THE ASEAN REGIONAL DIAGNOSTIC NETWORK PROJECT

Enhancing ASEAN Capacities to Reduce Phytosanitary Impediments to Trade

Background

Under Chapter 5 of the ASEAN-Australia-New Zealand Free Trade Agreement (AANZFTA), Parties commit to apply the principles of the WTO's Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) in the development, application or recognition of any sanitary or phytosanitary measures to facilitate trade among the Parties while protecting human, animals and plant health. The architecture of AANZFTA, coupled with efforts at the national level and effective collaboration across the borders, is among the important existing mechanisms to assist Parties in overcoming SPS obstacles to trade.

Against this background, one of the major impediments to trade in agricultural commodities in ASEAN and with other major trading partners including Australia and New Zealand was the lack of diagnostic capabilities in the National Plant Protection Organisations (NPPOs) and other relevant agencies to identify plant pests and diseases. Without credible documentation and information proving that plant products, especially food products, are free from specific pests and diseases, farmers and food producers are unable to sell their goods into overseas markets. Nevertheless, many plant pests and diseases are not easily identified, require scientific methods and the use of specific equipment to ensure an accurate diagnosis.

ASEAN agriculture had been adversely affected by widespread limitations in the ability to produce credible lists of the plant pests and diseases present in production areas and to identify quarantine interceptions. Further, there was an absence of a regional mechanism to make the aggregate diagnostic capability available, nor one to enable more developed countries to assist other countries in addressing capacity gaps.

Benefits of Correct Identifications of Plant Pests and Diseases

- Enables diagnosticians and farmers to better understand the issues and to control potential damages inflicted by pests and diseases
- Facilitates the development of appropriate and defensible quarantine measures to better protect national SPS conditions
- Strengthens trust between trading partners and enhance market access

In 2011, Parties agreed to implement the **ASEAN Regional Diagnostic Network (ARDN)** Project, under the AANZFTA Economic Cooperation Support Programme (AECSP), in order to establish an ASEAN-wide, cooperative system for delivering credible, plant pest and disease diagnostic services.

Project Information

Supported by:
AANZFTA Economic Cooperation Support Programme

Phase I: July 2010 to June 2016

Phase II: May 2017 to October 2019

Total Budget: AUD 2,750,413

Proponents: Australia, Malaysia and Singapore

Implementer:
Department of Agriculture of Australia in consultation with AANZFTA Sub-Committee on Sanitary and Phytosanitary Measures

Main areas of support:
Training and mentoring activities at regional, sub-regional and national levels, development of diagnostic resources and modernisation of diagnostic technologies, and promotion of national and regional diagnostic networks.

Project Key Activities

Phase I (2010 – 2016)	Phase II (2017 – present)
Front-line Diagnostic Skills	
Nematodes (including mentoring in Thailand, Laos, Cambodia); Coccoidea (scale insects and mealybugs); Diptera; immature Lepidoptera; ascomycete fungi; Aleyrodidae (whiteflies); weeds.	Tephritid fruit flies; downy mildews (Oomycetes) (including mentoring in Laos); nematodes (mentoring in Lao PDR, Myanmar, Viet Nam).
Specialist Diagnostic Skills	
Phytophagous & stored product mites; phytoplasmas; viroids; viruses.	*Colletotrichum* (including mentoring on collection management).
Diagnostic Techniques and Resources	
DNA extraction and barcoding, sequencing, interpretation; digital imaging; remote microscopy.	Lucid technologies; dichotomous keys; DNA-based diagnostics, including use of high-throughput sequencing services and bioinformatics skills; techniques for depositing reference cultures in globally recognised, culture collections.
Diagnostic Resources	
Cotton leaf roll dwarf virus; bacterial wilt of corn; palm and mango weevils; factsheets on plant pathogenic fungi.	*Colletotrichum* diagnostic guide; Aleyrodidae (whiteflies) Lucid key; factsheets on weed seeds.
Regional Networking	
Nematodes; Aleyrodidae (whiteflies) Formation of ARDN Advisory Committee and establishment of ARDN website; initiation of ASEAN Diagnosticians Forum.	Nematodes; Aleyrodidae (whiteflies); weed seeds Updating of regional database of diagnostic expertise; updating of compilation of reference collections which support diagnostics.
National Networking	
	Development of national pest diagnostic networks in Thailand and Indonesia.
Laboratory Equipment	
Microscopes with imaging attachments, electronic devices, minor items and consumables.	
Others	
Professional development and recognition framework for ASEAN diagnosticians.	Proficiency testing; development of governance arrangements for Clearing House; protocols for handling samples and specimens.

ARDN Project Underpins Existing Trade Commitments

- The ARDN project has supported ASEAN's cooperation on food, agriculture and forestry through the development of strategic measures that ensure product safety, quality and compliance with global market standards (Strategic Measure 5, Food, Agriculture and Forestry, 2025 AEC Blueprint). The project also enables AMS to streamline and improve quarantine systems and procedures and harmonize standards and regulations, a key commitment under the Strategic Plan for ASEAN Cooperation on Crops (2016 – 2020).
- The ARDN project supports the implementation of AANZFTA and ATIGA commitments to enhance the practical implementation of the principles and disciplines contained within the WTO SPS Agreement (Article 81 of the ATIGA and Article 4, Chapter 5 of the AANZFTA). This included supporting Article 5 from the WTO's SPS Agreement to assess risk and determine the appropriate level of sanitary or phytosanitary protection and Article 6 to ensure that SPS is adapted to the characteristics of the area.
- The ARDN project supports the implementation of AANZFTA and ATIGA commitments to develop pest and disease notifications in emergency situations. Regional diagnostic networks allow members to exchange information in situations of food safety crisis, interception, control of pests and/or disease outbreak and its SPS measures (Article 83 of the ATIGA and Article 7, Chapter 5 of the AANZFTA).
- The ARDN project supports the implementation of AANZFTA and ATIGA SPS economic cooperation commitments through strengthening national and cross-border cooperation for the control and eradication of pests and disease outbreaks and the provision of technical assistance (Article 85 of the ATIGA, Article 8 of Chapter 5 and Chapter 12 of the AANZFTA).

Workshop in Support of the Formation of Thailand's National Diagnostic Network | Trang, Thailand, 22 November 2017

KEY OUTCOMES OF THE ARDN PROJECT

Improved Capacity in Plant Pest Identification

The ARDN project has significantly enhanced the capacity of the participating AMS in the identification of plant pests. This has provided scientific credibility to pest lists requested by trading partners, enabled notifications required under international phytosanitary obligations and brought transparency to quarantine operations.

> *Pest lists are important for farmers and local agricultural staff in giving the range of pests they might expect and should prepare to manage. They are important for quarantine officials at the border and for agricultural scientists in central laboratories for determining what are exotics and what are indigenous pests, including new incursions and eradication campaigns. They are important for exporters, trade negotiators and external trading partners to show whether potential quarantine pests are present in a country or not. This is essential for them to assess the risks of accepting produce from a country, and any treatments or certification that may be required. Most importantly for trade, having a pest list gives importing country confidence that the exporting country knows what pests it has, and has the expertise to identify them. Without this, the risks involved in trade and import testing would both be much higher*

— Ms Wilma Reano – Chief Agriculturist, Department of Agriculture of the Philippines

The participating ASEAN NPPOs have been able to apply the newly acquired skills, resources and modernised equipment to draw up scientifically-credible national and regional pest lists of high significance to trade. To date, the project has generated ASEAN-wide pest lists for whiteflies, scale insects, mealybugs, weevils associated with palms and mangoes, *Colletotrichum*, ascomycete and rust fungi, as well as a number of national pest lists for nematodes and mites.

Key Outcomes

- Improved capacity in plant pest identification
- Improved market access and import risks analyses
- Enabled inter-agency and cross-border collaboration

Along the process, the Project increased awareness of the importance of modern diagnostics technology and methodology in plant pests' identification. The project has also enhanced diagnostic capacities of over 500 front-line diagnosticians and specialists in agriculture and quarantine agencies in ASEAN, as well as networking this capacity. With enhanced skills and confidence, the NPPOs are also able to aid their provincial laboratories and farmers in assessing potential risks associated with a commodity or crops, meeting key SPS requirements of importing countries.

> *ARDN project provided us with new knowledge for proper identification and practices of pest surveillance and monitoring that resulted in a credible identification of specimens as well as identification of which specimens should be referred to specialists for further examination. Also, by proper identification, monitoring and surveillance result in reliable nation pest list*

— Mr Arnel Villena Somolostro, Agriculturist, Bureau of Plant Industry, Plant Quarantine Service of the Philippines

ARDN project has improved the skills of the participants especially in the diagnostics of the plant pests

— Dr Surmsuk Salakpetch, Director-General, Thailand Department of Agriculture

Through in-country training and mentoring workshops, provincial laboratories and farmers in the participating AMS have improved their skills in plant pests' identifications, hence crop protection. As cases in points:

- Thai officials have used the knowledge gained under the ARDN project to conduct in-country trainings on biological control of nematode pests. This has benefited over 1,500 Thai farmers since 2013.
- Officials from the Lao Department of Agriculture used the knowledge gained to share with their provincial peers and farmers about nematodes problems and various effective management options, such as crop rotation, when pest nematodes occur.
- Philippine Crop Pest Management Division has used remote microscopy in its laboratory equipped by the ARDN project to help their farmers in diagnosing their pests, and also applied the surveillance knowledge to train Philippine farmers in preparing and protecting their cocoa, coffee and papaya crops in both wet and dry seasons.

During the capacity building for papaya, we were able to find a new pest species for papaya. That was the first time we know we had that pest. That is one important outcome of the ARDN project

— Ms Wilma Reano, Chief Agriculturist, Department of Agriculture of the Philippines

The ARDN project is supporting to NPPOs to improve the capability of identification of pest that is associated with exported or imported agricultural commodities, intrinsically difficult to identify and are constraining or have the potential to constrain trade in ASEAN countries. With enhanced knowledge in plant pests, quarantine officers at the border are able to prevent pests coming into the country; at the same time local produces would have fewer chemical pesticides, therefore safer foods for domestic consumption

— Dr Pyone Pyone Kyi, Deputy Director and Head of Quarantine, Plant Protection Division, Department of Agriculture, Ministry of Agriculture and Irrigation, Myanmar

Improved Market Access and Import Risks Assessment

In some participating AMS, the ARDN project contributed to the establishment of a national surveillance system for the detection of exotic fruit fly and monitoring of endemic fruit fly species.

To date, the ARDN project has contributed to the improved quarantine measures and market access for agricultural produces as follow:

- Enabled Thailand to promote confidence among diagnostics laboratories of other ASEAN NPPOs in a diagnostic protocol that Thailand had developed for bacterial wilt of corn. Acceptance of this protocol enabled Thailand to demonstrate that it was free of this seed-born pathogen, which, in turn, provided the country with market advantage for high-value exports of seed corn.
- Assisted Laos to define pest status for its corn and cassava. As a result, Laos gained market access to China and Thailand for corn and to Cambodia, Thailand and Viet Nam for cassava, its third most important agricultural crop.

- Likewise, Cambodia credited the ARDN project for assisting the country in gaining market access to China for its rice and banana exports. These trade deals would not be feasible if Cambodian exporters could not provide the required information on the pests associated with bananas, including pest fruit flies, which were the subject of diagnostic training courses supported by the project.
- The ARDN project assisted the Philippines to identify a new pest species for its papaya, enhancing the country's transparency and surveillance capacity in papaya pests. This, in turn, has contributed to opening market access of Philippine papaya to New Zealand.
- Viet Nam can now use remote microscopy to assess detections by quarantine officers of insects in imported goods and clear consignments more quickly when there is no quarantine threat.

> *Australia and New Zealand are strong trade partners to ASEAN. We see that there are a lot of market potentials in the region and it is important to be able for us to engage with ASEAN at a similar level of scientific basis. We are all members of the International Plant Protection Convention which is set to ultimately let us have the same level of consistency and approaches to biosecurity. From one country to another, a consistency in understanding will ultimately lead to better outcomes and market access for all countries including Australia and New Zealand*
>
> *— Mr Peter Creaser, Assistant Secretary, Australian Department of Agriculture*

Enabled Inter-Agency and Cross-Border Collaboration

Successful implementation of the ARDN project has enabled an effective means for co-operation, collaboration and exchange of diagnostic knowledge and information, narrowing the capacity gap within and between AMS.

> *We think this is our commitment as an ASEAN Member to help level up other AMS in the capacity to identify plant pests, which will in turn help increase the level of produce we are receiving from them*
>
> *— Ms Mei Lai Yap, Director of Plant Science and Health, National Parks Board of Singapore*

The project has complemented the operations of a Clearing House in Malaysia and has helped to develop its communication strategies and trade development activities supported by other cooperation partners. Through a series of training workshops and mentoring activities, the ARDN project has created a range of formal and informal networks of specialist diagnosticians, who can now support each other and share information. For example, in 2017, the project successfully started a national diagnostic network in Thailand, and a Whitefly Facebook group following a regional workshop on whiteflies in 2015 for participants from AMS to stay updated on new developments, challenges, and discoveries about whiteflies in the region.

> *ARDN project provided the knowledge and platform for plant protection officials from the region to learn from one another during the workshop and also in the future. Thailand would like to develop and enhance such network for cooperation among the ARDN members, and to develop the diagnostic testing capability, to support the formulation of the phytosanitary policies*
>
> *— Dr Surmsuk Salakpetch, Director-General, Thailand Department of Agriculture*

The development of informal and formal networks under the ARDN project has enabled the community of diagnosticians to efficiently discuss high-priority SPS challenges, share possible solutions, and communicate about the concerned SPS regulations when needed.

Nematode Identification: *Enabling AANZFTA Trade Facilitation and Biosecurity*

Capacity-building under the ARDN project focused on identification of 40 specific plant pests or pest groups of high phytosanitary significance to trade, for which diagnostic capacity was still lacking in some ASEAN Member States. The nematodes are notable among these groups and have been one of the main targets for mentoring programmes under the ARDN project.

Plant nematodes are taxonomically challenging and difficult to detect. They damage the subterranean parts of crops such as rice, vegetables, fruit trees, vines and ornamentals. They are also commonly associated with aquatic plants, roots and tubers, and can be of major quarantine importance for commodities traded either for ornamental purposes (e.g. aquarium plants), consumption (e.g. garlic) or planting (e.g. seed potatoes). Nematodes are very small, ubiquitous and very diverse. The ARDN project progressed from elementary nematode diagnostics sessions to nematode identification workshops and mentoring programmes in a quarantine and SPS regulation capacity. Following are key outcomes from the project activities that specifically targeted plant nematodes:

The ARDN project enhanced knowledge and strengthened the diagnostic capacity and resources for plant nematodes.

Trainees evaluated at the commencement of the ARDN nematode workshop assessment revealed that only 33% of the participants correctly identified a nematode from a leech or planarian. Following each workshop, practical testing showed that the participants' ability to accurately identify nematodes and their characteristics (i.e. harmful pest, beneficial soil saprophytes) had improved to 100%.

The project also supported surveys in farming areas to increase understanding of nematodes and the significant differences between the nematode faunas of crops in different provinces of agriculture-based countries in the region. Alongside increased diagnostic ability and knowledge amongst participants, the project team also worked to develop a key to major groups of pest nematodes in ASEAN, which has been progressively revised with each subsequent nematode workshop.

In addition, high-resolution compound microscopes supplied by the project were helpful for diagnosticians in accurately identifying nematodes. In Myanmar, an ultrasonic machine for nematode extraction, provided by the ARDN project, helped shorten the identification period of nematodes from a full day to just half an hour. This has reduced the amount of time required to accurately identify nematodes by 48 times for Myanmar diagnosticians.

The ARDN project empowered farmers and enabled sustainability and market access for Myanmar.

Identifying nematodes is important, but the real impact comes from limiting the spread of the pest in the fields. Hence, getting farmers to know more about these pests was critical. In Myanmar, the ARDN project particularly focused on equipping farmers and provincial officials with the scientific knowledge, skills and technologies to cope with nematode spread. 'Farmers were actually able to identify nematode instead of just saying it was a bad year,' Dr Michael Hodda noted regarding his interaction with farmers.

It is not just plants that need to be certified as free of nematodes. Increasingly, seed exporters are also required to show pest free status. For Myanmar, the ARDN project team worked to help extract and identify nematodes in rice seeds and conduct pre-shipment testing for presence of plant-parasitic nematodes. These activities not only increased diagnostic confidence in Myanmar diagnosticians, but also significantly increased Myanmar's market access potential.

> ***With better knowledge and technologies, we can identify nematodes much faster. The compound microscope that supported by the ARDN project gives a clear image of nematodes that helps a lot in the identification of plant nematodes. We can also make posters using high-quality images to train plant protection and extension staff as well as farmers on how to identify and control plant pests***
>
> *— Dr Pyone Pyone Kyi, Deputy Director and Head of Quarantine, Plant Protection Division, Department of Agriculture, Ministry of Agriculture and Irrigation, Myanmar*

SUCCESS FACTORS OF THE ARDN PROJECT

Success Factors


Strong focus on building technical knowledge and laboratory capacity


Customised mentorship programme


Sustainable approach to training


Effective diagnostic networks


Gender inclusiveness

Strong Focus on Building Technical Knowledge and Laboratory Capacity

The ARDN project placed a strong emphasis on narrowing the diagnostic capacity gaps within and between AMS through raising awareness of the importance of accurate identification of plant pests as well as of the regional/national networks in facilitating trade while better protecting national SPS conditions. In particular, the project sought to enhance the knowledge and technical capacity of NPPOs in each AMS, with a focus on Cambodia, Lao PDR and Myanmar, through tailored mentoring programmes in concert with regional knowledge-sharing workshops and networking activities. In addition to sharpening diagnostic capacities of front-line diagnosticians, officials and farmers, the ARDN project also equipped NPPOs with laboratory equipment, copies of diagnostic keys, and thousands of pages of technical literature not available in AMS, and technical know-how for them to more accurately and effectively identify plant pests and diseases.

Customised Mentorship Programme

Complementing the regional and sub-regional training workshops, the laboratory-based mentoring by regional experts was also programmed to assist individual NPPOs to deliver in-house training, field work and plant pest identification. Participating NPPOs found this mentorship, tailored to varying circumstances, to be very practical and engaging in bolstering their knowledge and skills.

> *The ARDN project Mentor and us worked together to upgrade the skills of my staff who are still new and we improved a lot*
>
> *— Dr Pyone Pyone Kyi, Deputy Director and Head of Quarantine, Plant Protection Division, Department of Agriculture, Ministry of Agriculture and Irrigation, Myanmar*

> *Mentoring is showing people how it's done and then having them do it. Mentoring activities were fairly advanced where people can see you doing it and do it while I am there*
>
> *— Dr Michael Hodda, ARDN project Mentor and Associate Professor of Nematode Biosystematics and Ecology, Commonwealth Scientific and Industrial Research Organisation of Australia*

Sustainable Approach to Training

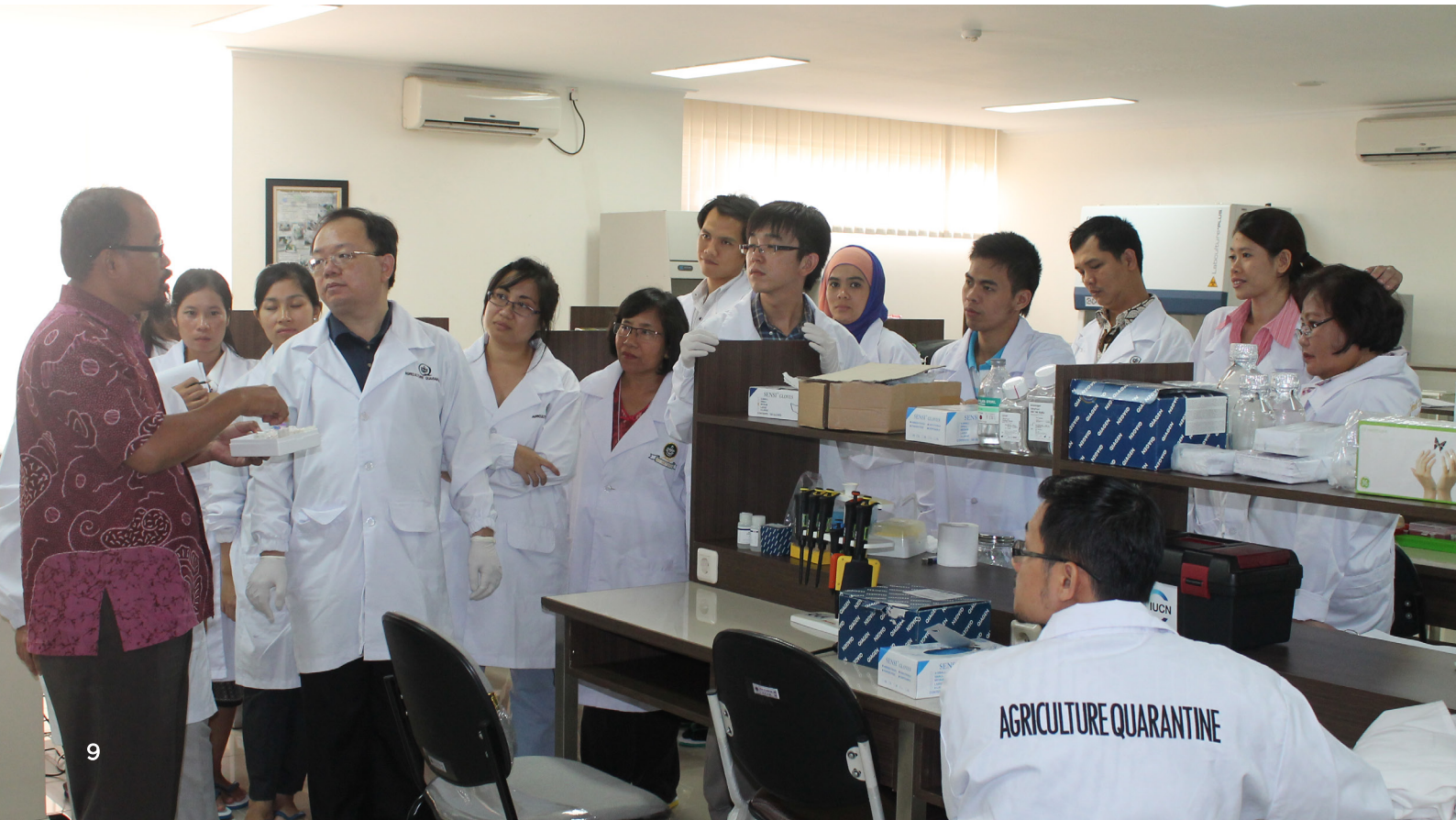
The ARDN project adopted a sustainable approach to training ASEAN NPPOs and their diagnosticians by developing an important and sustainable source of technical expertise, guidance and networks to outlast the project cycle. These included the development of online diagnostics tools and training materials, transfer of laboratory equipment and capacity as well as the embedding of these resources and best practices into daily diagnostics works. This led to the development of institutional capacity as well as individual skills. As part of the training outcomes, some officials from the participating NPPOs have published the following academic reports, contributing inter alia to the identification of species, the definition of pest status, and host-plant associations of pest species:

- 11 taxonomic publications, 2 conference presentations and 1 poster on the taxonomy of scale insects, mealybugs and their associates;
- 8 taxonomic publications on the taxonomy of plant-feeding mites, including a comprehensive national checklist of species; and
- 5 taxonomic papers on pest fruit flies.

Further, equipping diagnosticians and technical officers across participating NPPOs with technical know-how and laboratory capacity, who in turn, have applied them to benefit provincial laboratories and farmers in their respective countries. These multiplier effects have contributed to narrowing the capacity gap within the country.

> *Because the needs are great, relative to the available expertise, training those people with expertise to connect with farmers, extension workers, trainees and provincial staff is essential to making sure that they can be involved at a basic level, thus spreading some of the workloads and alleviating the capability shortfall*
>
> *— Dr Michael Hodda, ARDN project Mentor and Associate Professor of Nematode Biosystematics and Ecology, Commonwealth Scientific and Industrial Organisation of Australia*

DNA Extraction and Barcoding Workshop, 23–27 May 2016, Bekasi, Indonesia



Effective Diagnostic Networks

The ARDN project focused on supporting the development of national and regional networks and effective sources of mutual support for diagnosticians in the region. Participants have been able to seek advice from colleagues after making connections at various training workshops and in-country mentoring activities. In other situations, ARDN members have cooperated with others in the region to solve specific obstacles to improve outcomes. For example, countries without adequate DNA sequencing equipment have been able to acquire DNA of pathogens and pests through using relatively simple methods taught through the project, ship these samples to a DNA sequencing facility, and receive results within a few days. This has effectively eliminated an immediate need for local DNA sequencing equipment, which is financially viable and can improve diagnostic capabilities.

Gender Inclusiveness

The ARDN project provided particular attention to fostering female participation in science, technology and bioengineering. As a result, 70% of the project's individual beneficiaries were female.

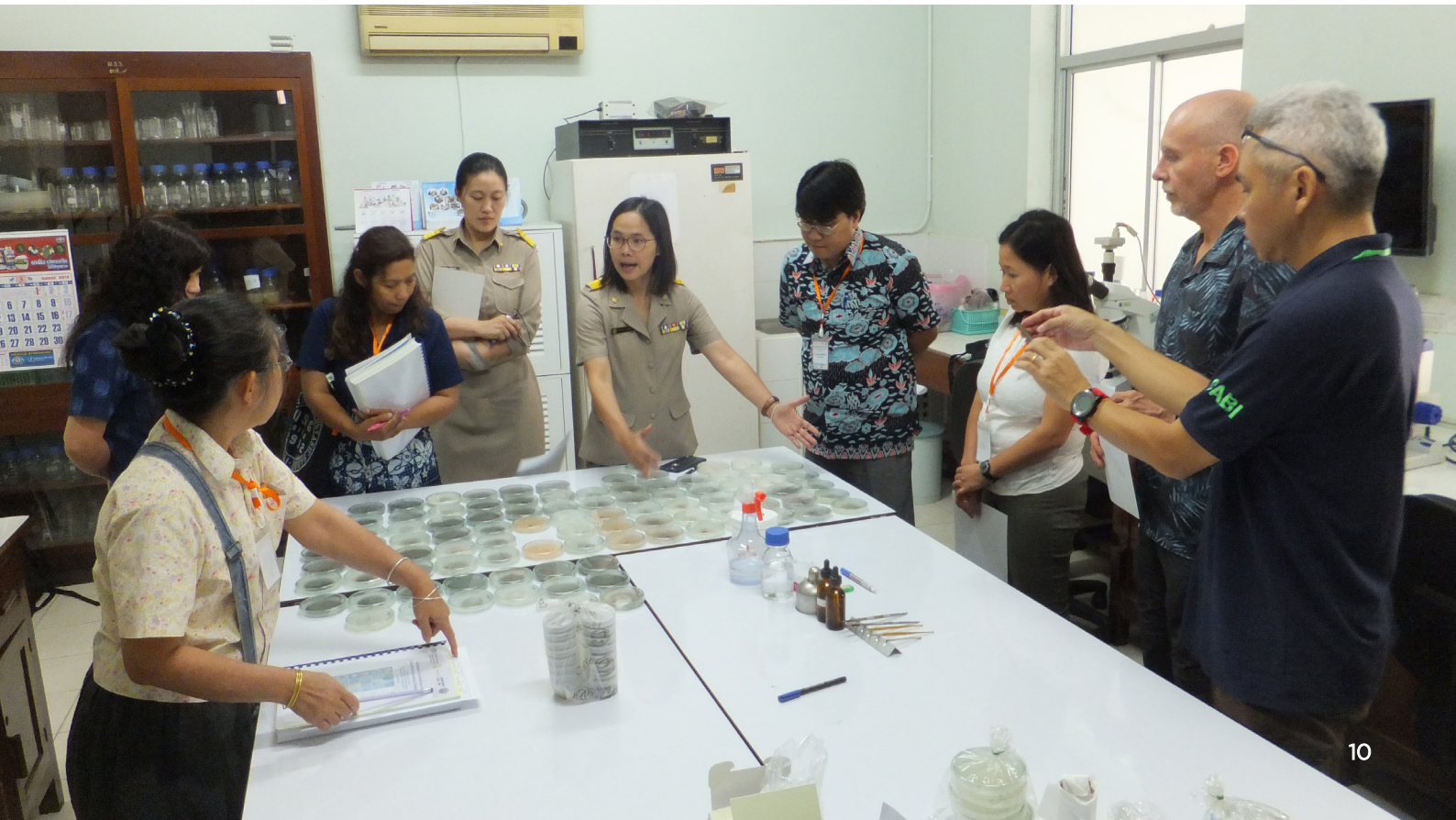
The project also provided ample opportunities for female scientists and managers as role models for leadership. For example, female scientist assumed significant leadership roles in the fruit fly workshop and follow-up training on downy mildews, weed seeds and South American leaf blight.

Individual Beneficiaries

70% Female

30% Male

Workshop and Diagnostic Guide on Identification of Plant Pathogenic Species of Colletotrichum, 26–30 March 2018, Bangkok, Thailand



CONCLUSION

> *The outcome of the ARDN project is aligned with the objectives of SPS of AANZFTA Agreement by supporting trade facilitation, greater transparency, and strengthen co-operation among the competent authorities of the Parties*
>
> *— Dr Pyone Pyone Kyi, Deputy Director and Head of Quarantine, Plant Protection Division, Department of Agriculture, Ministry of Agriculture and Irrigation, Myanmar*

Diagnostic capacities to identify plant pests and diseases are foremost in overcoming key phytosanitary impediments to trade in the AANZFTA region. Support activities under this multi-phased ARDN project are highly valued by the participating AMS and have contributed to strengthening crop protection, quarantine systems and import risks assessment in ASEAN. The Project has also fostered collaborations among competent authorities at both national and regional levels.

Findings of this case study demonstrate the significant contributions of the ARDN project in supporting the implementation of the SPS Chapter of AANZFTA through improving pest diagnostic capacities. They also demonstrate the need for all Parties to sustain their efforts to apply this improved capacity to achieve overall AANZFTA goals.

With special thanks to and acknowledging the efforts of the following offices and committees:

The following national agencies from AANZFTA Parties:

Department of Agriculture of Australia

Department of Agriculture and Agrifood, Ministry of Primary Resources and Tourism, Brunei Darussalam

Plant Protection Sanitary and Phytosanitary Department, General Directorate of Agriculture, Ministry of Agriculture, Fisheries and Forestry, Cambodia

Indonesian Agricultural Quarantine Agency, Ministry of Agriculture

Department of Agriculture, Ministry of Agriculture and Forestry, Lao PDR

Department of Agriculture, Malaysia

Department of Agriculture, Ministry of Agriculture and Irrigation, Myanmar

Ministry for Primary Industries, New Zealand

Bureau of Plant Industry, Department of Agriculture, The Philippines

The Agri-Food and Veterinary Authority of Singapore, now National Parks Board of Singapore

Department of Agriculture, Thailand

Plant Protection Department, Ministry of Agriculture and Rural Development, Viet Nam

- AANZFTA Sub-Committee of Sanitary and Phytosanitary Measures
- ASEAN Expert Working Group on the Harmonisation of Phytosanitary Measures
- ASEAN Sectoral Working Group on Crops
- Technical Advisory Committee of the Clearing House (Malaysia)
- The Southeast Asian Network on Taxonomy (ASEANET)
- Centre for Agriculture and Bioscience International