COMMERCIAL IN CONFIDENCE

FINAL REPORT

Impact evaluation of the Applied Research and Innovation System in Agriculture (ARISA) program

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CSIRO Planning, Performance and Evaluation Unit

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BOXES, CHARTS AND TABLES

Glossary

AIP-Rural	Australian-Indonesia Partnership for Rural Economic Development
ARISA	Applied Research and Innovation Systems in Agriculture
AUSAID	Australian Agency for International Development
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCED	Donor Committee for Enterprise Development
DFAT	Department of Foreign Affairs and Trade
EOI	Expression of interest
IDR	Indonesian Rupiah
IIG	Innovation Impact Group
IPM	Integrated Pest Management
ISRI	Indonesian Sugar Research Institute (key partner in the sugar intervention)
ITB	Institute of Technology Bandung
KPI	Key Performance Indicator
KUR	Kredit Usaha Rakyat
MEL	Monitoring evaluation and learning
MOCAF	Modified cassava flour
NTB	West Nusa Tenggara
PRISMA	Promoting Rural Income through Support for Markets in Agriculture
PS	Private Sector
PT	Term indicating a registered/formal business under commercial law
PT BCM	Bangkit Cassava Mandiri (agri-processing company focussed on cassava)
PT BISI	Agri-input company supplying seeds for rice, vegetables, fruits, hybrid corn, fertiliser and pesticides
PT GMM	PT Gendis Multi Manis (partly owned by the Indonesian Bureau of Logistics, sugar company with a recent and small operation in Madura)
PTPN X	PT. Perkebunan Nusantara X (state-owned sugar company and largest sugar producer in Indonesia)

PT TPS	PT Tiga Pilar Sejahtera
R&D	Research and development
RI	Research institute
RISTEKDIKTI	Ministry of Research, Technology and Higher Education Indonesia
SAFIRA	Strengthening access to Finance in Rural Agriculture
SCP	Science and commercialisation partnership
SME	Small and medium-sized enterprises
TIRTA	Tertiary Irrigation Technical Assistance
UB	University of Brawijaya (key partner in the dairy intervention)
UGM	University of Gadjah Mada
UIIK	Unit of intermediation
UNEJ	Jember University (key partner in the cassava intervention)
UNDANA	University of Nusa Cendana
UNRAM	Mataram University (key partner in the maize and beef interventions)

Summary

The Applied Research and Innovation System in Agriculture program (ARISA) has been a flagship program for Australia-Indonesia relations. Funded by the Department of Foreign Affairs and Trade (DFAT), ARISA involved a partnership with the Government of Indonesia and was implemented by the CSIRO. ARISA has built institutional and individual capacity to achieve systemic and sustainable productivity improvements for key agricultural commodities.

ARISA's key interventions

Throughout the life of the project, ARISA facilitated partnerships across a number of agricultural commodities including maize, cassava, beef, sugar, dairy, pigs and shallots.

- **The Maize-Pulse intervention** has provided technical support, affordable credit, and inputs to maize farmers in Lombok, facilitated by a supportive private sector and favourable government policies including a national standard base price for maize and guaranteed microfinance loans.
- **The Cassava intervention** linked local cooperatives, chip processing clusters and local investors to a national food processing company, resulting in an improvement in cassava production and processing in East Java. The Research Institute – Private Sector (RI-PS) partnership benefited from long-term personal relationships from existing networks, and the intervention helped address key challenges to commercialisation associated with variable market prices and long crop cycles relative to other crops.
- **The Beef intervention** involved the development of a niche 'herbal beef' market through changing fodder and animal management practices.
- **The Sugar intervention** involved providing training, credit, inputs and improved market linkages to increase production of sugar on Madura, one of the top five priority crops for Indonesia.
- **The Dairy intervention** involved promoting high-quality fodder varieties and training in husbandry practices to dairy farmers improving milk production. The intervention also assisted farmers and cooperatives to produce and sell high quality animal fodder. Through the intervention, PS saw how the RIs research could help improve their milk supply, and provided support to farmers to grow and effectively use improved fodder varieties.
- **The Pig intervention** involved the development and commercialisation of high quality, low cost pig feed made of a combination of local ingredients and concentrated commercial feed.

- **The Shallots intervention** involved the development of an integrated pest management system using low toxicity pesticides, biological controls and physical control of insects and diseases.

A total of $10.7 million was invested in ARISA from 2014 to 2019. The main CSIRO led activities included developing and supporting the RI-PS partnerships (instigating partnership development and providing partnership support), building innovation capacity at the institutional level (capability building for RISTEKDIKITI on approaches to research commercialisation and for RIs to develop commercialisation units) and ongoing monitoring and evaluation of the interventions and partnerships to assess the outcomes of ARISA against DFAT's Key Performance Indicators (KPIs).

Key outcomes

At the institutional level, ARISA has enabled new approaches to transforming research to practice, catalysing adoption of research, provided new platforms and networks to promote RI and PS partnerships, new incentives for engagement between PS, RIs and smallholder farms, and a realignment of research outputs with market needs.

New technologies were purchased, and new techniques were adopted by smallholder farms, and there was uptake of finance/loans by smallholder farmers, including women.

ARISA increased the likelihood of the application of new knowledge, the scalability and accelerated adoption of research through RI-PS partnerships, and shifted partnerships from resources exchange to deeper collaborations with financial benefits for both partners, increasing the sustainability of activities and impacts.

ARISA also achieved improved livelihoods of smallholder farmers through income increases, empowerment of rural women farmers, removal of barriers to PS activity, the development of a replicable model for fostering RI-PS partnerships, systemic change to support commercialisation of science, and realisation of the strategic objectives of CSIRO and DFAT.

The capability strengthening exercises held with RISTEKDIKITI influenced the new *Regulation on Innovation Management in Higher Education* creating incentives for universities to interact with the PS. RISTEKDIKITI also began directly engaging with RIs to implement and support the regulation changes in practice.

UNRAM and UNEJ, through the establishment of the commercialisation units, have also independently established and are pursuing new PS partnerships across a range of agricultural commodities including palm oil, coffee, cocoa, tea, sugar, seeds, spices and beef.

Impact value

The interventions facilitated through ARISA led to an increase in income for 11 156 rural households (0.7 per cent of rural households in West Nusa Tengarra and 0.1 per cent in East Java).

By the end of the project ARISA had a total outreach of 11 144 households, of which 75 per cent were below the AUD 2.50 poverty line and 27 per cent earning below AUD 2.00 per day.[1] Net attributable income (additional to income without the intervention) was AUD 21.9 million (117 per cent compared with non-adopters) and average net attributable income increase per household was AUD 1 965.

ARISA made headway in empowering women in the agricultural sector — 46 per cent of farmers engaged in ARISA were women. Most notably, in the maize intervention 231, or 32 per cent of loans initiated were issued to women, as historically banks have only loaned to men.

Investment costs relative to net attributable increase in income of impacted households and the value of additional turnover of intermediary services providers/SMEs produces a net benefit of $13.7 million, or benefit cost ratio of 2.3 during the life of ARISA.

CSIRO is applying the learnings from ARISA in a newly established Aus4Innovation partnership between DFAT, CSIRO and the Vietnamese Ministry of Science and Technology. The project involves identifying emerging areas of technology and digital transformation, trailing new models for partnerships between agriculture and public and private sector institutions, and strengthening Vietnamese capability in digital horizon scanning, scenario planning and commercialisation and innovation policy.

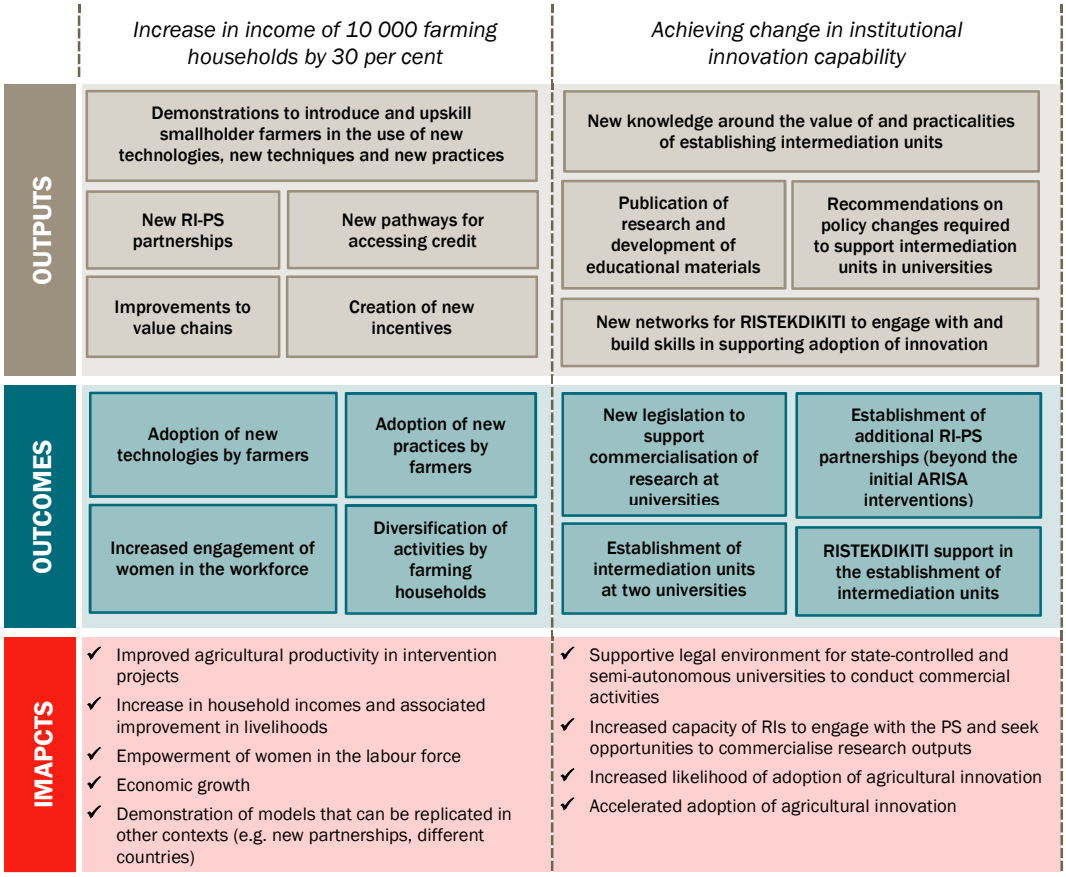
Supporting RIs to commercialise their research is helping to expand R&D in Indonesia (which at present is only undertaken by 1.9 per cent of firms).

The benefits of ARISA to Australia are reflected through the realisation of CSIRO and DFAT's KPIs and broader strategic objectives. Moreover, the learnings from ARISA can be applied in other innovation system challenges.

A summary of the ARISA impact pathway is set out in chart 1.

[1] A primary objective of DFAT was poverty reduction, and these income levels were purposefully set at the poverty threshold.

1 Outputs, Outcomes and Impacts



Data source: The CIE and ARISA.

1 Objectives and initiatives within ARISA

The Applied Research and Innovation System in Agriculture program (ARISA) was one of four poverty reduction programs undertaken as part of the Australian-Indonesian Partnership for Rural Development (AIP-Rural), funded by the Australian Government Department of Foreign Affairs and Trade (DFAT), involving a partnership with the Government of Indonesia, and implemented (and partly funded) by CSIRO.

The goal was to increase the incomes of 10 000 smallholder households in three core provinces in East Indonesia by 30 per cent over the five years, where agricultural productivity was low, and poverty among the rural population was high.

The objectives of ARISA were to facilitate research institution-private sector partnerships to promote the commercialisation of scientific research and innovation in agriculture, to instigate systemic change at the institutional levels to support the pursuit of collaboration for research commercialisation partnerships and to enact policy change to create an enabling environment conducive to innovation.

Throughout the life of the project, ARISA facilitated partnerships across a number of agricultural commodities including maize, cassava, beef, sugar, dairy, pigs and shallots.

Objectives and policy context of ARISA

ARISA was one of four poverty reduction programs implemented under the Australia-Indonesia Partnership for Rural Economic Development (AIP-Rural) (box 1.1). In line with the objectives of AIP-Rural the goal of ARISA was to increase the incomes of 10 000 smallholder households in three core provinces in East Indonesia by 30 per cent by December 2018. Running from January 2014 to April 2019, its key objectives were to:

- create changes in 'innovation capacity' of research institute intervention teams to partner with the private sector to achieve impact at scale
- create changes in 'innovation capacity' of research institutes to engage with the private sector and operate as a key stakeholder in the wider innovation landscape, and
- contribute to regulatory and policy environments that incentivise and enable RI-PS collaboration for agricultural innovation.

ARISA operated in the three Indonesian provinces of East Java (Malang and Jember), West Nusa Tenggara (Lombok Island and Sumbawa) and East Nusa Tenggara (West Timor and Flores Island), and facilitated the implementation of RI-PS interventions in maize, cassava, beef, sugar, dairy, pigs and shallots.

1.1 Australia-Indonesia Partnership for Rural Economic Development

The Australian-Indonesian Partnership for Rural Development (AIP-Rural) was the first phase of a ten-year program to increase farmer incomes in the eastern provinces of Indonesia. The initial program ran from 2013 to 2018 and was funded by the Australian Government Department of Foreign Affairs and Trade (DFAT) and involved a partnership with the Government of Indonesia. The goal of the program was to achieve a 30 per cent increase in the net incomes of 300 000 smallholder farming households by December 2018. This involved implementing strategies and interventions for farmers to improve access to new markets, high quality inputs, knowledge, technology and credit.

AIP-Rural operated in East Java, West Nusa Tenggara, East Nusa Tenggara, West Papua and Papua and comprised a portfolio of four complementary programs one of which was ARISA. The other three programs were:

- Promoting Rural Income through Support for Markets in Agriculture (PRISMA)
- Strengthening Agriculture Finance in Rural Areas (SAFIRA), and
- Tertiary Irrigation Technical assistance (TIRTA).

Historically, AusAID (now merged with DFAT) has supported rural development in eastern Indonesia. To this end, AIP-Rural extends on the knowledge and networks developed from previous programs. For example, between 2006 and 2010 AusAID funded the Smallholder Agri-business Development Initiative (SADI) which aimed to achieve a sustained increase in rural growth and household incomes through productivity gains, better access to markets, and on and off-farm value-added activities in four target provinces of Eastern Indonesia.

Source: PRISMA Program History, available at: https://aip-prisma.or.id/en/program-history; AIPD-Rural summary draft design document, available at: https://dfat.gov.au/about-us/publications/Documents/AIPD-rural-design.pdf

Maize-Pulse intervention

The Maize-Pulse intervention (box 1.2) provided technical support, affordable credit, and inputs to maize farmers in Lombok.

Favourable government policies assisted the intervention, including the establishment of a national standard base price for maize encouraged farmers to produce maize, and Indonesia's guaranteed microfinance program (Kredit Usaha Rakyat (KUR) loan guarantees minimised the risk of providing financing to farmers.

Its major challenge was the sale and withdrawal of initial program partner, Japanese owned credit and input supplier Asia Crop Solutions.

1.2 Maize-Pulse intervention

Increasing credit and input access to support smallholders

Partners: University of Mataram (UNRAM — research institute), Syngenta (global Agri-inputs company), Bank NTB and Asia Crop Solutions (Japanese owned credit and input supplier)

Intervention: Provide technical support, affordable credit and inputs to maize farmers in Lombok

Opportunity for intervention: there are number of challenges faced by maize producers, including:

- low yields
- risk of variable rainfall patterns
- lack of options for credit traditionally provided by local input suppliers who provide seeds
- time delays in accessing seeds and fertiliser

Key events:

- original partnership between UNRAM, Syngenta and Asia Crop Solutions
- UNRAM provided technical support, conducted further research on maize and pulse production and facilitated fair contracts between farmers and Asia Crop Solutions
- Syngenta provided field staff and Learning Centres to promote and support the use of hybrid maize varieties, pesticides and herbicides
- Asia Crop Solutions initially provided credit to farmers to support access to inputs and purchased maize and pulses at the end of the season thereby guaranteeing the credit payment. However, shortly following the formalisation of the partnership Asia Crop Solutions was sold and the new owner withdrew from the partnership due to concerns around the ability of the farmers to meet loan repayments and strategic direction change into energy.
- To continue the project, ARISA provided loans to a selection of growers for 1 growing season and UNRAM supported growers to find new buyers
- Bank NTB joined the partnership and provided Kredit Usaha Rakyat (KUR) loans under a government program. These loans had a capped interest rate and provided partial credit guarantees through state-owned credit guarantee companies. For many growers this was their first interaction with the formal banking system
- Bank NTB, UNRAM and Syngenta all expressed satisfaction with the business model, despite challenges such as the 2015-16 and 2016-17 El Nino wet season, and some difficulties in accessing the bank to repay loans
- In 2016 the government introduced a national standard base price for maize and in 2017 maize imports were restricted. This increased the price of maize, encouraged more farmers to take up maize production and incentivised Syngenta to expand its focus on maize

Outcomes:

- Change in practices:
  - First time access to credit for many farmers with 30 per cent of loans taken out by females who traditionally have not been able to access loans due to cultural reasons
  - Increased engagement of women in maize and mung bean production
  - Change in agricultural production from only maize to a more integrated maize-mungbean system, increasing sustainability
- Expansion of the program:
  - Syngenta established a third learning centre in North Lombok
  - Syngenta approached UNRAM to provide technical assistance as part of an existing Mercy Corp and Bank Andara project in Sumbawa
  - Bank NTB expressed willingness to expand the loan scheme to new areas in partnership with UNRAM who would provide technical support and act in a brokering capacity
  - A seed production company, agrochemical company and Bank BRI expressed interest in joining the intervention and implementing a similar business model (creating an innovation cluster)
- Catalysing future change:
  - Certification of farmers to become mung bean and ground nut seed producers
  - Training farmer-group leaders as Syngenta agents, to maintain the program post-ARISA

Increasing credit and input access to support smallholders
Impacts: ▪ Increase in income increases, with net attributable income change (NAIC) of $2.65 million ▪ Increase in net income and productivity for 2 735 farming households (50 per cent female participation) ▪ Through accessing loans farmers were able to get a credit history which would help with future loan applications ▪ Expanded skills and confidence of UNRAM staff for interacting with the private sector and improved their reputation, established their role as broker and facilitator and increased their work in the field thereby increasing their impact in the community ▪ Increased community and government trust in Syngenta leading to increased sales to both farmers and the government who used Syngenta seeds for their North Lombok seed distribution program in 2017-18 (however, this may have had supply implications for growers who wanted to purchase the seed outright) ▪ Built customer base of Bank NTB
Lessons learnt: ▪ Government policy can impact on the success of interventions (e.g. maize pricing encouraged farmers to grow maize and the KUR loan guarantees minimised the risk of providing financing) ▪ Flexibility of model as partners change

Source: ARISA Activity Completion Report, 2019, A.2.

Cassava intervention

The Cassava intervention linked local cooperatives, chip processing clusters and local investors resulting in an improvement in cassava production in East Java (table 1.3).

The RI-PS partnership was underpinned by long-term personal relationships from existing networks, which contributed to program success. However, variable market prices and long crop cycle relative to other crop types such as maize (8 to 12 months verse 3 to 4 months) impacted the attractiveness of cassava as a crop option for farmers.

1.3 Cassava intervention

Partnership for the development of integrated cassava farming systems and modified cassava flour chip clusters
Partners: University of Jember (UNEJ), PT Bangkit Cassava Mandiri (PT BCM a modified cassava flour processor), local and parent cooperatives, and clusters with local investors
Intervention: ARISA, UNEJ and PT BCM connected local cooperatives, chip processing cluster and local investors to improve cassava production and the incomes of smallholder farming households in Jember Regency East Java. UNEJ and ARISA also helped with technical aspects relating to growing cassava and varieties.
Opportunity for intervention: ▪ There are a number of challenges faced by farmers including: – Difficult agricultural conditions such as dryland and low crop productivity — Cassava is more drought tolerant than other crops – Limited market linkages for agricultural inputs and sale of produce – Many households send family members overseas to generate income, reducing labour availability — Cassava is less labour intensive than other crops such as maize ▪ There are numerous untapped opportunities to improve the livelihoods of cassava farmers including: – Linking production with value-adding processing activities at a community level – Utilisation of waste products such as peel and liquids from chipping process by integrating with other farming activities such as sheep fattening and organic fertiliser production

Partnership for the development of integrated cassava farming systems and modified cassava flour chip clusters

Key events:

- Historically UNEJ has undertaken Indonesian government funded modified cassava flour research
- In 2005 a private firm funded small trials of UNEJ's research using their corporate social responsibility budget
- The partnership with the initial company was short term, with a change in management directing activities away from the project, however UNEJ leveraged the work that had been done as a proof of concept to promote the research to other firms interested in wheat-flour alternatives
- In 2008 PT BCM was established as a subsidiary of a large food manufacturing company PT Tiga Pilar Sejahtera (PT TPS). UNEJ provided technical assistance to PT BCM on processing modified cassava flour and linking it to end uses (the strategy taken was similar to the nucleus-plasma model used in Indonesia palm oil production since the 1970s)
- PT BCM invested in building cassava chip processing clusters which collected cassava from farmers and processed it into chips. PT BCM provided technical and business advice to the clusters to ensure supply of processed cassava chips. UNEJ provided technical support (their enzyme was used in the clusters) and supported refinement of the chipping process. PT BCM processed the chips purchased from the clusters into modified cassava flour for supply to food production companies
- UNEJ facilitated a co-investment by a local cooperative and PT BCM to build a modified cassava flour factory in Trenggalek. The initial intention of the partnership was to create shared benefit between the local company and the firm, however, differences in needs led to PT BCM buying out the cooperative and establishing a new factory in Solo (prior to ARISA). UNEJ also identified the best variety for MOCAF and with CSIRO provided technical support on planting and production
- Cooperative investment by local investors into the community-level processing clusters was successful for PT BCM in that it meant less financial risk in setting up the processing centres while for UENJ it guaranteed local 'buy in' and benefits as well as contributing to the sustainability of the operation. The Cooperative model was experimented with and expanded under ARISA, and was one of its key benefits.

Outcomes:

- Change in practices
  - Generation of an attractive business case and developed market and industry interest in modified cassava flour, facilitating the establishment of cooperatives and clusters
  - Building famer capacity in cassava and chip production and the use of waste products, pursuing opportunities to improve and extend the business model (e.g. sheep fattening)
  - New employment opportunities for women (peeling and chopping the cassava at the cluster — of the 230 people employed by the clusters, 80 per cent were women)
  - Upskilling women to produce modified cassava flour products such as cake and noodles
- Expansion of practices
  - UNEJ has been engaged by a Swiss company to provide technical advice on how to apply the technology and processing model in Nigeria
  - Extension of UNEJ experimentation and activities such as fertiliser trials and use of modified cassava flour in different food products
  - Development of home industry using MOCAF flour which has provided employment for women
- Catalysing future change
  - UNEJ established an intermediation unit to connect university researchers with the private sector
  - Leveraged UNEJ discussion with various levels of Indonesia government on policy support for marginal agricultural areas

Impacts:

- Increase in income of 489 farming households, with NAIC of $0.28 million.
- Empowerment of women in the labour force (60 per cent female participation)

Partnership for the development of integrated cassava farming systems and modified cassava flour chip clusters
Lessons learnt: ▪ Variable market price and long crop cycle relative to other crop types such as maize (8 to 12 months verse 3 to 4 months) impact the attractiveness of a crop ▪ Partnerships were underpinned by long-term personal relationships from existing networks ▪ The partnership began well before ARISA's involvement highlighting the challenge faced by ARISA in facilitating partnerships for other interventions within the three-year time frame ▪ Activities to build capacity of women were possible because they took place close to women's homes

Source: ARISA Activity Completion Report, 2019, A.2.

Beef intervention

The Beef intervention involved the development of a niche 'herbal beef' market through changing feed and management practices (table 1.4).

Unfortunately, in 2016 removal of a ban on the import of Indian buffalo meat occurred, and in 2017 a price ceiling was imposed on frozen meat, which made premium 'herbal beef' unviable, particularly given that the premium cut only accounted for 20 per cent of the animal.

1.4 Beef intervention

Partnership to develop a profitable and sustainable beef production system in Sumbawa
Partners: University of Matarum (UNRAM) and PT Dharma (a beef company)
Intervention: Development of a niche 'herbal beef' market to increase incomes for farmers
Opportunity for intervention: ▪ Low productivity of beef production. Cattle are typically kept as a supplementary livelihood activity and sold to cover large expenses ▪ UNRAM's Consortium of Large Ruminant Research has demonstrated simple and low-cost animal feeding and management practices that can increase cattle production ▪ Power imbalance favouring buyers rather than farmers ▪ Increased demand in Indonesia for beef products including high quality products ▪ Low levels of traceability, certification and standards for meat means that it is difficult to guarantee quality
Key events: ▪ UNRAM had established relationships with communities in Sumbawa and had a history of working with overseas research institutes including CSIRO and district and provincial governments in West Nusa Tenggara and Sumbawa ▪ Jakarta based beef company PT Dharma had meatworks in Sumbawa and Jakarta. The firm wanted to sell Sumbawa beef as 'herbal beef' (grass-fed and halal certified) but had difficulty sourcing a reliable supply of beef leading to it closing its operations mid-way through the project ▪ An employee of PT Dharma was an alumnus of UNRAM and heard about the work being conducted in Sumbawa. This led to a formation of a partnership to help increase the supply of animals to the local abattoir. – UNRAM's role was to improve cattle production through feeding Leucaena, introducing new weaning and feeding practices and development of certification standards – PT Dharma's role was to pay a price premium to farmers for grass-fed animals, maintain abattoir operations and provide extension staff to support UNRAM's field activities

Partnership to develop a profitable and sustainable beef production system in Sumbawa

- In 2016 the Indonesian government removed a ban on the import of Indian buffalo meat and in 2017 the Indonesian government imposed a price ceiling on frozen meat. This meant that it was no longer viable for PT Dharma to sell the premium 'herbal beef', particularly given that the premium cut only accounted for 20 per cent of the animal. This led to PT Dharma relinquishing operations of the abattoir in Sumbawa
- In light of this, UNRAM undertook a number of activities to maintain the momentum of the program:
  - Seeking out alternative beef companies — this had limited success given the small market for 'herbal beef' and the remoteness of the farmers
  - Demonstrating the improved growth rates of the new feeding strategy to local traders' associations, local traders and large farmers — traders did not have an incentive to promote Leucaena to other farmers particularly given the lack of demand for high quality beef in the markets they service
  - Facilitating loans with Bank BRI and Bank NTB for famers to support capital investments in feeding pens

Outcomes:

- Change in practices
  - Improving small holder cattle production by shifting from free-grazing to fattening animals in pens with Leucaena-based feeding which improves the animal's condition and facilitates faster weight gain
  - Linking farmers to PT Dharma ensured premium prices for farmers and guaranteed PT Dharma access to high quality and traceable product
  - Linking farmers to traders ensured higher value animals were sold

Impacts:

- Increase in income for over 2 000 farmer households who adopted the new practices, with NAIC of $2.9 million, benefiting an outreach number of 2 667 farming households
- Increased number of women involved in generally male dominated value chain receiving benefits (33 per cent female participation)
- Increased customer base for banks providing loans for capital

Lessons learnt:

- Government policy can change the viability of an intervention (e.g. promotion of herbal beef strategy for Sumbawa by the local government)
- The presence of many small traders who were willing to accept small profit margins was unexpectedly beneficial to the farmers, indicating that a large firm was not needed to make the intervention a success

Source: ARISA Activity Completion Report, 2019, A.2.

Sugar intervention

The Sugar intervention involved providing training, credit, inputs and improved market linkages to increase production of sugar on Madura, one of the top five priority crops for Indonesia (table 1.5).[2]

Key challenges to the intervention included the Government imposed price ceiling on sugar, which made transport subsidies unviable, and the PS partner's low willingness to pay for RI's research outputs, when RI was no longer receiving government funding.

2 Overview of the Strategic Plan of Indonesian Ministry of Agriculture: 2015-2019, available at: http://ap.fftc.agnet.org/ap_db.php?id=416&print=1

1.5 Sugar intervention

Partnership to support market linkages, commercialisation of innovation and enabling policy environment for sugarcane producers in Madura, East Java

Partners: Indonesian Sugar Research Institute (ISRI), PT. Perkebunan Nusantara X (PTPN X — a state-owned sugar producer, the largest sugar producer in Indonesia), University of Trunujoyo, PT Gendis Multi Manis (PT GMM)

Intervention: Provision of training, credit, inputs and improved market linkages to increase production of sugar on Madura

Opportunity for intervention:

- To meet demand for sugar in Indonesia, the Indonesia Government made sugar one of the five priority crops, with the objective of being self-sufficient in sugar by 2019. To this end, The Ministry of State Owned Enterprises charged one of its companies PTPN X with developing the sugar cane industry in Madura
- PTPN X encouraged farmers to grow sugarcane in Madura but production was low at 40t/ha compared to the national average of 70t/ha due to limited water supply and low soil productivity

Key events:

- Before 1975, farmers were legally mandated to rent land to companies for sugar production. In 1975 a Presidential Decree allowed smallholder farmers to start producing sugar cane themselves
- The partnership was initially led by ISRI in collaboration with PTPN X and the University of Trunijoyo and aimed to expand sugar cane production on Madura, improve production for existing sugar cane farmers and support farmers to switch to sugar cane from other crops (ISRI and PTPN X were previously a single entity — hence PTPN had not traditionally paid for research)
  - ISRI supported the introduction of new varieties and best management practices
  - PTPN X provided credit for the purchase of inputs and facilitated improved management of post-harvest transport, market linkages and guaranteed prices to farmers
  - The University of Trunujoyo conducted baseline and socio-economic studies to inform effective strategies for engagement with community leaders, and promotion and dissemination of information
- Historically, ISRI had supported the development of improved sugar varieties and was originally publicly funded and provided all services to the sugar industry free of charge. In 2010, ISRI was privatised and has since found it difficult to secure funding from industry. Moreover, there is no system for ISRI to collect royalties from the new varieties they have developed
- ISRI partnered with ARISA to support communication and dissemination of research to farmers and to encourage further investment by private companies into ISRI's research program
- PPTN X worked with ISRI to develop smallholder suitable technology and sought to foster smallholder cane production on Madura which it processes at mills in East Java
- PTPN X withdrew from Madura following a decrease in the price of sugar and high costs of production. This meant that the subsidies for transport and sugar content initially agreed upon were no longer feasible
- ISRI independently established a partnership with PT Gendis Multi Manis (PT GMM) who work with between 200 and 300 contracted farmers in Pameksan and Sumenep districts and have a small processing unit on Madura. PT GMM agreed to provide land for demonstration plots, credit to farmers for inputs and to purchase sugar cane at market prices while ISRI provided improved seeds and ongoing technical support

Outcomes:

- Local government in Pamekasan expressed support to develop sugarcane in the district, using the same business model and partners
- PPTN X withdrew from the partnership due to government policy induced financial constraints
- Brown sugar processing company PT GMM collaborated with ISRI to disseminate innovations for sugarcane producers around Pamekasan
- At June 2018 1 534 households had accessed training and 496 were implementing improved practices (44 per cent of beneficiaries were women)

Impacts:

- 190 households experienced an increase in income by 29 per cent (compared to control groups), and an outreach number of 406 farming households generating a NAIC of $2.1 million

Partnership to support market linkages, commercialisation of innovation and enabling policy environment for sugarcane producers in Madura, East Java
Lessons learnt: ▪ A supportive policy context and objective to attain self-sufficiency in domestic sugar production was not sufficient to maintain involvement of PTPN X ▪ The price ceiling imposed by the government was a disincentive for the private sector ▪ State Owned Enterprises appear to take the research by ISRI for granted and have a low willingness to pay for research outputs, despite this being unsustainable due to the changes in funding arrangements ▪ State owned enterprises may not necessarily be driven by public policy and social inclusion objectives which may make transitioning from State RIs into commercially run entities challenging as it is difficult to obtain payment for research

Source: ARISA Activity Completion Report, 2019, A.2.

Dairy intervention

The Dairy intervention involved promoting high-quality fodder varieties to dairy farmers and training them in animal husbandry practices to improve milk production. The intervention also assisted farmers and cooperatives to produce and sell high quality animal feed (table 1.6). Through the intervention, PS saw how the RIs research could help guarantee their milk supply. To this end the PS partner built on its pre-existing relationship with farmers and provided additional field staff to work with cooperatives and farmer groups, support farmers to grow and effectively use improved fodder varieties and contract farmers to produce fodder based on the RIs recommendations.

1.6 Dairy intervention

Fodder farming business models for smallholder dairy production in East Java
Partners: Nestle, University of Brawijaya (UB)
Intervention(s): ▪ Promote a high-quality fodder variety and good animal husbandry practices to dairy farmers to improve productivity (thereby improving incomes) ▪ Facilitate famers and coops to produce and sell high quality animal feed
Opportunity for intervention: ▪ Farm-level constraints to milk production included limited availability of good quality feed for dairy cows, low levels of milk production amongst smallholder dairy farmers, poor herd management practices, animal disease, and limited access to equipment, resulting in low levels of milk production amongst smallholder dairy farmers
Key events: ▪ Nestle has long been present in East Java and processes the most milk in the province at its Pasuruan factory ▪ Nestle provides interest free loans to enable farmers through cooperatives to purchase equipment, training on good agricultural practices and sexed-semen for breeding ▪ Nestle built on its pre-existing relationship with farmers and provided additional field staff to work with cooperatives and farmer groups, supported farmers to grow and effectively use improved fodder varieties and contract farmers to produce fodder based on recommendations from the UB (e.g. Odot grass increases milk production by 1-2 litres per day compared with feeding standard elephant grass) ▪ UB's role was to contribute to the development of the fodder supply chain including testing and demonstrating the production of a new fodder variety, establishing fodder nurseries, training farmers and over time to facilitate cooperatives and others to specialise in the supply of fodder. UB also provided bookkeeping training to coops

Fodder farming business models for smallholder dairy production in East Java
▪ The arrival of new milk processing companies in the region. Increased competition motivated Nestle to partner with UB to increase current milk production through the use of fodder and safeguard Nestle's access to milk ▪ Brokering by ARISA facilitated an additional cooperative joining the project in late 2017 and another two in 2018 ▪ ARISA successfully extended the value of the partnership, brokering added value from the partners and advice on effective entry points to foster new markets (i.e. target fodder businesses to large farmers via coops)
Outcomes: ▪ Adoption of the project practices by 2 135 farmers with 32 per cent women ▪ Development of fodder businesses by large farmers/coops
Impacts: ▪ Final outreach of 2 571 farming households, receiving a NAIC of $7.14 million ▪ Improvement in animal management and new feeding practices led to an increase in net incomes for farmers by 37 per cent due to lower costs of production, improved productivity of dairy cows and improved milk prices (associated with improved product quality) ▪ Strengthening of Nestle's milk supply
Lessons learnt: ▪ Private sector was observed to be willing to support experiments that are at the periphery of their interests, given that their primary need (of guaranteed milk supply) was met. This was seen when Nestle wanted to abandon a trial of growing Odot in the shade after preliminary results indicated it was not worthwhile. However, UB wanted to continue the trial to ensure the scientific process was conducted appropriately

Source: ARISA Activity Completion Report, 2019, A.2.

Pig intervention

The Pig intervention was a small intervention involving the development and commercialisation of high quality and inexpensive pig feed (table 1.7). This project is continuing under phase two of PRISMA.

1.7 Pig feed intervention

Pig feed development and commercialisation in East Nusa Tenggara
Partners: PT Sierad, University of Nusa Cendana (UNDANA), PRISMA
Intervention(s): ▪ Increase local farmers' access to quality pig feed at lower prices by combining local ingredients with concentrate feeds in East Nusa Tenggara
Opportunity for intervention: ▪ Lack of knowledge around the feasibility, seasonal availability and nutritional content of local feed
Key events: ▪ Feeding trials undertaken by UNDANA and PT Sierad in Kupang. This involved testing a range of local feed ingredients (including tamarind seeds, cassava and pumpkin) with feed mixes from PT Sierad
Outcomes: ▪ Commercialisation of candidate feeds ▪ Demonstration sites established
Impacts: ▪ Access to improved pig feed for farmers

Lessons learnt:

- Not yet identified — Project is ongoing as part of phase two of PRISMA

Source: ARISA Activity Completion Report, 2019, pp 9-10.

Shallots intervention

This intervention in shallots involved the development of an integrated pest management system (table 1.8). Social and cultural barriers to adoption limited the scalability of this project.

1.8 Shallots IPM intervention

Developing and scaling out integrated pest and disease management practices for shallot produces in East Java
Partners: PT NuFarm, IPM technologies from Australia, PRISMA, University of Gadjah Mada (UGM)
Intervention(s): ▪ Integrated Pest Management (IPM) system for shallots using soft pesticides, biological controls and physical control of insects and diseases
Opportunity for intervention: ▪ Shallots rank third amongst all vegetable crops in terms of cultivated area and East Java is the second largest producer in Indonesia. ▪ Typical pest management is a schedule of up to 90 pesticide applications during the growing season. This has resulted in pest resistance to chemicals, economic losses, environmental issues and health concerns for farmers and consumers.
Key events: ▪ PT NuFarm co-invested in a number of demonstration sites in Probolinngo, Pare and Nganjuk for the promotion of IPM for dry season shallot production ▪ UGM conducted field studies including the testing of pheromone traps for the management of *Spodoptera exigua* ▪ Social marketing events held in the intervention areas by PRISMA, in collaboration with CropLife, local government and a range of input suppliers, including PT NuFarm. The events focussed on pesticide stewardship, IPM and disease management and good agricultural practices.
Outcomes: ▪ Proof of concept of a pheromone trap ▪ Adoption of the IPM system by farmers including the Bt product supplied by PT NuFarm
Impacts: ▪ Outreach of 2 276 farming households
Lessons learnt: ▪ Social and cultural barriers limited the scale-up of the intervention. Exposing large number of farmers to the new technologies through one-off field days and social marketing campaigns was not found to be effective for promoting adoption of a complex suite of technologies to ensure IPM was effective

Source: ARISA Activity Completion Report, 2019, p 9; ARISA Semester Report No. 6, January 2018; AIP-PRISMA, see https://www.aip-prisma.or.id/aip-rural/en/arisa/commoditiesdetail/20

2 *Impact pathway for ARISA*

A total of $10.7 million was invested in ARISA including $6.3 million from DFAT, $1.6 million in kind contribution from the CSIRO, and $2.8 million in leveraged investment from RI and PS. The main CSIRO led activities included developing and supporting the RI-PS partnerships (instigating partnership development and providing partnership support), building innovation capacity at the institutional level (capability building for RIs to develop commercialisation units), supporting policy change by RISTEKDIKITI and ongoing monitoring and evaluation of the interventions and partnerships to assess the outcomes of ARISA against DFAT's KPIs

This provided new ways to disseminate knowledge to smallholder farmers, improvements to supply chains for agricultural products, and new pathways for farming households to access credit.

At the institutional level, it enabled new approaches to transforming research to practice, catalysing adoption of research, provided new platforms and networks to promote RI and PS partnerships, new incentives for engagement between PS, RIs and smallholder farmers, and a realignment of research outputs with market needs.

As a result, new technologies were purchased, new techniques were adopted by smallholder farms, and there was uptake of finance/loans by smallholder farmers, particularly women.

ARISA also increased the likelihood of the application of new knowledge, the scalability and accelerated adoption of research through RI-PS partnerships, a shift in partnerships from resources exchange to collaborations with financial benefits for both partners, and longevity of activities and impacts.

ARISA is accredited with improved livelihoods of smallholder farmers, empowerment of rural women, removal of barriers to PS activity, the development of a replicable model for fostering RI-PS partnerships, systemic change to support commercialisation of science, and realisation of the strategic objectives of CSIRO and DFAT.

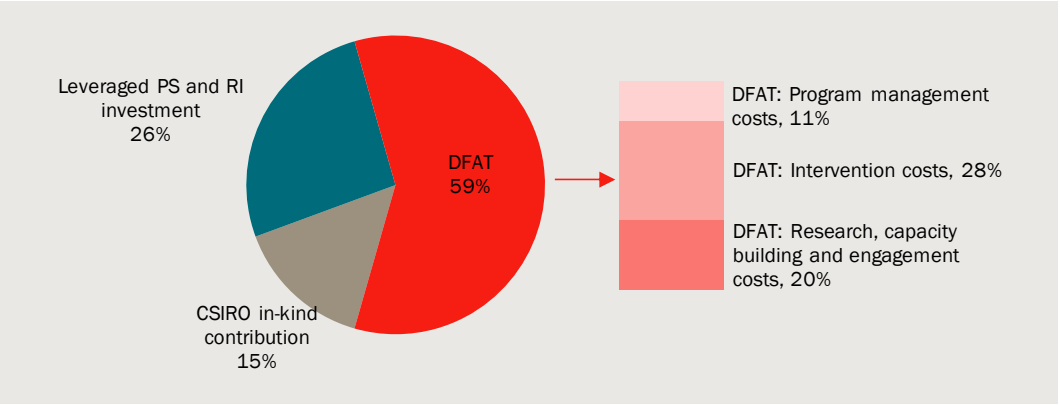
Inputs

The key inputs to ARISA include:

- $6.3 million of funding provided by DFAT allocated to:
  - intervention costs (47 per cent of funding)
  - research, capacity building and engagement activities with RIs, the PS and RISTEKDIKTI (34 per cent of funding), and

  - program management, including for the Monitoring, Evaluation and Learning manager (19 per cent).
- $1.6 million of in-kind funding provided by CSIRO for overhead costs of CSIRO staff engaged in the project
- $2.8 million of leveraged PS and RI investment in the interventions, and
- investment from smallholder farms (not quantified) (chart 2.1).

2.1 Investment in ARISA



Note: RI= Research Institute; PS= Private sector; DFAT= Department of Foreign Affairs and Trading

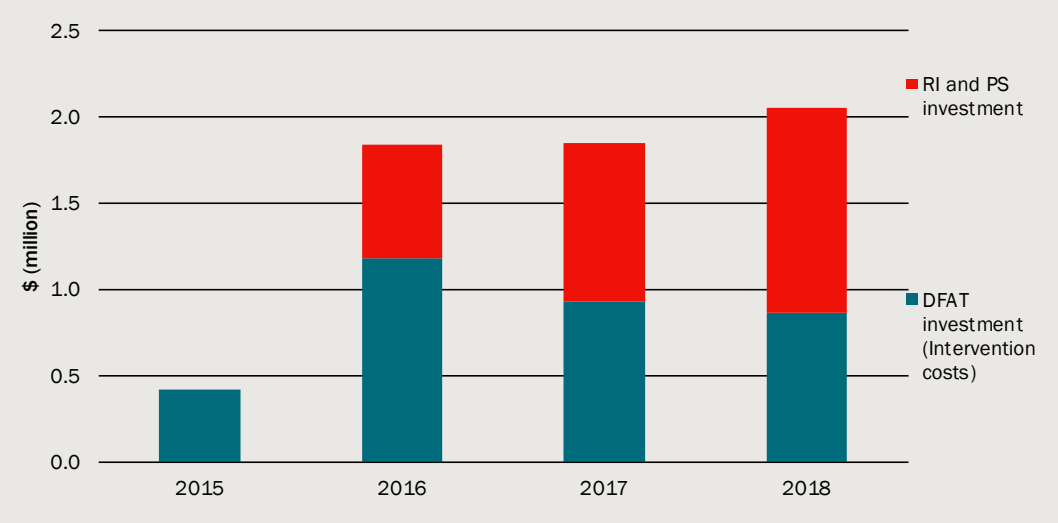
Data source: ARISA Activity Completion Report, 2019, p 33.

Investment in interventions from the PS and RIs increased each year reflecting growing confidence in the interventions and realisation of benefits over time (chart 2.2). Investment from the private sector comprised 80 per cent of partner investment.[3] Over the life of the project, Syngenta invested over $1.8 million in the maize intervention, PTPN X and PT GMM invested $80 300 in the sugar intervention, PT NuFarm invested $34 200 in the integrated pest management intervention, PT BCM invested $188 000 in processing clusters for the cassava intervention, Pt Sierad invested $28 000 and Nestle invested ~$94 438 in the diary intervention.[4]

3 ARISA Activity Completion Report, 2019, p 20.

4 ARISA Milestone Report, July to December 2018.

2.2 Investment in ARISA interventions



Note: RI= Research Institute; PS= Private sector

Data source: ARISA Activity Completion Report, 2019.

The ARISA team was comprised of:

- part-time Australian based staff including a Project Leader, a Project Coordinator, agricultural innovation system researchers, a value chain analyst/economic modeller, a intermediator and RISTEKDIKITI coordinator and a communication and finance manager, and
- Indonesian based staff including a Country Manager, an Intervention manager, an administration manager, a Monitoring, Evaluation and Learning (MEL) manager and support staff, a gender mainstreaming position (shared with MEL) and a RISTEKDIKITI liaison officer.[5]

Table 2.3 presents a summary of the managerial roles within the ARISA team.

2.3 Management structure of ARISA

Role	Description
Project Team Leader and Project Coordinator	▪ Overall management of the program, including financial ▪ Australian-based CSIRO staff member ▪ Reported to the Deputy Program Director of AIP-Rural ▪ Quality assurance ▪ Coordinator internal and external stakeholder engagement ▪ Project co-ordinator also responsible for capacity building programme and gender mainstreaming
In Country Manager	▪ In-country team leader based on Surabaya, Indonesia ▪ Reported to the Project Team Leader ▪ Responsible for establishing and managing the small grants scheme – Negotiation between project partners

5 ARISA Activity Completion Report, 2019, pp 33-34.

Role	Description
	– Assessment of project proposals – Capacity building – Supervision of in-country project team ▪ Supervised the results measurement system ▪ Supervised in country staff
Intervention Manager	▪ Directed private sector engagements ▪ Developed RI skills in approaching, pitching and negotiating with the PS
Monitoring, Evaluation and Learning (MEL) Manager	▪ In-country team leader based on Surabaya, Indonesia ▪ Reported to the Grants Manager ▪ Oversaw establishment of the results measure framework ▪ Responsible for the day-to-day implementation of the results measurement system with MEL Officers – Capacity building e,g, measuring attribution – Reporting on portfolio quality ▪ Promoting project impact ▪ Management of 2 MEL staff

Source: ARISA Draft Design Document, July 2014, p 37; ARISA Activity Completion Report, 2019, pp 33-34.

Activities

The activities led by ARISA can be categorised into three categories:

- pilot interventions — developing and supporting the partnerships between RIs and the PS through pilot studies
- building innovation capacity at the institutional level — the development of commercialisation units at RIs, and demonstrating the learnings from the model to RISTEKDIKTI, and
- policy dialogue and capacity building to increase government capability to support innovation in research institutions and across wider innovation systems.

In addition, monitoring and evaluation was undertaken at both the partnership level and for each of the interventions.

Developing and supporting the partnerships between RIs and the PS

At project commencement, expressions of interest (EOI) were sought from prospective RIs and PS firms for interventions that aligned with the overarching AIP-Rural goals of poverty reduction amongst smallholder farmers in the target provinces. Eligibility criteria for RIs and the PS are summarised in table 2.4.

ARISA personnel conducted a series of roadshows in Indonesia to explain the grants process. The EOI templates were available in English as well as Indonesian and applicants were able to submit in their preferred language.[6]

6 ARISA Semester Report No.2, December 2015, p 44.

2.4 ARISA RI and PS eligibility criteria

Partner	Eligibility criteria
Research Institute	▪ Willingness to reach out to the private sector and collaborate on the commercialisation of innovation ▪ Located in either eastern Indonesia or with significant research capacity in the region ▪ Demonstrated willingness and a plan for developing institutional capacity for market facing research and collaboration ▪ Ability to propose innovation ideas and partnership ideas with relevant agribusinesses ▪ Human and infrastructure capacity to conduct agricultural innovation systems research ▪ Willingness to co-invest (in-kind or financially) in own institutional development and in collaborative partnerships
Private sector	▪ Interest to commercialise an innovation that adhered to the projects criteria of increasing income for smallholder farmers ▪ Willingness to co-invest with RIs in the development and dissemination of the innovation ▪ Capacity to participate in the collaboration both in the innovation's development as well as its dissemination

Source: ARISA Draft Design Document, July 2014, pp 31-32.

Partnership development

The partnership development activities undertaken by ARISA included:

- delivery of a series of introductory workshops to teach RIs and the PS about how a partnership works, what a partner is and the benefits of partnerships, which resulted in a non-binding partnership agreement, documenting roles and responsibilities, individual and joint expectations and risks, contributions, communications and governance structures
- capacity building workshops on research ethics and social inclusion (e.g. inclusion of women in the workforce and in decision making), and
- workshops to facilitate PS and RI development of a business model including the design of a results chain to map out the activities planned by partners and how these are expected to lead to outcomes and impacts.

The RI-PS partnerships facilitated by ARISA are presented in table 2.5.

2.5 RI-PS partnerships facilitated by ARISA

Project	Research Institute Partners	Private Sector Partners
Maize-Pulse intervention, increasing credit and input access to support smallholders	▪ University of Mataram	▪ Syngenta (agrochemical company) ▪ Bank NTB
Partnership for the development of integrated cassava farming systems and modified cassava flour (MOCAF) chip clusters	▪ University of Jember	▪ PT Bangkit Cassava Mandiri (MOCAF processor)
Partnership to develop a profitable and sustainable beef production system in Sumbawa	▪ University of Mataram	▪ PT Dharma (beef company)

Project	Research Institute Partners	Private Sector Partners
Sugar intervention, partnership to support market linkages, commercialisation of innovation and enabling policy environment for sugarcane producers in Madura, East Java	▪ Indonesian Sugar Research Institute	▪ PT GMM (no formal partnership but a memorandum of understanding was signed)
Fodder farming business models for small holder dairy production in East Java	▪ University of Brawijaya	▪ Nestle

Note: RI= Research Institute; PS= Private sector

Source: ARISA Activity Completion Report, 2019, A.2.

Partnership support

The partnership support activities undertaken by ARISA included:

- a CSIRO-led capacity building program in Brisbane in May 2017. The program involved[7]:
  - workshops on customer engagement, funding, relationship building, negotiating and intellectual property and legal considerations
  - on-farm visits to demonstrate the benefits of value-add processing and agricultural irrigation
  - a visit to a mine site to demonstrate how to rehabilitate land post mining activity for use in livestock production
  - a presentation by technology transfer company Uniquest who commercialise research from the University of Queensland and work to ensure sustainability of research outcomes and that social and environmental benefits of research are realised
- organising peer-to-peer learning events between RIs where 'institutional entrepreneurs' shared their experiences about partnerships and firms share their experiences of working with RIs
- training RIs on customer engagement focussing on the value add of research, pitching ideas to the PS and negotiating deals
- innovation fairs where researchers pitched their research to companies to receive feedback and potentially develop relationships
- 6-monthly reflective partnership meetings
- annual meetings for RI and PS participants to share their experiences and learn from each other
- CSIRO staff worked with partners on an ongoing basis to refine and update the business model as circumstances changed or the partnership evolved, and
- CSIRO staff acted as an intermediator between partners to support cohesion and the realisation of targets and goals (e.g. targeting 10 000 households).

7 The visit was attended by representatives from the University of Jember, Mataram University, Brawijaya University, the Indonesia-P3GI Sugar Plantation Research Center, Pasuruan, RISTEKDIKTI and the CIPG Institute.

Development of commercialisation units at RIs

In early 2017, both UNRAM and UNEJ confirmed their interest in establishing intermediation units to help them engage more effectively with the PS and support the commercialisation of research.[8]

ARISA provided support to both institutions through exposing the intermediation unit personnel and researchers to other intermediation units in Australia and Indonesia and through facilitating capacity building exercises:

- ARISA undertook comparative advantage assessments in Lombok in April 2017 and East Java in August 2017 to help the intermediation units identify their comparative advantage, as well as key business opportunities in the region and to set the foundation for intermediation unit establishment and engagement with the PS going forward.
- ARISA conducted Customer Essential Engagement Training in Australia in April 2017. This two-day intensive workshop trained researchers in how to interact with the business environment. Participants also attended a presentation by technology transfer office, Uniquest who commercialise research from the University of Queensland and works to ensure sustainability of research outcomes and realisation of the social and environmental benefits of research.
- ARISA co-hosted a learning exchange in February 2018, where RISTEKDIKTI, UNRAM and UNEJ staff participated in cross-visits and discussions with established intermediation units in Java.
- ARISA co-hosted workshops between RISTEKDIKTI, UNRAM and UNEJ. For example, a workshop on establishing an intermediation unit was conducted in June 2018, and a second workshop was held in November 2018 to allow UNRAM and UNEJ to share their experiences in establishing their intermediation units.
- ARISA organised ongoing mentoring for the UNRAM and UNEJ intermediation unit teams through CSIRO's Small and Medium Enterprise engagement team, CSIRO's Innovation systems team and private consultancy - Innovation Impact Group (IIG).

Building capacity of RISTEKDIKTI

In January 2017, ARISA began working with RISTEKDIKTI (The Ministry of Research, Technology and Higher Education) to build the skills of RISTEKDIKTI staff in innovation policy development.

ARISA and RISTEKDIKTI developed a policy priority for the establishment of intermediation units for semi-autonomous institutions, innovation clusters and Planning, Monitoring, Evaluation and Learning strategies.

A timeline of key activities undertaken by ARISA with respect to this objective is presented in table 2.6.

8 ARISA Activity Completion Report, 2019, pp 5, 23-24.

2.6 Timeline of events focussing on building capacity of RISTEKDIKTI

Date	Activity
February 2017	▪ Planning, Monitoring, Evaluation and Learning workshops to: – share approaches and past experiences in incentivising and orchestrating RI-PS collaborations – understand RISTEKDIKTI programs – learn from the findings from the European Union- Indonesia Trade Cooperation Facility project – discuss lessons from ARISA through Donor Committee for Enterprise Development and other Monitoring, Evaluation and Learning systems
April 2017	▪ Planning, Monitoring, Evaluation and Learning workshops to plan the establishment of intermediation units to facilitate research interactions with the PS
December 2017	▪ RISTEKDIKTI Director and key staff participated in a study tour to Australia where they were exposed to programs and innovation schemes in Canberra and Brisbane
February 2018	▪ ARISA partnered with RISTEKDIKTI to run an Indonesia intermediation unit cross-visit, a learning exchange involving the Bogor Agricultural University, Institute of Technology Bandung (ITB), Gadjah Mada University (all autonomous universities), UB and UNRAM (semi-autonomous universities), and UNEJ (state-controlled university). This provided an opportunity for ARISA to mentor RISTEKDIKTI in: – evaluating the strengths, weaknesses, opportunities and challenges experienced by current intermediation units – how to critically reflect on ways to improve arrangements to support the establishment of new units – supporting UNEJ and UNRAM to learn from other universities about intermediation unit establishment
June 2018	▪ ARISA and RISTEKDIKTI co-facilitated a workshop on the establishment of the intermediation unit at UNRAM. RISTEKDIKTI received insight into the regulatory constraints semi-autonomous universities face in establishing intermediation units.
November 2018	▪ ARISA partnered with RISTEKDIKTI and Innovation Impact Group (IIG) to run a mentoring workshop on how to engage with the private sector, identifying the strategic priorities of UNRAM based on the comparative advantage studies. This supported RISTEKDIKTI's understanding on how to support intermediation units and researchers through their programmes and incentives.
February 2019	▪ ARISA partnered with RISTEKDIKTI to run a workshop to support the Innovation Cluster and Management programme. Participants included local and provincial government, the PS and RIs. RISTEKDIKTI gained experience in how to broker relationships across multiple sectors.

[a] The visit was also attended by representatives from the University of Jember, Mataram University, Brawijaya University, the Indonesia-P3GI Sugar Plantation Research Center, Pasuruan and the CIPG Institute.

Source: RISTEKDIKTI media release May 2017, available at: https://ristekdikti.go.id/kabar/kunjungan-arisa-partners-ke-australia/; ARISA Activity Completion Report, 2019, pp 25-26.

Monitoring and evaluation of the partnerships and interventions

From project inception, ARISA involved extensive data collection to measure progress towards key performance indicators (KPIs) (table 2.7). ARISA's monitoring and results measurement system was based on the results measurement standard of the Donor Committee for Enterprise Development (DCED). This standard aligns with DFAT Monitoring and Evaluation Standards 1, 2 and 3, and enabled consistent use of a common set of KPIs across all interventions and with the three other AIP-Rural programs (PRISMA, SAFIRA and TIRTA).[9]

9 ARISA Activity Completion Report, 2019, p 5.

Surveys were conducted at the commencement of each intervention and every 6 to 12 months thereafter. For each intervention this included:

- the number of farming households accessing innovation
- the number of farming households using innovation
- the number of households with increased net incomes
- increase in income, and
- percentage of female farmer.

2.7 ARISA Key Performance Indicators

KPI	Description
1a	Change in *innovation capacity* of research institute intervention team
1b	Change in *innovation capacity* of targeted research institute faculty
2	Progress toward establishing policy dialogue mechanism to engage in learning from innovation at the RI-PS interface
3	Net additional and attributable income changes of farmer household using project-supported innovations
4	Number of farming households who have adopted the project innovation (use)
5	Number of farming households who have been exposed to the project innovation (access)

Source: ARISA intervention workbooks.

Outputs, outcomes and impacts

The outputs, outcomes and impacts as they relate to the specific interventions and institutional development are presented in chart 2.8. These fall into the following themes:

- interventions — increasing incomes for farming households
- innovation capacity — achieving change in innovation capacity at the RI and government level.

Outputs

The outputs of ARISA at the intervention level include:

- new ways to disseminate knowledge to smallholder farms
- publications and educational materials
- improvements to value chains for agricultural products, and
- new pathways for farming households to access funding and credit.

The outputs of ARISA at the innovation capacity level include:

- new approaches to transforming research to practice, catalysing adoption and commercialisation of research
- new platforms and networks to promote RI and PS partnerships
- new incentives for engagement between PS, RIs and smallholder farms, and
- realignment of research outputs with market needs.

Outcomes

The outcomes of ARISA at the intervention level include:

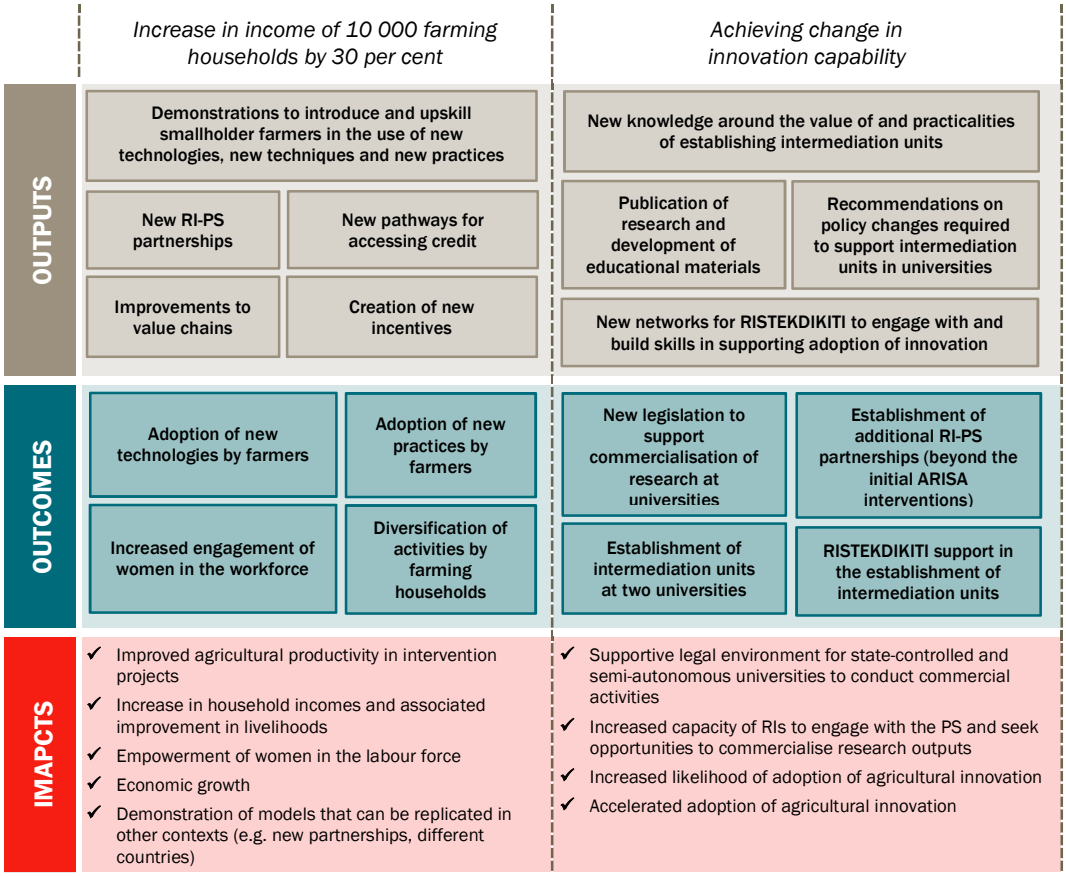
- new technologies purchased and new techniques and approaches adopted by smallholder farms
- uptake of finance/loans by smallholder farmers, and
- increased participation of women.[10]

The outcomes of ARISA at the innovation capacity level include:

- increased likelihood of application of new knowledge
- scalability and accelerated adoption of research outputs/agricultural innovations through RI-PS partnerships
- shift from partnerships based on transactional exchanges of resources to collaborations with financial benefits for both partners
- increased likelihood of sustainability and longevity of activities and impacts
- experimentation with a variety of research commercialisation modalities (e.g. consulting, internships, embedding researchers)
- changes to regulation, and
- capacity building of RISTEKDIKTI staff on modes of research and commercialisation.

10 Cosijn., M. et al, 'What is possible in women's economic empowerment at the research business interface: the story of innovation in agricultural systems in Indonesia', available at: https://www.slideshare.net/CGIAR/what-is-possible-in-womens-economic-empowerment-at-the-research-business-interface-the-story-of-innovation-in-agricultural-systems-in-indonesia

2.8 Outputs, Outcomes and Impacts



Data source: The CIE and ARISA.

Impacts

The impact of ARISA in supporting RI-PS partnerships includes the actual and potentially measurable effects associated with the interventions and institutional change:

- improved livelihoods of smallholder farmers
- empowerment of women in the rural workforce
- systemic change to support the commercialisation of science through institutional change and policy influence
- development of a replicable model for fostering RI-PS partnerships
- meeting the strategic objectives of CSIRO and DFAT
- removing barriers to PS activity, and
- economic growth.

These impacts are discussed in detail in the following chapter.

3 Measuring the impact of ARISA

The interventions facilitated through ARISA led to an increase in income for 11 156 rural households (0.7 per cent of rural households in West Nusa Tengarra and 0.1 per cent in East Java).

By the end of the project ARISA had a total outreach of 11 144 households, of which 75 per cent were below the AUD 2.50 poverty line and 27 per cent earning below AUD 2.00 per day. Net attributable income was AUD 21.9 million (117 per cent more than would otherwise have been the case, attributable to ARISA).

When considering total investment in ARISA alongside the net attributable increase in income of impacted farm households and the value of additional turnover of intermediary services providers or SMEs, the net benefit of ARISA equates to $13.7 million, or, a benefit cost ratio of 2.3.

ARISA made headway in empowering women in the agricultural sector, most notably, in the maize intervention where 231, or 32 per cent of loans initiated were issued to women. In the absence of ARISA, these women would have not been able to access credit. The Dairy and Beef interventions also supported the empowerment of women through increasing participation and engagement in otherwise male dominated commodities.

The capability strengthening exercises held with RISTEKDIKITI have led to a number of legislative reforms through the *Regulation on Innovation Management in Higher Education* which allows and creates incentives for universities to interact with the PS. RISTEKDIKITI also began directly engaging with RIs to implement and support the regulation changes in practice.

UNRAM and UNEJ have independently established and are pursuing new PS partnerships across a range of agricultural commodities including palm oil, coffee, cocoa, tea, sugar, seeds, spices and beef.

CSIRO are applying the learnings from ARISA in a newly established partnership between DFAT, CSIRO and the Vietnamese Ministry of Science and Technology under the Aus4Innovation program. The project involves identifying emerging areas of technology and digital transformation, trialling new models for partnerships between agriculture and public and private sector institutions, and strengthening Vietnamese capability in digital horizon scanning, scenario planning and commercialisation and innovation policy.

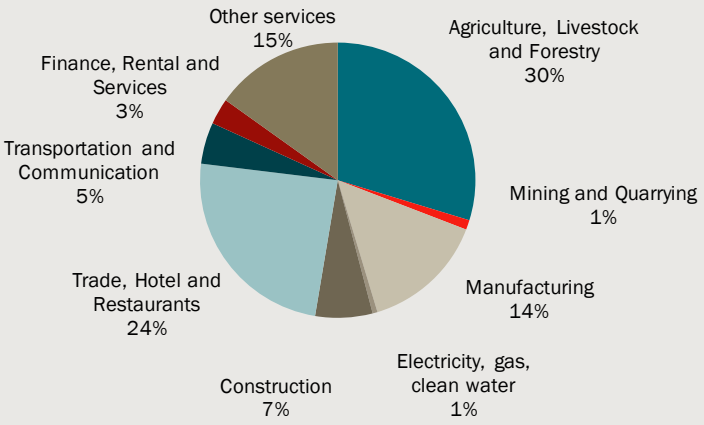
ARISA has also strengthened the PS, which generates around 90 per cent of jobs, funds more than 60 per cent of investment, comprises around 80 per cent of government revenue in low- and middle-income countries, and is the main producer of exports.

Supporting RIs to commercialise their research will support the revival of R&D in Indonesia. This is critical as firms in Indonesia spending money on R&D is substantially below the Asia-Pacific average (1.9 per cent of firms, compared to 14.9 per cent regionally, and 22 per cent globally).

Improving livelihoods of the rural population

Employment in agriculture accounts for 30 per cent of the Indonesian population and was the largest sector by employment contribution in 2017 (chart 3.1).

3.1 Employment by industry in Indonesia in 2017



Data source: Arifin, B. et al. 2018, 'Profitability and Labour Productivity in Indonesian Agriculture', available at: http://documents.worldbank.org/curated/en/739411554283544226/pdf/Profitability-and-Labor-Productivity-in-Indonesian-Agriculture.pdf

There were 5 420 households in West Nusa Tengarra and 5 736 households in East Java that experienced an increase in income due to the RI-PS partnerships facilitated by ARISA (table 3.2). This represents 0.7 per cent of rural households in West Nusa Tengarra and 0.1 per cent of households in East Java (table 3.3).

3.2 Number of households impacted by ARISA, by region

Project	No. households that experienced an increase in income
	No.
West Nusa Tengarra	
Beef intervention	2 667
Maize intervention	2 753
Total	**5 420**
East Java	
Dairy intervention	2 571
Cassava intervention	483
Sugar intervention	406
Integrated pest management intervention (shallots)	2 276

Total	**5 736**

Source: Intervention DFAT indicators reports

3.3 Proportion of households impacted by ARISA, by region

Project	No. households that experienced an increase in income	Total number of households in region	Rural households as a proportion of all households	Total number of rural households in region	Proportion of rural households in region impacted
	No.	No.	Per cent	No.	Per cent
West Nusa Tengarra	5 420	1 344 000	54.6	733 824	0.7
East Java	5 736	10 738 900	48.9	5 251 322	0.1

Note: Based on 2015 household statistics

Source: Intervention DFAT indicators reports; https://www.neliti.com/publications/51222/number-of-households-by-province-2000-2015; https://www.bps.go.id/statictable/2014/02/18/1276/persentase-penduduk-daerah-perkotaan-menurut-provinsi-2010-2035.html

The total costs of ARISA were $10.7 million over 4 years and the total benefits were $24.4 million (table 3.4). Benefits reflect net attributable income increases of all farm households and the value of additional turnover of intermediary service providers or small-medium enterprises. This equates to a net benefit of $13.7 million and a benefit cost ratio of 2.3 — for every $1 of investment there was $2.30 of benefits.

3.4 Value of improving livelihoods of the rural population

Measure	Value
	$ (million)
Costs	
DFAT direct investment	6.3
CSIRO in-kind contribution	1.6
Leveraged PS and RI investment	2.8
Total investment	**10.7**
Benefits	
Net attributable income increases of all farm households	20.6
Value of additional turnover of intermediary service provider or small medium enterprises	3.8
Total benefit	**24.4**
Net Benefit and BCR	
Net Benefit	**13.7**
Benefit Cost Ratio	**2.3**

Note: converted from IDR at a rate of 10638 (average 2018 IDR to AUD exchange rate, Reserve Bank of Australia)

Source: The CIE, based on DFAT indicators for the Dairy, Beef, Cassava, Maize, Sugar and integrated pest management interventions

Systemic change to support the commercialisation of science

ARISA facilitated and promoted systematic change at both the institutional and government level including:

- **RIs** — Through providing training and access to other intermediation units, ARISA supported the establishment of intermediation units at both the UNRAM and UNEJ. This provides a mechanism for researchers to transform the new knowledge or technology developed from their research to a commercial and/or scalable product or technique.
- **Government** — The capability strengthening exercises held with RISTEKDIKITI influenced legislative reforms through the *Regulation on Innovation Management in Higher Education* which allows and creates incentives for universities to interact with the PS. This includes:
  - enabling the leaders of Higher Education research institutes to engage with businesses
  - enabling non-autonomous universities to establish cooperation, networking and strategic partnerships
  - shifting the assessment of RI performance based on innovation performance (in addition to lecturing, publications and community impact), and
  - allowing universities to raise revenue from products and services resulting from innovation management (box 3.5).[11]

When considered within the context of economic growth, these changes will have substantially long-term benefits for Indonesia through leveraging research into the private sector — which in developing countries generates around 90 per cent of jobs, funds more than 60 per cent of investment, comprises around 80 per cent of government revenue in low- and middle-income countries and is the main producer of exports.[12] Moreover, investment in R&D is markedly limited in Indonesia, with the proportion of firms that spent money on R&D in 2015 at 1.9 per cent, compared to an average of 14.9 per cent for all countries in East Asia and the Pacific and an international average of 22 per cent.[13]

Hence, supporting RIs to commercialise their research will contribute to support the revival of this weak R&D environment. Moreover, through research being commercialised, the scale of access farmers have to new technologies, processes, finance and ways of aggregating produce will increase, which increases the economic benefit and value to farmers. The focus on women also helps ensure increased share of benefit for women.

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11 ARISA Activity Completion Report, 2019, A.4.

12 Department of Foreign Affairs and Trade. 2014, 'The role of the private sector in supporting economic growth and reducing poverty in the Indo-Pacific region', *Submission to the Joint Standing Committee on Foreign Affairs, Defence and Trade*, p 12.

13 It is noted that a better regional comparison would be Asia-only, however this is not reported. See the World Bank Enterprise Surveys, Country Profile: Indonesia — innovation and technology indicator, available at: https://www.enterprisesurveys.org/en/data/exploreeconomies/2015/indonesia#innovation-and-technology

3.5 Learnings from ARISA for RISTEKDIKTI

RISTEKDIKTI reported that the reform of the *Regulation on Innovation Management in Higher Education* was directly influenced by the field trip to Australia, the cross-learning visits to intermediation units at universities in Indonesia and ongoing discussions. These activities demonstrated:

- the importance of including strategic planning for intermediation units
- the importance of planning, monitoring and evaluation
- the importance of having different capabilities in the business unit, e.g. private sector experience and skills, and
- mentoring as a way of building capacity.

The change in regulation has been accompanied by direct activities undertaken by RISTEKDIKTI to support RIs to commercialise research.

- Since early 2018, RISTEKDIKTI has played a key role in supporting UNRAM establish their commercialisation unit (UIIK). This included holding two capability building workshops in 2018 (supported by ARISA) which involved UNEJ sharing their experiences with UNRAM and RISTEKDIKTI on establishing an intermediation unit.
- RISTEKDIKTI committed to continuing to support UNRAM beyond the life of ARISA through the Academia Link Industry program which seeks to bridge the gap between research and industry.
- In January 2019 RISTEKDIKTI presented a workshop on the new innovation policy to all universities in Indonesia.
- RISTEKDIKTI identified Lombok as a pilot site for an Innovation Cluster and Management Programme which is being rolled out in Indonesia based on the foundational work undertaken in ARISA. In February 2019, RISTEKDIKTI co-hosted a workshop with UNRAM on the establishment of innovation clusters in Lombok, particularly agri-tourism clusters. While CSIRO staff attended the workshop, it was delivered and funded by RISTEKDIKTI with the intention of continuing the work of ARISA beyond the life of the project.

Source: ARISA Milestone Report, July to December 2018, p 9,12.

Replication of the ARISA model in other projects

Establishment of new RI-PS partnerships

At December 2018, UNEJ and UNRAM had independently established or were actively pursuing 16 PS partnerships (table 3.6).

In addition, UNEJ has developed a partnership with a Swiss company to assist in developing the cassava processing technology in their Nigerian mill based on the technology used in the cassava intervention.

3.6 New RI-PS partnerships

Company	Sector	Status of partnership (December 2018)	Description
UNEJ			
PC Ketapang II LTD	Energy and Natural Resources	Signed	▪ A research project to support partner interest
PT Astra Agro Lestari, Tbk.	Palm Oil Production	Signed	▪ Student internships ▪ Alumni replacements ▪ Development of a collaborative research proposal
PT Perkebunan Nusantara XII	Estate crops company (Coffee, Cocoa, Tea, Sugarcane	Final step, waiting for signing ceremony	▪ Student internships ▪ Upskilling farmers in Bondowoso on coffee innovations in production, processing and packaging
PT Industri Gula Glenmore	Sugarcane	In Progress	▪ Development of a collaborative research proposal
PT Perkebunan Nusantara X	Estate crops company (Coffee, Cocoa, Tea, Sugarcane)	Signed	▪ Student internships ▪ Some collaborative research is running
PT BASF Indonesia	Agro-chemical	Signed	▪ Student internships ▪ Collaborative demonstration plots ▪ Development of a collaborative research proposal
PT Mitra Tani Dua Tujuh	Frozen Vegetables	In Progress	▪ Development of a collaborative research proposal
CV Rahmat Tani	Seeds	In Progress	▪ Student internships ▪ Development of a collaborative research proposal
PT. Benih Citra Asa	Seeds	In Progress	▪ Student internships ▪ Development of a collaborative research proposal
DSAP Group	Palm oil	Not Available	▪ Advisory Services
PT. Sumber Inti Pangan	Spice and flavouring	Not available	▪ Technology transfer
PT. Tiga Pilar Sejahtera (PT. BCM)	Food processing	Not available	▪ Technology transfer ▪ Student internships ▪ Some R & D projects, funded by external agencies
PT. East West Seed Indonesia	Seeds	In Progress	▪ Some collaborative research proposals are running ▪ Student internships ▪ A collaborative community engagement is running
UNRAM			
PT Bisi	Seeds	Ongoing	▪ Collaborative research

Company	Sector	Status of partnership (December 2018)	Description
			▪ Community engagement ▪ PT Bisi (located on Lombok island) approached UNRAM to assist them in developing a model to distribute their maize seed varieties and to obtain loans for farmers from Bank NTB. ▪ PT Bisi were interested in adopting a model similar to that used by UNRAM, Syngenta and Bank NTB in the maize intervention. ▪ PT Bisi supported the training of extension staff in UNRAM's intercropping research.
Bank NTB	Finance for maize, horticulture and beef (including IndoBeef)	Ongoing	▪ Community engagement ▪ Research adoption
Bank BRI	Finance for beef (including IndoBeef)	Ongoing	▪ Community engagement ▪ Research adoption

Source: ARISA Milestone Report, July to December 2018, p 6.

Application in Vietnam

The learnings from ARISA are being applied in a newly established partnership between DFAT, CSIRO and the Vietnamese Ministry of Science and Technology.[14] The objective of the partnership is for Australia to contribute to a strengthened innovation system that supports Vietnam's continued economic growth and achievement of the Sustainable Development Goals (particularly with regard to food and nutrition security, poverty reduction and environmental sustainability).[15]

The partnership, called the Aus4Innovation partnership was established in January 2019 and will work to facilitate the exploration of emerging areas of technology and digital transformation, trial new models for partnerships between agriculture and food public and private sector institutions, and strengthen Vietnamese capability in digital horizon scanning, scenario planning and commercialisation and innovation policy. Specifically, ARISA has influenced the Science and Commercialisation Partnership (SCP) component of Aus4Innovation.

The intended outcomes of the SCP align with the goals and outcomes of ARISA. These include:

- a strengthened National Commercialisation program and guidance for science commercialisation intermediaries
- network of agriculture and food innovation system actors at a national and local level, for instance, scientific experts, coaches and mentors, intermediaries, agribusinesses, and policy makers, and

14 CSIRO, 'Science Commercialisation Partnerships Project Overview'.

15 See https://sustainabledevelopment.un.org/?menu=1300

- more effective commercialisation and partnership approaches between university and RIs and the PS to facilitate the application of scientific knowledge, such as innovation clusters and agri-business platforms.

The program involves a combination of education and learning modules, practical learning and best practice and evidence-based analysis to develop a science commercialisation capacity building program, pilot ten projects and assess different methods for commercialisation and partnership of agriculture and food knowledge and technology in Vietnam.

Benefits to CSIRO

The benefits of ARISA to CSIRO include:

- demonstrated success in delivery of multi-million dollar complex agricultural innovation systems at a country level
- showcasing the value of embedding and resourcing data collection for monitoring and evaluation from the outset of the program
- change in practice and capacity building within CSIRO in terms of showcasing CSIRO's innovation and partnership brokering capability
- expanding core research capability and practice in agricultural innovation systems, and
- meeting a selection of CSIRO's impact categories (table 3.7).

An evaluation of ARISA using CSIRO's National Benefit Scorecard is presented in Appendix A.

3.7 Meeting CSIRO's impact categories

Impact type	Description of category	Relevant ARISA impact
Economic impact categories		
Policies and programs	The capability to influence or change the coordination and governance of social, economic and environmental policies and programs, for example, better return on investment and reduction in green and red tape.	▪ Systematic and institutional change to support the commercialisation of science
Social impact categories		
Access to resources, services and opportunities	Access to new or improved knowledge and improved knowledge management and participation in social and economic life	▪ Improving livelihoods of the rural population
Quality of life (security and livelihoods)	The degree of wealth and material comfort available	▪ Improving livelihoods of the rural population
Innovation and human capital (creative and invention)	Contribution to a society from production of inventions, design and cultural programmes as well as embodying knowledge, inspirations, aesthetics and symbolic. Human capital is productive wealth embodied in labour, skills and knowledge.	▪ Systematic and institutional change to support the commercialisation of science

Note: Only impact categories relevant to ARISA have been presented
Source: CSIRO Impact Evaluation Guide, November 2015, Strategy, Market Vision and Innovation, Appendix C.

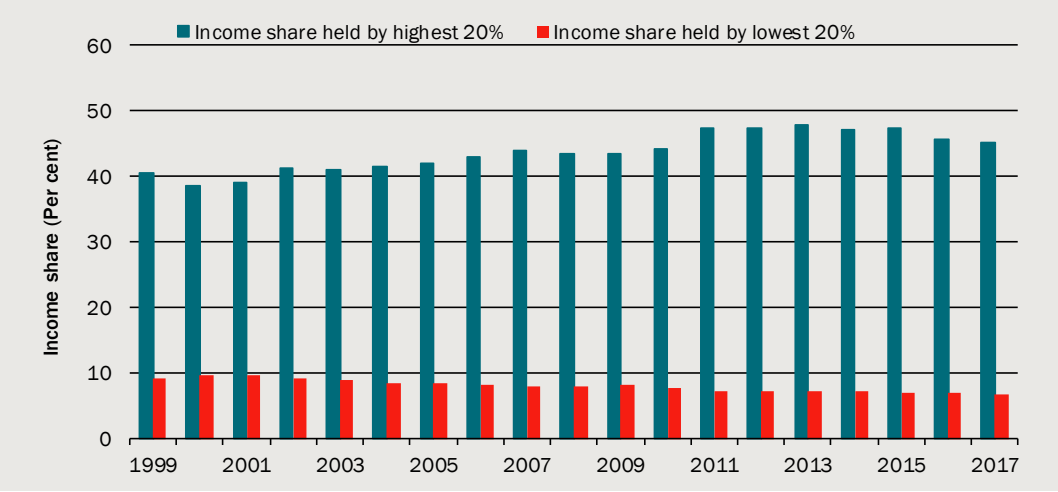
Meeting DFAT's policy objectives

The activities undertaken during ARISA meet many of the policy objectives/strategic priorities of DFAT's Indonesia Aid Investment Plan 2015-16 to 2018-19.[16]

The achievement of these objectives is associated with broader benefits including economic growth, regional stability and reduced income inequality in Indonesia. Income inequality has negative implications for economic growth by limiting the ability of low-income families to invest in skills and education and therefor restricting the number of skilled and highly productive workers available for hire.[17]

There is a significant amount of income inequality in Indonesia. In 2017, the lowest earning 20 per cent of the population held 7 per cent of income, while the highest earning 20 per cent of the population held 45 per cent (chart 3.8). The rate of poverty (average monthly per capita expenditure below the poverty line) is higher in rural (13-15 per cent) than urban areas (7-9 per cent), and is worse in the three ARISA targeted provinces than the average for rural Indonesia as a whole (chart 3.9).

3.8 Income share held by highest and lowest 20 per cent of Indonesian population

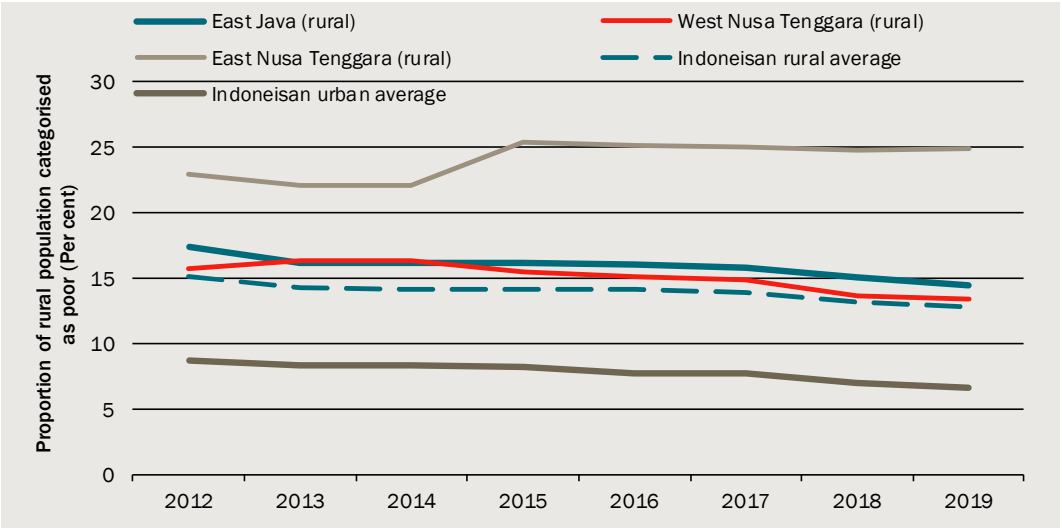


Data source: World Bank country indicators

16 DFAT. 2015, 'Indonesia Aid Investment Plan 2015-16 to 2018-19', available at: https://dfat.gov.au/about-us/publications/Pages/aid-investment-plan-aip-indonesia-2015-16-to-2018-19.aspx

17 OECD. 2015, 'How does income inequality affect our lives', available at: https://www.oecd-ilibrary.org/social-issues-migration-health/income-inequality/how-does-income-inequality-affect-our-lives_9789264246010-6-en

3.9 Proportion of rural population categorised as poor



Note: 'Poor' is defined as average monthly per capita expenditure below the poverty line; Data point for East Java in 2018 was not reported and has been estimated based on the average of 2017 and 2019

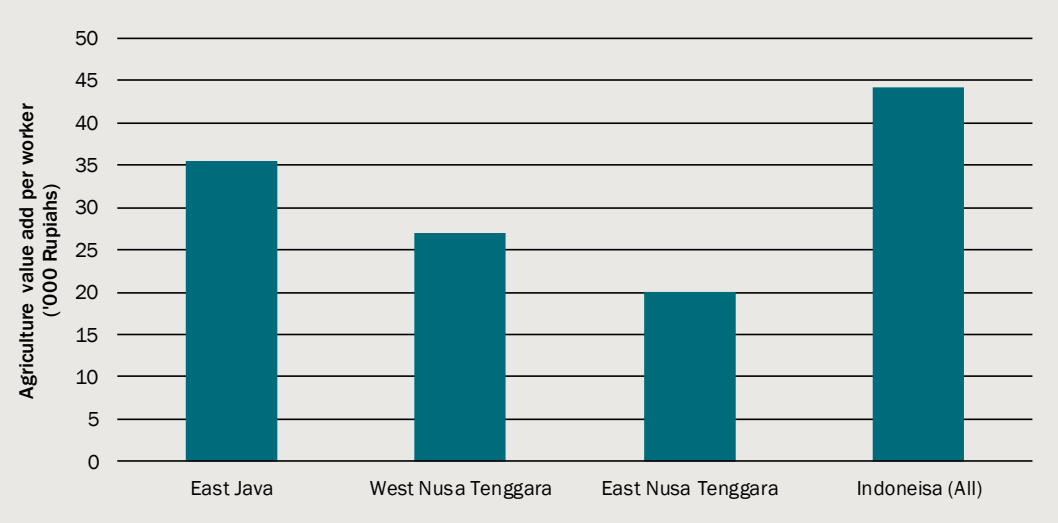
Data source: Indonesia Central Bureau of Statistics, Poverty and Inequality indicators, available at: https://www.bps.go.id/site/pilihdata.html

DFATs *Effective economic institutions and infrastructure* objective aims to support Indonesia to boost inclusive growth and productive jobs by improving its policy and regulatory system through mechanisms such as private sector investment and economic growth.

This objective is concerned with raising agricultural productivity. The facilitation of RI-PS partnerships in ARISA fostered adoption of better agricultural practices through upskilling and training of farmers in provinces that exhibit lower agricultural productivity compared to Indonesia overall (chart 3.10).

One of the performance benchmarks of this objective was the number of smallholder farmers with increased incomes through private sector investment. This benchmark is aligned with the key outcome of the ARISA interventions, which saw farming households experience a boost in incomes following the adoption of productivity enhancing technologies and techniques.

3.10 Value add per worker in the Agriculture sector in 2016



Data source: Indonesia Central Bureau of Statistics, Labor indicators, available at: https://www.bps.go.id/site/pilihdata.html

DFATs *Advance gender equality and women's empowerment* objective is directly addressed by ARISA. Female smallholder farmers in Indonesia face multiple challenges including difficulty accessing land, credit and other services and are excluded from decision making. Moreover, women are often expected to provide unpaid farm work, and bear a disproportionate burden of care and reproductive roles within the family and community.

Almost half (46 per cent) of participants in the ARISA interventions were women. The percentage of participants who were female was 33 per cent in the beef intervention, 50 per cent in the maize intervention, 60 per cent in the cassava intervention, 32 per cent in the dairy intervention, 44 per cent in the sugar intervention and 56 per cent in the integrated pest management intervention.

The impact of ARISA in improving the livelihoods of women was most successful for the maize intervention which involved supporting the training of women in growing maize and mung beans and facilitating access to credit (with 231, or 32 per cent of loans initiated in this intervention being issued to women). Substantial headway was also made in the dairy and beef interventions which are traditionally male dominated commodities. In sugar and cassava post-harvest processing and production of secondary products was also promoted for women to generate household level incomes.

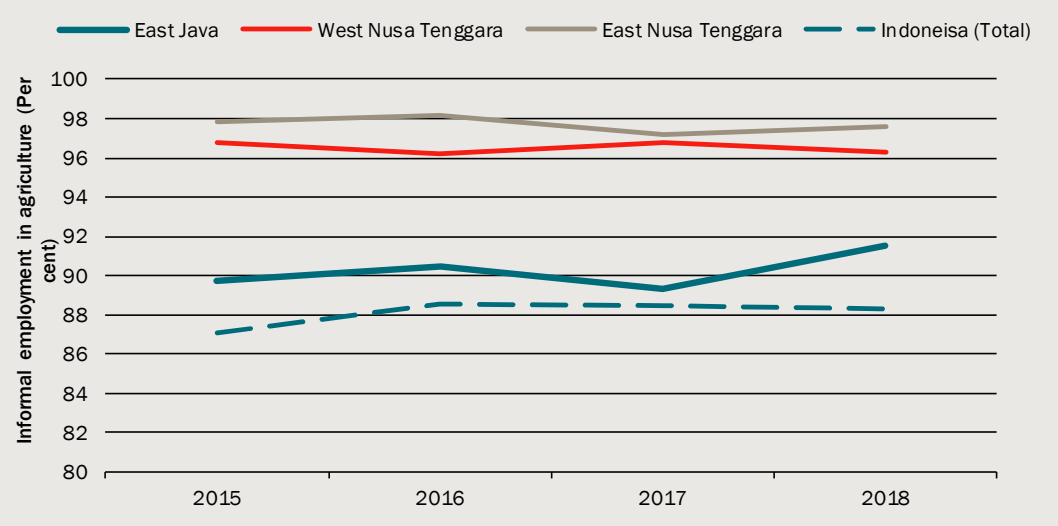
Removing barriers to operations for the private sector

In a developing country context, the private sector is a key provider of job generation, investment and government revenue. The private sector is made up of a diverse range of businesses including microenterprises (for instance, individual farmers and street traders), small medium sized enterprises (for instance large locally-owned firms) and large enterprises and multinational corporations. Almost half of private sector activity in low income countries and a third in middle income counties is in the informal sector and are therefore not registered with or taxed by government.

The majority of Indonesia's informal sector is comprised of very small micro firms with less than 5 employees that typically pay low wages, are relatively unproductive compared to larger firms, are managed by individuals with a low level of education, mostly supply products to local markets and do not attempt to expand their operations. The main reasons for a firm to not formally register their business are because they have no intention to expand, only operate in lower-tier demand markets or to avoid paying tax.[18]

The rate of informal employment in the agriculture sector in Indonesia is very high at 88 per cent in 2018. This rate is moderately higher in East Java and substantially higher in West Nusa Tenggara and East Nusa Tenggara where almost all employment in agriculture is considered informal (chart 3.11).

3.11 Informal employment in the Agriculture sector



Data source: Indonesia Central Bureau of Statistics, Labor indicators, available at: https://www.bps.go.id/site/pilihdata.html

The RI-PS partnerships facilitated by ARISA exposed smallholder farming households to new networks, technology and techniques to improve productivity and increase incomes. To varying degrees within each project this provided smallholder farmers with the opportunity to value add and gain a competitive advantage as well as take advantage of some increased economies of scale. This change in practice could potentially move farmers from the informal sector to the formal sector. This would have positive flow on effects, such as improving prospects for farmers to access credit.

18 Rothenberg, A. D., Gaduh, A., Burger, N. E., Chazali, C., Tjandraningsih, I. R., Rini, S. C. and Weilant, S. 2016, 'Rethinking Indonesia's Informal Sector', *World Development*, vol. 80, pp 96–113. https://doi.org/10.1016/j.worlddev.2015.11.005

A Evaluation of ARISA using CSIRO's National Benefit Scorecard

An assessment of ARISA against CSIRO's National Benefit Scorecard (test phase) is presented in table A.1. ARISA has been scored using a traffic light system where:

- 🔴 = No alignment with benefit type
- 🟡 = Somewhat aligned with benefit type, and
- 🟢 = Strong alignment with benefit type.

A.1 Assessing ARISA against CSIRO's National Benefit Scorecard (test phase)

Benefit type	Score	Rationale for score
Support Government foreign policy agenda		
Direct alignment to a priority sector of Government/National Challenge	🔴	ARISA did not target an Australian priority sector
Enhances Australia's reputation as a significant global contributor to complex problems	🟢	ARISA demonstrated Australia's capacity building capabilities
Attract (or potential to) investment into Australia	🔴	ARISA was not about attracting investment into Australia
Contributes to foreign policy development/specific agenda in a region/country	🟢	The activities undertaken during ARISA met many of the policy objectives/strategic priorities of DFAT's Indonesia Aid Investment Plan 2015-16 to 2018-19
Contributes to a secure Australia (health, defence, security, biosecurity)	🟡	Reducing poverty in Indonesia indirectly improves Australian security through reducing regional instability
Enhance our scientific standing, access to capability and talent		
Partnership with World class institutes to enhance global standings	🟡	ARISA involved working with many Indonesian organisations. Local Australian organisations were also engaged throughout ARISA to train Indonesian and research institute representatives in engaging with the private sector and commercialisation activities
Provides access to infrastructure and/or capability not otherwise available in Australia	🔴	ARISA did not involve improving Australian access to infrastructure not available in Australia
Conduct of collaborative world-leading research to solve a global problem	🟢	ARISA contributed to knowledge on how agricultural innovation systems function in developing countries and how to strengthen them to increase agri-food production and food security

Benefit type	Score	Rationale for score
Promotion of CSIRO's research capability in global markets	🟡	CSIRO based agricultural researchers supported some of the interventions including cassava, maize, dairy and beef
Increase (or potential to) CSIROs capacity to deliver impacts domestically	🟡	ARISA developed CSIRO staff members skills in monitoring and evaluation, understanding how innovation systems function and how to develop capacity in RI and PS
Capture the value of CSIRO's innovations & services		
Financial ROI (potential) to CSIRO is evident	🟡	The quantifiable benefits of ARISA accrue to smallholder farming households and Indonesia organisation. In this sense, the ROI was not a direct benefit to CSIRO
Market opportunity is greater than domestic opportunity	🔴	Australian domestic market opportunity was not relevant to ARISA
Creation of industry- research linkages	🟢	A key part of ARISA was fostering private sector and research industry links
Promotion of CSIRO's innovation and capacity in global markets	🟢	ARISA showcased CSIRO as a service provider in capacity building
Leverage of existing investment for greater impact	🟢	ARISA was initially funded by DFAT and CSIRO. As the project matured and the private sector observed the benefits of the project, private sector investment was leveraged
Create pathways to global markets for Australian innovation		
Develop strategic partnership with an SME and/or Domestic University	🔴	ARISA does not create pathways to global markets for ***Australian innovation***
CSIRO's value-add to the partner is evident- through a number of benefits – technology innovation, access to capability, access to global investment funding	🔴	
Attract (or potential to) investment back into Australia	🔴	
New market is accessed where opportunity is greatest	🔴	
Promotion of Australia's innovation and research capability globally	🟡	

Note. The attribution of each benefit type to a category is based on the National Benefit Scorecard – Test Phase (as yet unpublished by CSIRO). The scores and rational based on the considered opinion of the CIE.

🔴= No alignment; 🟡= Somewhat aligned 🟢= Strong alignment.

Source*: CSIRO, 'National Benefit Scorecard – Test phase'; The CIE.*

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