseases in the global policy limelight. Wet markets in Asia were singled out as a source of global pandemic risk and there were calls to close, ban, regulate and reform them. While some wet markets centre heavily on wild animals, many do not sell wildlife or bushmeat. More commonly, a wet market is a fresh-food market where live animals (poultry, ruminants, seafood and wildlife) are kept, slaughtered and sold to consumers alongside fruits, vegetables and/or grains. Dr Kevin Bardosh and Associate Professor Cecily Maller of RMIT University leads a rapid assessment to understand how the COVID-19 pandemic has impacted wet markets in Vietnam, Kenya and the Philippines, specifically in relation to biosecurity reforms, food security, and women's economic empowerment. This project contributes to stage 3 of the ACIAR assessment of COVID-19 impacts on food systems in our region.[22]

The COVID-19 pandemic exposed multiple failures in economy and society, and it is clear that the costs of the global shock have not been equally distributed. Also contributing to the ACIAR COVID-19 impacts assessment is a small research activity led by Dr Paulo Santos of Monash University aims to understand what drives vulnerability to poverty among agricultural households in Myanmar and Vietnam, and what research needs to originate from such analysis. The research analyses existing expenditure and consumption data to quantify the relative importance of different shocks on poverty.[23]

Social Systems

Agrichemicals are an important tool for increasing agricultural yields and a necessary contributor to food and nutrition security. However, off-label use can have significant impacts on human and environmental health. A small research activity, led by Dr Liana Williams and Dr Lucy Carter of CSIRO, is using a human-centred approach to understand the interplay between agrichemical use and the institutional and regulatory frameworks that are intended to safeguard against off-label use, as well as networks for access to chemicals, information and training. Agrichemical use will be analysed through case studies in selected crops in Laos and Vietnam. Understanding gained from the study will serve as a foundation for future ACIAR research.[24]

A small research activity will analyse 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, will determine how the tools contribute to changing gender relations and empowering women, and to what extent. The project will also build the capacity of in-country partners and 10 social science researchers in the early stages of their careers, through training in mixed-method research, including participatory methods, and project-level Women's Empowerment in Agriculture Index.[25]

Sea-level rise and changes to seasonal rainfall patterns reduce freshwater availability and higher saline intrusion of farms in the Mekong River Delta during the dry season. ACIAR is supporting research to identify options for profitable crop diversification in the region. ACIAR project SLAM/2018/144

Soil and Land Management

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.[26]

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Current and proposed projects

1. Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam (AGB/2012/061)
2. Improving livelihoods in Myanmar and Vietnam through vegetable value chains (AGB/2014/035)
3. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
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 smallholder rice chain in the Mekong Delta [Vietnam] (AGB/2019/153)
6. Inclusive agriculture value chain financing [Indonesia, Vietnam] (AGB/2016/163)
7. Strengthening leadership, coordination and economic development of the temperate fruit industry in northern Vietnam (AGB/2018/171)
8. Research to support agricultural policy and strategic planning: research to assist the Vietnam Government with the formulation of the 2021–2030 Agricultural Development Strategy for Vietnam (AGB/2019/185)
9. Food loss in the catfish value chain of the Mekong River Basin (Food Loss Research Program) [Cambodia, Lao PDR, Vietnam] (CS/2020/209)
10. Improving greenhouse gas inventory systems to support the mitigation ambitions of Fiji and Vietnam [Fiji, Vietnam] (WAC/2019/150)
11. Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines (FIS/2016/122)
12. Half-pearl industry development in Tonga and Vietnam (FIS/2016/126)
13. Supporting grouper farming smallholders in Vietnam to improve their small-medium enterprise businesses by engaging with aquafeed companies to produce commercial feeds (FIS/2021/121)
14. Blue economy: valuing the carbon sequestration potential in oyster aquaculture [Vietnam] (FIS/2020/175)
15. Developing and promoting market-based agroforestry and forest rehabilitation options for northwest Vietnam (FST/2016/152)
16. Reducing forest biosecurity threats in South-East Asia [Indonesia, Vietnam] (FST/2018/179)
17. Building effective forest health and biosecurity networks in South-East Asia [Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam] (FST/2020/123)
18. Intensification of beef cattle production in upland cropping systems in Northwest Vietnam (LPS/2015/037)
19. Safe Pork: market-based approaches to improving the safety of pork in Vietnam (LS/2016/143)
20. Goat production systems and marketing in Laos and Vietnam (LS/2017/034)
21. Asian chicken genetic gains: a platform for exploring, testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia [Cambodia, Myanmar, Vietnam] (LS/2019/142)
22. Rapid assessment of the impact of COVID-19 on wet market reforms: case studies from Vietnam, Kenya and the Philippines (COVID-19 impacts program) (LS/2020/204)
23. Vulnerability in the Anthropocene: a prospective analysis of the need for social protection (COVID-19 impacts program) [Myanmar, Vietnam] (LS/2020/206)
24. Understanding agrichemical use in South-East Asia agriculture [Laos, Vietnam] (SSS/2020/143)
25. Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam (SSS/2018/139)
26. Farmer options for crops under saline conditions in the Mekong River Delta, Vietnam (SLAM/2018/144)