

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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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 huánglóngbing (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)