

# PBRI Phase II Report 2020-2023



PLANT BIOSECURITY  
RESEARCH INITIATIVE

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#### **ACKNOWLEDGEMENT OF COUNTRY**

The PBRI acknowledges the Australian Aboriginal and Torres Strait Islander peoples as the traditional custodians of the lands where we work, live and learn.

**PLANT BIOSECURITY**  
**RESEARCH INITIATIVE**

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# Acknowledgements

PBRI Phase II saw the continued collaboration of committee members, sharing their knowledge, time, and good will towards improving the coordination of biosecurity RD&E investment across plant industry sectors.

In this phase, we welcomed and acknowledged the contribution of new PBRI Committee Members, Ms Sarah Corcoran (PHA), Mr Callum Fletcher (GRDC), Ms Ellen Buckle (AgriFutures), Ms Keira Beattie (DAFF), Dr Stephen Mudge (SRA).

At the end of Phase II, we thank outgoing PBRI Committee Members for their valuable contribution, they were Dr Alison Anderson (Hort Innovation), Dr Harjeet Khanna (SRA), Ms Sarah Corcoran (PHA) and Mr Stuart Kearns (PHA).

We thank our MOU partners for their commitment to delivering our joint objectives – Dr David Teulon (B3 NZ), Dr Baldissera Giovani (Euphresco), Dr Irene Kernot (ACIAR) and Dr Anne Walters, Dr Rosa Crnov and Mr Andrew Bishop (PHC) and look forward to developing a new MOU agreement with PHA.

# Executive Summary

Phase II of the Plant Biosecurity Research Initiative (PBRI) focused on supporting cross-sectoral co-investment in plant biosecurity Research, Development and Extension (RD&E), facilitated through collaboration and strategic partnerships.

The delivery of PBRI Phase II was enabled by financial contributions from its members, comprising the seven plant Research and Development Corporations (RDCs), Plant Health Australia (PHA) and the Department of Agriculture, Forestry and Fisheries (DAFF). The PBRI Collaborative Agreement for Phase II commenced in July 2020, and was extended for further five years (Phase III) in June 2023.

In addition to the co-investment, PBRI Phase II also established several partnerships with key domestic and international stakeholders, formalised through Memorandum's of Understanding (MOUs). These partnerships have served as the foundation for enabling PBRI's membership to connect and engage with a wider pool of knowledge and capability for supporting plant biosecurity RD&E initiatives.

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*Across PBRI Phase II, a total of 10 investments valued at \$17.4M were prioritised and commissioned for delivery through the membership base, in addition to the 12 investments worth \$51.0M initiated in Phase I 2018-2023.*

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A comprehensive independent review of PBRI Phase II was conducted by Ag Econ. This review found that the PBRI delivered its strategic goals of prioritising and coordinating collaborative plant biosecurity RD&E.

The review found that PBRI's success was underpinned by the lean and agile membership base combined with the coordination efforts of the Program Director, which supported a culture of collaborative intent.

At the end of Phase II, the PBRI was recognised as a:

- cost-efficient and sustainable model for co-investment in biosecurity innovation across plant industries
- focal point of plant biosecurity RD&E expertise relevant to plant industries
- facilitator of biosecurity collaboration and networks, linking researchers, industry, and government

Monitoring and evaluation and an enhanced communication of the PBRI's impact were identified as areas for improved delivery of the PBRI program. These areas will be included in a new work program for the Phase III as part of the PBRI's commitment to continuous improvement.

The new five-year agreement signifies the ongoing support by members for the PBRI collaboration model and its role in the Australian Biosecurity landscape. It is also an acknowledgement of the benefits and efficiencies delivered through the coordination of biosecurity RD&E priorities and investment across Australian plant industries.

This report describes how the PBRI continues to deliver a collaboration model aimed at minimising duplication in plant biosecurity RD&E investment.

## 1. PBRI Purpose

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To drive efficiency and impact in plant biosecurity RD&E across industries through coordinated and targeted investment.

## 2. PBRI Vision

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To be recognised as the leading source of RD&E excellence in biosecurity across plant industry sectors with benefits to the environment.

## 3. Outcome Statement

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Australia has long term capability for high impact RD&E to safeguard and minimise the impact of plant biosecurity threats to our plant production industries.

## 4. Strategic Goals

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- Identify targeted cross-sectoral plant biosecurity innovation for co-investment.
- Responsive coordination and leveraging of high value cross-sectoral investment in plant biosecurity innovation.
- Promote and facilitate collaboration for better plant biosecurity outcomes for industry, their communities, and the environment.

## 5. The PBRI Key Focus Areas of Research

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Preparedness | Diagnostics | Surveillance | Management | Capability Building | Industry Resilience

## 6. The PBRI members

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- AgriFutures Australia
- Cotton Research and Development Corporation (CRDC)
- Council of Rural Research and Development Corporations (CRRDC)
- Australian Government Department of Agriculture, Fisheries and Forestry (DAFF)
- Forest and Wood Products Australia (FWPA)
- Grains Research and Development Corporation (GRDC)
- Horticulture Innovation Australia Limited (HIA)
- Plant Health Australia (PHA)
- Sugar Research Australia (SRA) Limited
- Wine Australia

# About The PBRI

## What we do

The PBRI foster coordination and collaboration for targeted investment in high value, cross-sectoral plant biosecurity RD&E and contribute to a strong biosecurity system that will:

- have heightened preparedness and prevention against pests, diseases and weeds entering Australia.
- accurately detect and diagnose the biosecurity threat with confidence.
- quickly respond to minimise the damage caused by pests before widespread damage occurs.
- provide intelligence and quality assurance to maintain and grow market access.

## The PBRI at a Glance

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### **\$69.4 Million**

has been co-invested by PBRI members and partners in plant biosecurity RD&E since the PBRI was first established in 2017.

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### **\$43.8 Billion**

The collective value of production of plant industries supported by the PBRI is approximately \$43.8 billion (2021-2022).

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### **110 BEC members**

The PBRI Biosecurity Extension Community is 110 members strong.

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### **210 Plant Health Student Members**

There are 210 global members of the PBRI Plant Health Student Network.



### **8 Biosecurity fora**

In Phase II, the PBRI held 8 fora to exchange research knowledge and ideas for plant biosecurity RD&E, including the PBRI Symposium and online research fora.



## The PBRI Co-investment Model

Concept development in Phase II was based on ideas generated from workshops, co-design with industry and partners, research pitches and concept submissions.

The co-investment process is depicted below:



## Our Members

The PBRI Phase II was a partnership between Australia's seven plant Research and Development Corporations (RDCs), Plant Health Australia, the Council of Rural RDCs and the Australian Government Department of Agriculture, Fisheries and Forests (DAFF). Plant biosecurity RD&E was a high priority area in all member organisations' individual strategic plans.

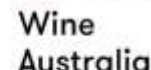
All 10 parties were signatories to the PBRI (Phase II) Collaboration Agreement, which was effective from July 2020 to June 2023.

Oversight and ownership of the PBRI Strategy resides with the PBRI Management Committee, which includes a representative member from each organisation.

The PBRI Management Committee membership includes General Managers or equivalent, the Australian Chief Plant Health Officer (DAFF), the CEO of Plant Health Australia, the Executive Officer of the Council of Rural RDCs and the Program Director of the PBRI.

In June 2023, the PBRI Management Committee member were:

- Dr Mila Bristow, General Manager, Trade and Biosecurity, Horticulture Innovation Australia Limited
- Ms Ellen Buckle, Senior Manager Export Fodder, Pasture Seeds, Tea Tree Oil, Kangaroo, Buffalo, Deer and Goat Fibre, AgriFutures Australia
- Ms Sarah Corcoran, Chief Executive Officer Plant Health Australia
- Mr Craig Elliott, Program Manager, Biosecurity Research and Innovation, Wine Australia
- Mr Callum Fletcher, Manager Biosecurity, Grains Research and Development Corporation
- Mr Stuart Kearns, National Manager Preparedness and RD&E
- Ms Anwen Lovett, Executive Officer, The Council of Rural RDCs
- Dr Jo Luck, Program Director, The Plant Biosecurity Research Initiative.
- Ms Susan Maas, Innovation Manager, Cotton Research and Development Corporation
- Ms Jodie Mason, Head of Forest Research, Forest and Wood Products Australia
- Dr Stephen Mudge, Manager Research Missions, Sugar Research Australia Limited
- Dr Gabrielle Vivian-Smith Australia's Chief Plant Protection Officer and Keira Beattie, Project Manager, Australian Government Department of Agriculture, Fisheries and Forestry
- Dr Ken Young, Senior Manager Biosecurity and Regulation, Grains Research and Development Corporation



## Partnerships

- Dr David Teulon, Director, Better Border Biosecurity (B3), New Zealand
- Ms Irene Kernot, Research Program Manager for Horticulture, Australian Centre for International Agricultural Research (ACIAR)
- Dr Baldissera Giovani, Coordinator, Euphresco, France
- Dr Rosa Crnov and Mr Andrew Bishop, Joint Chairs, Plant Health Committee



# The PBRI Strategy

The [PBRI Strategy](#) sets a framework for the PBRI members to come together to share knowledge, coordinate ideas, and prioritise co-investments in plant biosecurity RD&E.



## Strategic goals

- Identify targeted cross-sectoral plant biosecurity innovation for co-investment.
- Coordinate and leverage prioritised cross-sectoral investment in plant biosecurity innovation.
- Promotion and facilitation of collaboration for better plant biosecurity outcomes for industry, their communities and the environment.



## Key drivers



## Key focus areas for investment

Key Focus Areas		Outcomes
Preparedness		Industry is better prepared for the arrival of a biosecurity threat
Diagnostics		Rapid, accurate and cost-effective detection of high priority pests and diseases at the border and in-field
Surveillance		Cost-effective and coordinated surveillance for biosecurity threats
Management		Management of pests and diseases with minimal impact to plant production, trade and the environment
Capability building		Developing capability in plant biosecurity to support our plant industries into the future
Industry resilience		Greater participation of industry in biosecurity decision making to reduce economic and social consequences

# Measuring Success – A Summary



## Strategic Goal 1 - Identify targeted cross-sectoral plant biosecurity innovation for co-investment.

- 33 Cross-sectoral investment priorities for the PBRI were agreed to through a PBRI workshop in January 2021 and Fall armyworm workshop in April 2021.
- Eight online research fora were held around key priority areas e.g., Fall Armyworm (FAW) RD&E gaps, shipping container hygiene, sustainable pest management, diagnostics, over the horizon biosecurity.
- Regular meetings were held with MOU partners (B3 NZ, Euphresco, ACIAR and PHC) to discuss respective investment rounds, project calls and RD&E priorities.
- Ten quarterly PBRI committee meeting agendas included current biosecurity issues or new research investments that were suitable for co-investment.
- Four integrated cross-sectoral priority areas were developed and agreed to including early warning, diagnostics, surveillance and improving the value of biosecurity in the community.
- PBRI members contributed to the successful Australian National University - led ARC Centre Biosecurity Training Centre bid.
- In 2023, A concept on the cultural impact of Biosecurity on Indigenous Communities was co- designed with DPITT NT, NFF, NECBRDES, CDU and AgriFutures.
- In 2022, a new diagnostic platform concept, Biosecurity Trakka based on the Covid tracking platform, Austrakka was co-designed with the Plant Health Committee sub-committees.
- The development of an iMapPESTS 2.0 regional surveillance concept was initiated in April 2023, taking surveillance research to the regions.

## Strategic Goal 2 - Coordination and leveraging of prioritised cross-sectoral investment in plant biosecurity innovation.



The following cross-sectoral projects were contracted or delivered in Phase II:

- Podcasts for Fall Armyworm management in northern farming systems (CRDC, GRDC, Hort Innovation, AgriFutures, SRA)
- Understanding the risk of native insects vectoring in Australia and New Zealand (Wine and Hort)
- Understanding the key market drivers that will underpin the development of an Insecticide Resistance Management Strategy for Fall armyworm I (DAFF and PHA)
- Boosting diagnostic capacity for plant production industries (DAFF and all RDCs)
- The development of environmental DNA detection of the Brown Marmorated Stink Bug and other high priority plant pests (Hort and PFRNZ)
- Rapid diagnostic screening for Post Entry Quarantine pests (DAFF and Hort)
- Field-based testing for fall armyworm (DAFF and Hort)
- Co-developing and extending integrated Spodoptera frugiperda management systems for the Australian vegetable industry (Hort and GRDC)

### Strategic Goal 3 - Promotion and facilitation of collaboration for better plant biosecurity outcomes for industry, their communities, and the environment.



- As part of the B3 MOU, the PBRI participated in the International Congress of Biological Invasions and presented at the B3 Conference May 2023. The PBRI supported an Indigenous Ranger (DAFF) to participate in the ICBI conference in Christchurch.
- An MOU was signed with ACIAR in November 2020.
- An MOU was signed with the Plant Health Committee in October 2022.
- In collaboration with Euphresco, the PBRI delivered the global video competition 'Plant Health TV'
- The PBRI was featured in a capability building panel session for plant health at the FAO Near East and North Africa meeting in Bari, Italy in June 2023.
- A Global Plant Health Network workshop was co-delivered with Euphresco and B3 NZ at the London Plant Health Conference Oct 2022 and
- The PBRI-Euphresco collaboration was illustrated with a Xylella project at the International Plant Health Conference, London, October 2022.
- The International Plant Health Day Steering Committee delivered the global video competition the DAFF Science Exchange and a IDPH photography competition.
- 150 delegates attended the biannual PBRI Symposium held at the Adelaide Wine Centre in May 2022.
- An EOI for the inaugural Ritman Scholarships was launched in February 2022. Four PhD students researching plant health were awarded the Scholarship.
- A new Plant Health Student Network was launched in September 2022 by the Ritman Scholars.
- Ritman Scholar, Bianca Rodrigues-Jardim presented on the PBRI and the new Plant Health Student Network at the Kansas State Biosecurity Training Course in May 2023.
- The PBRI Biosecurity Extension Community quarterly online meetings continued through Phase II with 110 members.
- The PBRI participated in the Northern Australia Biosecurity (NABS) Forum panel session in Cairns.



# Measuring Success – in detail

## 1. Goal 1 - Identify targeted cross-sectoral plant biosecurity innovation for co-investment.

### 1.1 33 Cross-sectoral investment priorities agreed to

33 overlapping areas of priority were identified amongst the PBRI members in a workshop in January 2021 and in a subsequent Fall armyworm RD&E gap analysis (April 2021). These priorities aligned to the six Key Focus Areas agreed to in the first phase of the PBRI (see Attachment 1). They were used to develop and consider plant biosecurity RD&E concepts for co-investment throughout phase II.

### 1.2 Eight online biosecurity research fora

During the pandemic, face-to-face meetings ceased, and online meetings were increasingly used by the PBRI to exchange ideas and to hear about the latest research. The PBRI scheduled a series of online forum topics to explore current and proposed research around agreed high priority topics. The audience included researchers and RDC representatives and attendees ranged from 30 - 50 per topic.

#### The PBRI Online Research Fora

Date 2021	Topic	PBRI KFA's
25 Feb	Sea container hygiene	Preparedness
30 Mar	Sustainable pest management	Sustainable Pest Management
27 Apr	Fall Armyworm RD&E gaps	all
25 May	Identifying emerging biosecurity threats - over the horizon intelligence	Preparedness
20 Jul	Data and analytics for enhanced biosecurity	Preparedness, Diagnostics and Surveillance
26 Oct	Diagnostics - new technologies, addressing gaps	Diagnostics
23 Nov	Surveillance - early detection technology	Surveillance
20 Apr 2022	Pacific Biosecurity R&D	Preparedness

The purpose of these fora was to collaborate across sectors, building on existing research investments underway, or to examine new areas of research that may provide benefit to multiple plant industries, and be the focus of future co-

investment.

#### 1.2.1 Sea Container Hygiene

On 25 February 2021, fifty Australian researchers, regulators and R&D managers came together to discuss potential research options to strengthen biosecurity measures for sea containers.

Participants of this forum included DAFF, B3 NZ, Chevron, CEBRA, CSIRO, University of Canberra, Iugotec, Intelligent System Design, the University of Sydney, Murdoch University, PHA and the Rural RDCs.

The forum was opened by Dr Robyn Cleland, Assistant Secretary, Plant Import Operations (then DAFF), who introduced the topic, describing efforts the department is taking to manage this complex problem. Dr Cleland emphasised the need for further novel measures to improve inspection and detection of pests and sustainable treatment methods options.

In 2020, Khapra beetle was first detected in a consignment of refrigerators imported in a single shipping container. Khapra beetle (*Trogoderma granarium*) is a serious pest of stored grain and dry foodstuffs worldwide which can cause stored grain losses of up to 75 per cent from direct feeding. Khapra beetle is exotic to Australia. If it were to become established here, it would pose a serious threat to Australia's grains, dried fruit and nut industries.

Approximately 20 million sea containers are in circulation globally, with three million containers imported into Australia each year. Along with these imports comes the risk of serious pests such as khapra beetle hitchhiking in and on the containers.

Container risk profiling methods, novel pest detection technology and new treatments were

presented at the workshop as potential alternatives to methyl bromide.

The Department of Agriculture, Water and the Environment is part of an ongoing international collaboration through the QUADS Sea Container Working Group and the IPPC's Sea Container Task Force. The next steps from the workshop will be to explore the research presented in more detail to improve container hygiene and reduce the risk of importing hitchhiker pests such as Khapra beetle.



Source: Hort Innovation

### 1.2.2 Sustainable Pest Management

On 30 March 2021, Australian researchers presented their latest research on sustainable pest management. The topic was introduced by Dr Ken Young, Senior Manager Biosecurity and Regulation at GRDC, who acknowledged the importance of having a diverse suite of tools for sustainable pest management as part of successful IPM programs. This included chemical, plant resistance, cultural and biological approaches.

The workshop program included Professor Ary Hoffman (University of Melbourne), who

presented new research on novel pest suppression and resistance management of invertebrate grain pests, manipulating endosymbionts in key aphid pest species.

Professor Ron Hill (University of Sydney) described a targeted approach using hormone receptors for insect control.

Professor Phil Taylor (Macquarie University) gave an overview of several areas of research: effective attractants for surveillance, monitoring and 'lure & kill', automated screening for biosecurity threats in containers at ports of entry, pesticide-resistant beneficial species for integrated chemical and biological pest control, and effective and safe repellents.

Dr Ian Newton (DAF) described research on entomopathogenic insecticide, detailing the benefits of using species-specific nuclear polyhedrosis viruses and fungal species as biopesticides that will not harm beneficial insects and pollinators.

Dr Raelene Kwong (Agribio) presented a new five-year project on host specificity testing of the blackberry sawfly for the control of blackberry.

Professor Geoff Gurr (Charles Sturt University) described his research on landscape management to support beneficial arthropods.

Professor Neena Mitter (QAAFI, University of Queensland) presented her work on Bioclay, an RNA-based biopesticide.

Dr Sharon Downes and Dr Peter Hunt (CSIRO) concluded the workshop by presenting the 'Agripest Challenge' describing a chemical-limited future based on growing market demands for limited chemical use, resistance to pesticides increasing, and the ongoing cost of chemicals to growers.

### 1.2.3 Fall Armyworm RD&E Gaps

On 27 April 2021, 50 industry, government, and research representatives from across Australia

and New Zealand met online to discuss approaches to management of fall armyworm.

The participants heard ten presentations in a bid to identify priority cross-sectoral RD&E that would best benefit industries in managing the new pest, which has spread into many Australian agricultural regions over the past year.

The workshop topic was introduced by Mr Stuart Kearns from Plant Health Australia, who outlined a continuity plan and gap analysis developed with Cesar Australia, funded by Grains Research and Development Corporation (GRDC). He also detailed an upcoming RD&E project funded by the Australian Government Department of Agriculture, Water and the Environment which will explore fall armyworm genetic research, insecticide resistance, commercial and native plant hosts, and population dynamics.



Source: Agriculture Victoria

Participants heard from government plant health experts in Victoria, New South Wales, Queensland, Northern Territory and Western Australia about current impacts of fall armyworm in Australia, including the worst affected crops so far. This confirmed that multiple industries are already seeing reduced yield from the pest, particularly grains and vegetables, with 90 per cent crop losses in some cases.

The jurisdictions also outlined the research and surveillance activities that they have initiated and highlighted promising areas for further work, including using pheromones to disrupt mating and possible bio-control options.

Producers have limited management tools available to them and need urgent extension

information on how to identify and manage the pest.

The following cross-industry initiatives were prioritised by workshop participants:

- Multi-industry monitoring programs, including for pesticide resistance, especially where these can be added on to existing surveillance programs such as for Helicoverpa.
- A transition to a robust integrated pest management strategy including area wide management based on education, training, detection tools and data sharing. The concept of a systems approach or 'hub' was discussed to provide the coordinated approach required.
- Regional insecticide resistance strategies for practical implementation.
- A review of minor use permits for fodder crops.
- Specific pheromone lures to minimise by-catch and the need for diagnostics or dissections of moths in pheromone traps to boost early detection.
- Low-cost diagnostics for larvae that can be used on-farm such as a dipstick test.
- Sharing of resources and communication material, including with animal industry RDCs.

#### 1.2.4 'Over the horizon' Biosecurity Threats

An online meeting held on 2 June focused on 'over the horizon' biosecurity threats, a high priority area for the members. The purpose was to better understand what our next plant biosecurity threats might be, based on current research and operational activity. Knowledge of the pest pressure at our borders, or in near neighbouring regions, will help to inform RD&E investment decisions to minimise any damaging consequences of a new pest arriving.

Dr Gabrielle Vivian-Smith, Australia's Chief Plant Protection Officer, introduced the workshop topic describing the increasing pest pressure at our borders. She presented Commonwealth Biosecurity 2030, the strategic roadmap which aims to increase offshore intelligence, research and data analytics and smart technology to cope with the unexpected threats.

Dr Darren Peck, Director, NAQS Plant and Animal Surveillance, described biosecurity in northern Australia, with islands in the Torres Strait providing potential pathways for new pests from the north. Risks are changing due to pest pressure increasing at the border, increased industry development in the north and climate change. Community and industry engagement will be key to future NAQS activities.

Dr Richard Bradhurst, CEBRA Research Fellow, described the animal spread model AADIS used to simulate and visualise an animal virus introduction. He also demonstrated the plant model APPDIS, using tramp ant and exotic fruit flies as case studies. The models can be used to test policy and management options for pests that may be introduced on natural or human-mediated pathways.

Dr Julie Soewarto, Forest Pathologist, B3 and Scion Research NZ, outlined a new project identifying pre-border biosecurity threats to New Zealand through Māori and Pacific collaboration. This research involved understanding the co-occurring plant species and has identified 78 pathogens that may present a risk to New Zealand.

Dr Craig Phillips, Senior Scientist, B3 and AgResearch NZ, presented a project on automating pest risk analyses using insect records on forage crops. Hazards were ranked by the attributes they share with non-native insects already established in NZ. Hazard scores for biosecurity risks to forage crops included a risk assessment of 1857 insects. There is potential to reduce PRA cost and increase transparency and reproducibility.

Professor Michael Springborn, Department of Environmental Science and Policy, UC Davis, spoke about the risks posed by unregulated online retail and described research using the 'nudge principle' to investigate consumer choice and decision based on biosecurity risks.

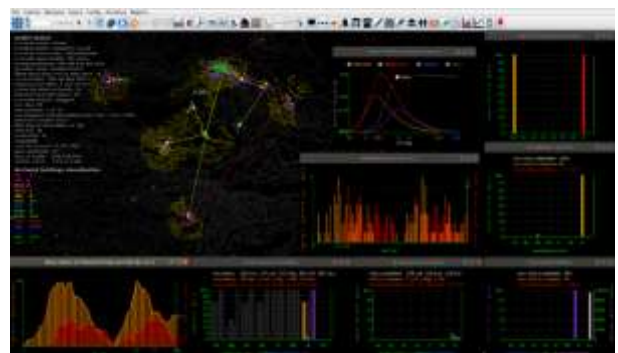
Dr Brian Garms, DAFF, presented data on hitchhiking insects found on sea cargo which pose a risk to Australian agriculture. He found that

overwintering pests such as ants, spiders, sting bugs and snails that can survive on inanimate material had several common characteristics. Also, there were key characteristics of the type of shipped goods that make them suitable vectors for these pests.

Dr Fiona Constable, Senior Research Scientist, Agriculture Victoria, described her work that was supported by DAFF on the risks identified in the international trade of seed, in particular relating to the introduction of new viruses. These research results led to adjustment of policy relating to seed importation, specifically the increased testing at the border for plant viruses.

The final speaker was Professor Mike Furlong, School of Biological Sciences, University of Queensland. Mike presented a large program of work supported by ACIAR, including the establishment of plant health clinics in the Pacific. He also outlined work underway on fall armyworm trapping in PNG and Fiji and biocontrol of Asian citrus psyllid.

Growing resistance to a biocontrol virus, which was used to manage the coconut rhinoceros beetle, has been reported in the Pacific. Of concern is the beetle's rapid march from the South Pacific across to Guam and Hawaii to Vanuatu, New Caledonia, and Solomon Islands. The beetle's move through PNG has been rapid with large-scale coconut plantations and oil palm plantations being destroyed. Australia's sugar, pineapple, mango, and coconut oil industries are now threatened by the beetle, as the populations are growing on Australia's doorstep.



Source: AADIS - FMD outbreak visualisation (R. Bradhurst 2021)



### 1.2.5 *Data and Analytics for Enhanced biosecurity*

The PBRI members and partners met on July 20 to hear about the role of data and analytics to support biosecurity. This forum focused on the types of data being collected and how it is being used in a biosecurity context. More biosecurity data has been created in the last year than ever previously recorded, creating new opportunities to better understand and profile risk.

Ms Susan Maas, R&D Manager, Cotton Research and Development Corporation (CRDC) introduced the importance of access and integration of data from an industry perspective. CRDC led the cross-industry Precision to Decision (P2D) project, which facilitated the development of digital technology in Australian agriculture, including relevant legal frameworks, data systems and access to critical datasets for the Australia farm and agribusiness sectors.

Mr Pierre Skorich, Compliance Testing and Intervention, DAFF, discussed the regional, transnational, and international threats and opportunities that will affect Australia's assets and objectives. Mr Skorich explained that the threat of diseases such as African Swine Fever arriving in Australia is not just driven by disease epidemiology, but by a complex set of economic, trade, cultural, geographic, and geopolitical factors.

Dr Sarah Richmond, General Manager Science Programs, Bio Platforms, outlined a new initiative – the Bioplatforms Framework – Pathogen 'omics. The aim of this project is to consolidate and extend national knowledge and capabilities in plant protection and biosecurity preparedness, by developing a referential 'omics data resource of key pathogens. The project will also contribute to best-practice standards and workflows for identification, monitoring and management of plant pathogen populations.

Bianca Kallenberg, Remote Sensing Analyst, Geospatial and Analytics Branch (DAFF) described the criteria for procuring satellite data for application within the Department. Bianca presented a comparison of spatial and temporal

criteria from eight different satellite providers, outlining their capabilities such as multispectral, object detection, AI analytics and 3D footprint building.

Staying on the theme of hyperspectral and thermal imaging, Prof. Pablo Zarco-Tejada, Precision Agriculture and Remote Sensing, University of Melbourne, demonstrated results from the retrieval of spectral plant traits from hyperspectral data for *Xylella fastidiosa* detection in olives in Spain.

Dr Tom Walsh, Principal Research Scientist, Environmental Systems Biology, CSIRO, explained the new Australian Invasive and Pest Species Genome Partnership. The aim of the partnership is to have locally focused, high quality, pest genome reference data assets, which have open access to users.

Nathaniel Bloomfield, Research Fellow, CEBRA described research on automated image analysis for identifying biofouling risk on vessels. This included integrating neural network models with a prototype user interface and developing methods to expand the image dataset using semi-supervised learning.

Mr David Gale, Manager, Surveillance System and Data Management, PHA, described the key features of the plant pest surveillance virtual coordination centre, AusPestCheck. Mr Gale outlined several areas for expanding the use of AusPestCheck e.g., pesticide resistance mapping and a capacity to visualise pest abundance.

Professor Brendan Rodoni, Research Director, Microbial Sciences, Agriculture Victoria, spoke about the guidelines and standards required for harmonising high throughput sequence usage, data analysis, reporting and data storage. A National Biosecurity Data Platform (NBDP) will be established to bring together sequence information and metadata to allow the real-time analysis of disease outbreaks.

Mr Greg Hood, Principal Data Scientist, (DAFF) described two areas of work underway at the Biosecurity Analytics Centre – improved 'platform, access, and tooling' to allow data sharing and

improved capacity to deploy research tools. He described the process from data extraction to model validation used to ensure reliable data for use in biosecurity research.



Source: Shutterstock

### **1.2.6 Plant Biosecurity Detection and Diagnostic forum**

This forum tabled the latest research and national gaps in the plant biosecurity diagnostics area. The chair of the Sub Committee for Plant Health Diagnostics (SPHD), Dr Brendan Rodoni (Ag Victoria Research), outlined the role of SPHD, a committee of state and territory diagnosticians aiming to deliver and continually improve national plant health diagnostics. SPHD members have several working groups, including a new group focused on developing standards for a High Throughput Sequencing (HTS) platform.

Mr David Nehl, Director – Plant Pathology and Botany Section, Operational Science and Surveillance (DAFF), discussed the various pros and cons of using MALDI-TOF Mass Spectrometry for Biosecurity Diagnostics for border intervention, surveillance, regulated and natural pathways and vector monitoring.

Dr Kayvan Etebari, Research Fellow, School of Biological Science (UQ), presented his research on mitochondrial haplotyping for management of the Coconut Rhinoceros Beetle (CRB), which was supported by ACIAR. The range expansion of this pest in the Pacific Islands is related to a haplotype that is reported to show reduced susceptibility to the virus used to control the insect.

Ms K'rie Coster, Project Manager, Rural R&D for

Profit – Boosting Diagnostics (GRDC) presented the highlights of the \$15 million, collaborative diagnostic project. The project's key outputs will include 12 National Diagnostic Protocols, six early detection tools and five pest reference collections will be updated. This project also addresses gaps in national proficiency testing and industry training through incursion scenarios and diagnostic 'blitzes' on-farm.

Dr Monica Kehoe, Molecular Plant Pathologist (DPIRD, WA), expanded on the application of High Throughput Sequencing (HTS) as a national biosecurity tool, including agreed guidelines for reporting of data and outcomes. The sharing and coordination of HTS data for biosecurity within Australia is critical to the platform. Dr Kehoe is part of a working group developing a strategic roadmap for the development and adoption of HTS as a diagnostic tool across all Australian jurisdictions.

Ms Kathleen DeBoer, Project Officer (PHA), provided an update on the development of National Diagnostic Protocols (NDPs), the nationally agreed methods for use in emergency responses. PHA now have primary responsibility for the NDPs as well as the Australian Plant Pest Database (APPD). The APPD is being rebuilt, collating information on vouchered specimens from 16 major plant pest reference collections nationally. The new website for APPD went live on 1 November 2021.

Dr Alexander Schmidt-Lebuhn, Research Scientist, Plant Systematics and Population Genetics (CSIRO), presented his pilot research with DAFF on the development of a mobile detection system to identify BMSB (see image above). Using specimens from the Australian National Insect Collection, a BMSB detection algorithm and App was developed for a mobile phone and iPad use.

Joel Willis, Director, Detection Capability and Emerging Technology (DAFF) presented his work on the application of 3D x-ray technology and auto risk detection algorithms to settings such as mail and passenger baggage screening. The technology allows much greater resolution for the detection of plant material that was not previously possible.

Dr Andrew Weeks, Director (Cesar Australia) outlined the benefits and challenges of using eDNA detection in biosecurity applications, using examples from his research on leaf miner, BMSB and aphids. eDNA detection is cost-effective and has the potential to allow early detection at borders or in the field and increases the detection window.

Mr Jeff Smith, Director, Detection Capability and Emerging Technology (DAFF), presented work on COVID-19 detector dog feasibility using dogs based at Adelaide and Sydney airports. The dogs were trained and tested using locally collected samples from hotel quarantine, returning travelers and hospitals. Preliminary results showed the dogs were able to detect the virus with a high success rate.

Dr Linda Zheng, Research Scientist, Virology (Ag Victoria Research), presented her research on the project Virus-Curate AU, which aims to generate an accessible database of curated Australian virus isolates. The goals are to meet and contribute to global standards, provide appropriate scientific evidence to support national and international policy and to contribute to national and globally linked databases.

Dr Karen Armstrong, Diagnostics theme leader (B3 New Zealand) gave an overview of the B3 Diagnostics projects including, detection and sampling tools for use on importation pathways, high throughput sequencing, stable isotope provenance research, viable virus detection, plant pathogen bioelectric sensor and diagnosis of irradiated insects and fruit.



Source: Scitech Daily 2019

### 1.2.7 Biosecurity Surveillance RD&E

The PBRI has prioritised Surveillance RD&E as one of its Key Focus Areas, with interest in investing in activities that aim to reduce surveillance costs and increase coverage over large and remote areas, with better methods of coordination of data capture.

The last forum of the year was introduced by Dr Satendra Kumar, NSW Chief Plant Protection Officer. The agenda concentrated on Biosecurity Surveillance RD&E. Dr Kumar described the challenges for the state jurisdictions in maintaining capacity & capability, in applying technology and innovation on the ground and in the ability to provide surveillance activities across the biosecurity continuum.

The first speaker was Dr Tuyet Hoang, Program Manager for Austrakka, the nationally recognised platform for real-time analysis of genomic data for public health. Tuyet presented their high-profile work on national Covid-19 strain tracking during the pandemic. The potential for a similar plant diagnostics genome tracking system will be considered further by the PBRI members.

Dr Ryan Higgs, Onside CEO, presented a digital check-in app for farmers, growers, and contractors. The App enables the identification of biosecurity risk on farm through tracing movement.

Dr Elizabeth McCrudden, Pacific Engagement and International Plant Health, DAFF, described the

successful use of WhatsApp in remote surveillance in PNG, due to Covid travel restrictions.

Dr Paul Barber, ArborCarbon Managing Director, spoke about improving surveillance activities using airborne remote sensing and AI.

Ms Shakira Johnson, Communication and Extension, AUSVEG, provided an overview of the iMapPESTs project and presented industry feedback on the project outcomes.

The audience heard perspectives on Surveillance from industry and government in a panel session at the end of the forum. This included Dr Sharon Harvey, R&D Program Manager, Wine Australia, who spoke about the benefits of having access to the Commonwealth's pest interception data to better inform Wine Australia's investment in biosecurity research.

Mr Bill Gordon, NSW Grains Biosecurity Officer, identified the collection, coordination, and management of surveillance data as a big issue. He saw opportunities to improve information sharing and to prioritise targets for surveillance. As part of this, community engagement will be particularly important.

Dr Nicole Thompson, Sugar Research Australia, described surveillance activities for the sugar industries as generally occurring in response to an incursion or as small, targeted programs. This presents difficulty in analysing data across multiple small programs. In the sugar industry, machinery movement occurs across the state and between states, so monitoring processes in place are critical.

Mr Francisco (Paco) Tovar, National Forest Biosecurity Coordinator, Plant Health Australia, saw innovative technologies as being expensive to implement and not always designed for operational purposes. He suggested there is value in extend existing technologies such as the Austrakka platform, ArborCarbon, AusPest Check, MyPestGuide. These tools are available but better industry involvement in the design and delivery could occur.

Dr Greg Chandler R&D Manager-Biosecurity, Hort Innovation, described remote sensing as a useful tool to cover large spatial scales and in directing ground surveillance to high-risk areas. Data collection for market access should also include data for key exotic species, to increase efficiency. Surveillance R&D investment should consider the longevity of surveillance tools and the business model for future use.

Dr Stephen Dibley, Deputy Chief Plant Health Officer, AgVictoria, explained that state jurisdictions are focused on early detection or delimiting activities in an incursion. He also emphasised<sup>21</sup> that labour resources for surveillance is always limited. Data sharing is occurring between the Commonwealth and jurisdictions which is proving very valuable.

Dr David Teulon, Director, Better Border Biosecurity (B3) New Zealand, shared the important aspects of surveillance R&D that he looks for when considering funding. He emphasised that surveillance is key to all parts of the biosecurity continuum. Technology is available but where should it be applied and is it fit for purpose? Can the technology be used now or in five, 10- or 20-years' time? Climate change will be a layer to consider which may demand iterative changes to the biosecurity system to adapt. New Zealand has a biosecurity team of five million – how do we continue to engage the community on Biosecurity?

Common areas discussed on the cross-industry and government panel were used to develop future research concepts.

### **1.2.8 Biosecurity R&D in the Pacific**

In 2022, DAFF released its first Pacific Biosecurity Strategy which aims to improve plant, animal (including aquatic animal) and environmental health, and biosecurity outcomes in the region. Our approach to improving outcomes includes relationship-building, collaboration and support, and co-design and co-delivery with Pacific Island Countries and Territories near neighbours and relevant organisations in the region. This forum brought together current activities in the Pacific, undertaken by the Pacific Community (SPC), DAFF,



ACIAR, B3 NZ, MPI NZ UQ and CSIRO.

Dr Visoni Timote, Integrated Programme Coordinator for the Biosecurity, Sanitary and Phytosanitary Standards for the Land Resources Division of the Pacific Community (SPC), presented the emerging biosecurity priorities in the Pacific that can be addressed with R&D. The Coconut Rhinoceros Beetle – Guam Strain is present only in Guam, PNG, Solomon Islands and Hawaii; Cassava bacterial blight is present only in the Solomon Islands; and Panama disease is present only in Australia and not present in any Pacific countries. Funding, equipment, and technical expertise in the region are ongoing challenges for the Pacific.

Dr Sophie Peterson, Director, Pacific Engagement, and International Plant Health (DAFF) provided an overview of Australia’s engagement work in the Pacific as part of the 20220-2027 strategy, which addresses the Commonwealth Biosecurity 2030 strategic roadmap outcomes and strategic actions, including:

1. Develop a strategy to support our Pacific Island biosecurity partnerships and engage 2 dedicated engagement officers.
2. Increase partnership activities with our near neighbours to build their risk-management capability and continue our engagement with international bodies.
3. Expand offshore assurance arrangements and overseas supply-chain integration.
4. Increase offshore intelligence, research, and data sourcing to support risk-based interventions, preparedness, and response.

Dr Katharina Hofer, Diagnostics and Surveillance Services (MPI NZ) provided an overview current and future capability work under the Enhanced Pacific Biosecurity Partnership. Dr Chris Dale, Biosecurity Specialist, Agricultural Development and Food Security (DFAT) described the role of DFAT in supporting regional biosecurity in the Pacific. Dr Raghu Sathyamurthy, Research Director, Biosecurity and Health (CSIRO) gave an outline of CSIRO’s role in coordinating Indo-Pacific Biosecurity RD&E.

Dr Allan Woolf, Team Leader Postharvest Science (PFRNZ) described the biosecurity compliance of

Samoa taro exports without methyl bromide treatment and Prof. Mike Furlong, Professor School of Biological Sciences (UQ) described the Plant health Clinic established with ACIAR and his work on biological control of insects in the Pacific.



Source: ACIAR Plant Doctor Maca Vakaloloma (Plant Health Clinic). Photo: Dave Lavaki

Dr Amit Sukal, Associate Scientist -Germplasm Health/Virologist Pacific Community (SPC), spoke about Developing virology diagnostic capacity in the Pacific. Alby Marsh (Māori Engagement Director, PFRNZ and B3 NZ) presented his project on networks for indigenous people in the Pacific.

### 1.3 MOU Partner Meetings

Regular meetings were held with MOU partners (B3 NZ, Euphresco, ACIAR and PHC) to discuss respective investment rounds, project calls and priorities where relevant. In Phase II, the PBRI continued to work with its strategic partners through regular online meeting.

All four MOU partners attended the PBRI Symposium and Partnership meeting in Adelaide in May 2022. Future collaborative opportunities were presented and discussed such as the London Plant Health Conference in September 2021, the International Congress of Biological Invasion May 2022, the B3 Conference May 2022 and the next PBRI Symposium was proposed to be held in Cairns in 2024.

The B3 NZ MOU was reviewed and renewed, and monthly meetings with the Director, Dr David Teulon continued. In May 2022, Dr Teulon resigned from B3, and Dr Desi Ramoo and Alby Marsh took on the roles of Co-Directors. The B3

Council Chair Mr James Buwalda also stepped down and Melanie Mark-Shadbolt took up the role of Chair.

Online meetings with Euphresco continued bi-monthly, with opportunities for collaboration on Euphresco topic calls identified. Euphresco, the PBRI and B3 Directors proposed a global network for plant health research which was subsequently developed as a bid to the EU Horizon Programme. This project was funded for three years to enable the establishment and consolidation of the global network (see below).

The ACIAR MOU was signed on 6 November 2020 and meetings to explore potential collaboration and co-investment were held. A regular meeting between Irene Kernot (ACIAR), Sophie Peterson (DAFF) and Jo Luck (the PBRI) were held to specifically focus on any research investment synergies in Pacific countries.

#### **1.4 The PBRI Management Committee Meetings**

Ten quarterly PBRI committee meetings were held online in Phase II and were attended by the PBRI member representatives or proxy.

The agendas included a standing item 'member updates', which included an overview of strategic issues from each member organisation that may impact the PBRI investments and activities. Current biosecurity issues or incursions were discussed in confidence and new research investments that may be suitable for co-investment were outlined.

Other standing items included the PBRI concepts under development, status of co-investments governance, partnerships and communication and events.

Minutes, actions, and a communique for public release were recorded from each quarterly meeting.

One PBRI member was rotating Chair for each meeting with support from the Program Director.

#### **1.5 Integrated cross - sectoral investment**

### **priorities**

As part of the RDC's and DAFF's core investing role in Agricultural Innovation Australia (AIA), the PBRI was invited to submit investment priorities for consideration. Several workshops with the PBRI members generated four clear areas for investment based the PBRI Key Focus Areas.

Four large cross-sectoral priority areas were developed and agreed to by members, including:

1. Emerging Threat watch
2. Rapid threat detection
3. Biosecurity sentinels
4. building the value of biosecurity in the community.

Details of each investment area was developed and aligned to DAFF's 2030 Strategic Actions and the PBRI Strategy's Key Focus Areas.

#### **1.6 ARC Biosecurity Training Centre bid**

In 2022, the PBRI members were invited to participate in an ARC Industrial Transformation Hubs and Centres bid led by ANU in collaboration with JCU and UC. Several members contributed ideas through a series of one-on-one consultations led by Professor Peter Solomon, ANU, which assisted in the refining of the bid. The bid was announced by the ARC as being successful in August 2023.

The PBRI members committed in-kind and cash support to the Biosecurity Training Centre bid, which was announced as successful in August 2023.

The Centre will have four objectives:

- Train the next generation of innovators and leaders in plant biosecurity to secure Australia's agricultural, horticultural, and environmental sectors from pests and diseases.
- Innovate and develop novel approaches and technologies for pest and disease surveillance, detection, and identification through training-driven platforms.
- Address the societal outcomes associated with transformational biosecurity changes

through engagement with a new cohort of trained researchers and leaders.

- Build an enhanced environment of interaction and collaboration between plant biosecurity stakeholders in industry, Government, and universities.

The contracts will be executed by June 2024 with a partner forum to be held alongside the 2024 PBRI Symposium in Cairns.



Source P. Solomon, Australian National University 2023

### 1.7 The cultural impact of biosecurity on Indigenous Communities Concept

Northern Australia is the frontline of Australian biosecurity. This region presents biosecurity challenges due to the proximity of neighbouring countries the ecological and climatic conditions that may be conducive to the introduction of exotic pests and diseases the limitations of seasonal access the range of operating environments.

Indigenous communities in the north are already engaged in our national biosecurity efforts. The Indigenous Ranger Program is one example of this, which has been very successful. The program has proven its effectiveness with identification of several threats, including the early discovery of guava root-knot nematode.

In biosecurity, there is a general understanding of the economic impact and social consequences of biosecurity threats on agriculture. However, western cultures generally don't have a basic understanding of the cultural impact biosecurity risks may have on local indigenous communities.

This project will seek to better understand the impact of biosecurity risks on First Nations communities through storytelling and knowledge sharing. It will begin the conversation with First Nations communities about plant health and biosecurity, which will act as the foundation for future partnerships and opportunities.

This concept was initially conceived with NT DITT, NT Farmers, CDU, AgriFutures, NECBRDES, NAQS and will be further developed in Phase II with DAFF and the Indigenous

### 1.8 Biosecurity Trakka Concept

In 2022, a new diagnostic platform concept, Biosecurity Trakka based on the Covid tracking platform, Austrakka was co-designed with the Plant Health Committee sub-committees.

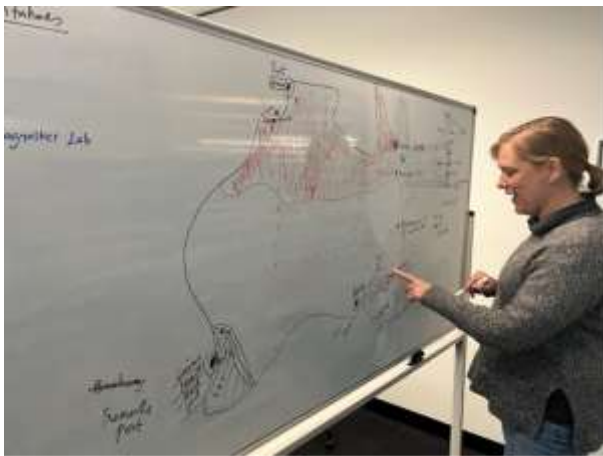
Genomic data are collected for many pest and pathogen threats but currently not coordinated and standardised at a national level. There is no system to organise, share and interpret the data. Data sharing is critical to enable a rapid and informative response to support the plant biosecurity system. High throughput sequencing (HTS) is a transformative technology for the identification and tracking of biosecurity threats to Australian primary industries. With the increasing amount of data being generated on pests and diseases of plants, a need for a secure, centralised platform has emerged that allows the submission, sharing and analysis of genomic data detected in agricultural and environmental settings.

During the Covid-19 pandemic, a national data sharing platform called AusTrakka was used to provide real-time analysis of integrated pathogen genomic data across Australia. It provided a unified and coordinated public health microbial genomics network to advise and interact with existing laboratory and public health networks, government, policy makers and other stakeholders. A similar model of data sharing is critical to enable rapid and informative responses to support the plant health system.

Importantly, a governance structure was developed and agreed by all states and territories

to share their data to allow it to be analysed and published without giving up ownership of the data itself, or even allowing others to view the raw data. Since others could not necessarily see and verify the quality of the data, a strong system to ensure that data quality was of the highest level was instituted.

The PBRI has acted on a strategic and timely opportunity to develop an underpinning national plant biosecurity infrastructure system that brings together the many complex and discrete components that are required to address the gap between the creation of innovative 'omics data, and the use of this data to inform on-the-ground actions in plant health. Such a system would provide a nation-first step change across the Australian agricultural plant sector, and ultimately enable existing research questions to be investigated far more efficiently and effectively and provide the means for researchers to address new innovative questions to increase productivity, resilience and on-farm profitability.



Source: *iMapPESTS 2.0 workshop* - Susan Maas (CRDC)

It is proposed that Biosecurity Trakka would provide access to standardised quality sequence data that can be analysed and shared amongst diagnostic laboratories with minimal metadata to inform policy decisions in real-time, a valuable tool during a biosecurity incursion. The sequence data would link to relevant databases (e.g., Australian Plant Pest Database), provide quality assurance around sequence quality to meet minimum system standards prior to analysis, and

provide the benefit of more rapid pest identification, targeted surveillance, and assurance to regulators and industry members.

Diagnosticians, researchers, and approved users would have access to Biosecurity Trakka database through a secure web portal that provides access to standardised pathogen and pest consensus sequences from Australian jurisdictions, with sequence accession linked to minimal metadata which provides links to sequence databases.

A tender for the Biosecurity Trakka project was published by Hort Innovation in September 2023. Hort Innovation will be the lead on this project with in-principle commitment from other PBRI members.

### 1.9 iMapPESTS 2.0 regional surveillance concept

The development of a new phase of iMapPESTS was initiated in April 2023, taking surveillance research to the regions. The PBRI members agreed to develop regional surveillance solutions based on industry needs.

In the next phase of this project, there will be a greater focus on regional ownership and use of pest management solutions or surveillance tools through co-design with regional agronomists, extension practitioners and grower groups.

The concept aims to increased detection and monitoring capability for enhanced biosecurity, for four regions:

- the 'North including Darwin, Kununurra and Cairns
- Central NSW to Central Queensland
- Mildura to Riverina
- southwest WA.

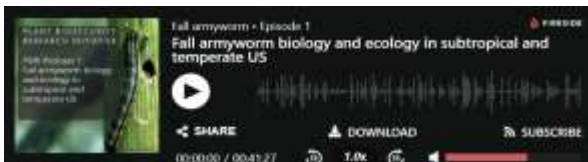
As in iMapPESTS 1.0, the concept will incorporate discovery and deployment of enhanced detection technology to reduce cost and increase surveillance coverage on a regional basis. It will also leverage through project-generated knowledge, data, and hardware where relevant.



## 2. Goal 2 - Coordination and leveraging of prioritised cross-sectoral investment in plant biosecurity innovation

### 2.1 Podcasts for Fall Armyworm management in northern farming systems

The PBRI Podcasts explore some of Australia's most unwanted plant pests. They feature interviews with growers and agronomists on their first-hand experience in managing new and emerging pests, leading Australian researchers on their latest findings and observations and international experts who share their experiences and learnings. Each episode runs for about 30 minutes.



Source: <https://www.pbri.com.au/pbri-podcasts/>

The first series of the PBRI Podcasts is on Fall armyworm and was delivered by Mr Stuart Kearns, PHA. It includes the experiences and observations of experts from around the globe and here in Australia as we prepared to take on this invasive pest. Throughout the series of nine podcasts, host Mr Chris Brown delves into the biology and behaviour of fall armyworm and explores how we can best prepare ourselves to minimise its impact.

### 2.2 Understanding the risk of native insects vectoring in Australia and New Zealand

Xylella is regarded as the number one biosecurity threat to Australia and the cost to the wine and grape sector alone has been estimated into the billions of dollars over a 50-year period.

Xylella is a bacterium spread by insects that blocks the water conducting vessels of plants (the xylem) causing decline and death of over 500 different plant species, many are important agriculture crops such as wine, citrus, olives, stone, and pome fruit.

If Xylella was introduced into Australia, there are several xylem feeding insects that may spread the disease in Australia.

The aim of this project is to prevent spread of the bacterium; and provide growers and the sector the tools and knowledge to effectively contain and treat the insect vectors if Xylella were to arrive in Australia.

As Xylella is transmitted by xylem feeding insects, the project will investigate which insect species present in Australia and New Zealand may vector the bacterium.

The project is a national and international collaboration, featuring leading scientists and industry representatives worldwide.



*The meadow spittlebug (Philaenus spumarius)*

Source: Cheryl Moorehead, Bugwood.org

### 2.3 Understanding the key market drivers that will underpin the development of an Insecticide Resistance Management Strategy for Fall armyworm.

This project was completed in Phase II of the PBRI and originally identified as a high priority because FAW populations entering Australia in 2019 were already resistant to certain insecticide modes of

action and some insecticides were not registered in all host crops.

Insecticide effective against FAW have differing selectivity to beneficial predators and parasitoids (beneficials).

The use of insecticides targeting FAW needs to be complementary with other insecticide management programs in the crop and the region of use.

An increase in insecticide use targeting FAW is likely to place further resistance pressure on key insecticides.

FAW populations are known worldwide to be able to rapidly select for insecticide resistance.

A strategy underpinning the effective management of FAW in Australia will develop regionally based Insecticide Resistance Management Strategies (IRMS) for key host crops and insect targets.



*FAW larva (left). Maize leaf unrolled to show damage and frass. Helicoverpa larva (right) on millet head. Photos by Melina Miles. Source: [www.thebeatsheet.com.au](http://www.thebeatsheet.com.au)*

To facilitate development of these regional IRM strategies, detailed market research is required to understand the major host crops geographic region; when these crops are grown within the region; current insecticide use patterns for other pests; predicted FAW pressure; and how FAW is likely to change existing insecticide use patterns and if the adoption of increased insecticide use

targeting FAW is likely to significantly impact beneficial populations, resulting in 'flaring' of other insect pest species.

Current insecticide use was explored, including documenting successful IRMS that are already in place for other pests. The project will also seek to explore how FAW management is likely to change insecticide use patterns. More detail on this project can be found [here](#).

## **2.4 Boosting diagnostic capacity for plant production industries.**

The Boosting Diagnostic Capacity for Plant Production Industries Project was completed in Phase II of the PBRI. It was a cross-industry Australia-wide project concentrating on high priority exotic pests that threaten production, trade, and market access.

The research program was developed as a bid by the PBRI members to the Commonwealth Rural R&D for Profit Program. It was selected and approved for funding under to increase the capacity and capability of Australia's plant focused diagnostics from baseline levels.

It was recognised that recent pest and diseases incursions in Australia have highlighted the importance of having a nationally coordinated diagnostic network with the highest level of accuracy and confidence in testing.

The disruption to trade while diagnostic decisions are being made is costly and provided the impetus for industry and government to partner on this project of national diagnostic capacity building.

The investment includes \$4.6 million cash from the Commonwealth, \$3 million cash from the RDCs and other partners and \$7.4 million in kind contributions from stakeholders, for a total investment of \$15.1 million over the course of the program. It enhanced the sensitivity of laboratory diagnostic tools to create improvements in the diagnosis of suspect pests and diseases.

Laboratory identification improvements will be achieved by developing national diagnostic

protocols, improved diagnostic tools and methodologies, along with establishing reference collections to support diagnostic functions.

See project team member's, AusVeg, article here. Plans for a next phase of this project are being developed by the PBRI.



Source: AusVeg

## 2.5 The development of environmental DNA detection of the Brown Marmorated Stink Bug and other high priority plant pests

In a novel application of environmental DNA (eDNA), a new research and development initiative, led by cesar and undertaken in partnership with EnviroDNA and Plant and Food Research New Zealand, is developing eDNA based diagnostic technologies to detect BMSB at border points and in agricultural regions.

Environmental DNA (eDNA) is an innovative species detection tool being used in Australia and overseas for a range of activities in the fields of biosecurity, biodiversity conservation and environmental impact assessments.

All organisms leave traces of their DNA in their surrounding environment and this technology now makes it possible to take environmental samples to determine what species were present in real-time.

These molecular techniques detect trace amounts of DNA, potentially increasing the detectability of biosecurity threats, and are therefore an exciting prospect for integration into biosecurity activities to prevent incursions and delimit outbreak areas.

In this project, eDNA-based assays were developed and validated and sampling protocols for the real-time detection of BMSB at ports and in the field to increase the sensitivity and cost-efficiency of detection of this species in biosecurity activities were performed.

The eDNA methods and assays were field-tested as part of a collaborative project with Plant and Food Research New Zealand in an outbreak area such as Santiago, Chile, with sensitivity and cost-efficiency modelling used to determine optimised sampling protocols for Australia (and New Zealand). The project was completed in Phase II of the PBRI. For more information see Cesar's article on their research here.



Source: Cesar Australia

## 2.6 iMapPESTS

The RR&D4P project iMapPESTS project was completed in Phase II of the PBRI. It was a collaboration of government, industry, and researchers developing a mobile cross-industry plant pest surveillance network, which provided information on endemic, established, trade sensitive or exotic pests. The project rapidly monitors and reports the presence of high-priority pests and diseases.

A suite of high-tech surveillance units, known as 'Sentinels', were developed to incorporate several smart trapping devices for monitoring airborne spores & insects. The suite of Sentinels is equipped with power supply, climate sensors, telemetry and a control panel to remotely monitor and control the units. The units vary in size, power requirements, trap composition, cost and deployment method.

Advanced diagnostic techniques were explored for priority targets across Australia's plant industries, including exotic pests and pathogens, aiming to deliver fast, reliable, and cost-effective ways to identify pests and report to industry in a timely fashion.

Surveillance trap samples captured by the surveillance network were analysed using morphological identification and advanced molecular diagnostic tools to rapidly detect and quantify high-priority pests and diseases.



iMapPESTS sentinel unit

## 2.7 Improving plant industry access to new genetics through faster and more accurate diagnostics using next generation sequencing.

A post-entry quarantine diagnostics research project has been extended in Phase II. This project is supporting the adoption of 'next generation sequencing' in the screening of imported horticultural plant material in post-entry quarantine facilities. Citrus, Nursery, Potato (Fresh and Processing), Raspberry, Blackberry and Table Grape industries are engaged in this project.



PEQ plant material for screening

Source: Robin Eichner, DAFF, 2022

The project team is working closely with industry representatives and the Australian Government to address their needs, which has led to policy adoption of the new methodology to accelerate quarantine testing at the border.

It is delivering next generation sequencing tools to fast-track screening for pathogens of imported plant material in post-entry quarantine facilities. The technology allows plants to move through the quarantine process much more quickly – allowing industry earlier access to new germplasm.

## 2.8 Field-based testing for fall armyworm

This project (a Hort and DAFF investment) developed a rapid molecular test for use in the field for early detection and identification of fall armyworm (FAW).

The DNA-based tests developed use Loop-Mediated Amplification (LAMP) technology to provide rapid and highly accurate tests suitable for use in the field. The project assessed the performance of these LAMP tests in-field against a broad panel of moth species, to determine how effectively each can detect FAW.

Workshops were also run to demonstrate to growers and agronomists the LAMP identification process.

This short investment conducted the second phase of this research to foster national collaboration in monitoring the movement of fall armyworm through the provision of a quick and accurate test with standardised protocols for use.

The project:

- Facilitated the rapid identification of fall armyworm in regional Australia through in-field testing across multiple horticultural areas.
- Increased awareness of in-field testing in regional Australia, especially northern Australia. This included engaging with biosecurity and growers to demonstrate the testing.



- Improved knowledge of technological requirements in regional Australia to allow the rollout of this technology for fall armyworm detection and surveillance.

from these trials will be shared with the Australian vegetable industry and will inform future fall armyworm research investments.

## **2.9 Co-developing and extending integrated *Spodoptera frugiperda* management systems for the Australian vegetable industry**

This project will support the rapid co-development of an integrated fall armyworm management strategy that will deliver better outcomes for those regions currently affected by fall armyworm as well as for those regions that may experience an incursion in the future.

This investment seeks to provide the support needed by the Bowen, Bundaberg, Burdekin, Gumlu and Lockyer Valley vegetable industries, their advisory networks, support industries and researchers to capture, develop and use their experience of managing FAW on-farm in 20/21 and 21/22 seasons.

The vegetable industry will work closely with researchers to identify management gaps and trial a range of strategies on-farm. Outcomes

### 3. Goal 3 - Promotion and facilitation of collaboration for better plant biosecurity outcomes for industry, their communities, and the environment.

#### 3.1 B3 NZ

As part of the MOU with B3, the PBRI program director was on the technical committee of the 4th International Congress on Biological Invasions (ICBI2023) hosted in Christchurch (Taotai), New Zealand (Aotearoa) on 1-4 May 2023.



*Jo Luck (PBRI), Greg Chandler (Hort Innovation), Treena Burgess (Murdoch University) and Bertie Hennecke (DAFF) at ICBI 2023*

The ICBI congress provided a forum to explore, share and develop responses to the global challenges and threats that Invasive Alien Species (IAS) present to biodiversity, ecological systems and food production and safety in terrestrial, freshwater, and marine ecosystems. The theme and focus for 2023 was 'Innovation. Collaboration. Partnership'.

The PBRI supported Indigenous Ranger, Mr Zach Sowden from the Carpentaria Land Council Aboriginal Corporation to participate in the indigenous engagement sessions of the ICBI and B3 Conference. Acting Director of the Indigenous Ranger Program, Ms Renae Todd, and Ranger, Mr Milmarja Yanner also attended the conference.



*Milmarja Yanner and Zachariah Sowden, Indigenous Rangers from Carpentaria Land Council Aboriginal Corporation*

#### 3.2 ACIAR

In the 2020 International Year of Plant Health (6 November), a new partnership aimed at strengthening plant biosecurity was signed between the PBRI and the Australian Centre for International Agricultural Research (ACIAR).

Working with colleagues like ACIAR in Australia, B3 in New Zealand and EUPHRESKO in Europe gives us a way to share our knowledge, and to learn from the experiences of others so we can continue to improve here in Australia.

The research ACIAR invests in providing Australian researchers with the opportunity to work throughout our region to develop diagnostic, surveillance and management capabilities before pests and diseases reach Australian shores.

ACIAR is currently investing more than AUD\$26

million in plant biosecurity research across 14 projects in the Indo-Pacific region.

ACIAR works closely with countries in Africa, south-east Asia and Pacific nations that have plant industries in common with Australia, such as horticulture, forestry, maize, and rice.

Through ACIAR investments, Australian scientists use their valuable knowledge for the benefit of partner countries while learning about pests and diseases that have yet to reach Australia, and contributing to solutions that meet Australia's own agricultural challenges.

The new partnership between ACIAR and the PBRI will lead to research projects that focus on understanding the biosecurity threats in neighbouring regions that will inform preparedness and prevention programs in Australia.

Experience and knowledge will be shared between neighbouring countries with an aim to reduce the risk of the damaging consequences of biosecurity threats to agriculture and the environment in Australia and across the region.

### 3.3 Plant Health Committee

An MOU was signed in October 2022 to mark the collaboration between the PBRI and the Plant Health Committee. Deputy Chair of Plant Health Committee, Dr Anne Walters emphasised the importance of this partnership in developing plant biosecurity research priorities together.

The Plant Health Committee have recently completed an analysis of the biosecurity system, under the Intergovernmental Agreement for Biosecurity, including jurisdictional capability audits. From these analyses, critical RD&E priorities have emerged that align to four of the PBRI's Key Focus Areas for investment:

- Preparedness
- Industry Resilience
- Sustainable Pest Management
- Capability Building

Representatives from the PBRI and the Plant Health Committee will meet each quarter to

exchange research priorities and provide relevant updates. Future research development will include consultation on proposed investments to ensure, where possible, coordination and collaboration of research occurs, across industries sectors and the state jurisdictions. A workshop was held in November 2021 to review the Plant Health Committee priorities in collaboration with the new Plant Industry Biosecurity Committee and the PBRI.

### 3.4 Euphresco

The collaboration with Euphresco continued through Phase II under the terms of our MOU. Work on delivering two key activities are outlined below.

#### International Day of Plant Health 2023 – Plant Health TV



Plant Health TV Zeinab Sweidan's [winning video](#)

In February 2023, Euphresco the International Centre for Advanced Mediterranean Agronomic Studies of Bari ([CIHEAM Bari](#)) and the PBRI launched a call for a video competition '**Plant Health TV: Promoting the importance of Plant Health research**'.

The purpose of this video contest was to:

- Increase the visibility of plant health research activities and raise awareness among non-scientific communities.
- Celebrate the work and dedication of students and early career researchers.
- Bring together people and organizations from around the world.
- Support the International Day of Plant Health objectives (<https://www.fao.org/plant-health/en>)

Interested MSc and PhD students and Early Career Researchers (ECRs) from the two international student networks - CIHEAM Bari Former Trainees Network and the PBRI Plant Health Student Network were invited to submit a short video (up to 90 seconds) on one of the video contest's topics. The [final videos](#) were published on YouTube and an evaluation panel with representatives from the IPPC, the PBRI, Euphresco and CIHEAM made a decision on the highest ranking video.

On 21 June 2023, the [winning video](#) was announced at an FAO meeting at CIHEAM Bari, Italy. The FAO high-level meeting focused on the management strategy of transboundary plant pests and diseases in NENA region was held from 21-23 June.

An engaging side event to this meeting called 'Let's refresh plant health' was moderated by Italian journalist Maurizio Menicucci. The PBRI Program Director, Jo Luck, was interviewed by the journalist in a panel session at this meeting, discussing plant health research capacity building around the globe.

Bari is located near an intense olive growing region affected by the destructive disease, Xylella.



*Jo Luck and Maurizio Menicucci at the CIHEAM, Bari event*

This included sessions on plant health research capacity building around the world, international cooperation in plant health capability building and finally, the winner of the 2023 Plant health TV contest was announced.

### 3.5 Global Plant Health Research Network, London workshop

Euphresco, the PBRI and B3NZ hosted a workshop at the DEFRA UK offices in London in September 2022 to discuss options for global coordination of plant health research. This workshop coincided with the first International Plant Health Conference in London.

Workshop Participants included CABI, CIHEAM, INIA, DEFRA, ACIAR, B3, Euphresco and conference delegates.

Collaborating on plant health research with global partners avoids duplicating investment in plant health research and provides a network to share valuable experience and expertise on how to detect and manage plant pests.

The workshop, held before the Conference, consisted of a small group with substantial international plant health interests and activity. The workshop covered such issues as network membership, governance, resources and suggested activities. Some examples included collaborative plant health research on food security and climate change, international student networks, research extension and outreach, and knowledge exchange through targeted workshops, webinars and conference and laboratory exchanges.

Raising the profile of plant health research collaboration through coordinated communication, targeting the International Day of Plant Health was also discussed.

Global Plant Health Research Network workshop attendees.

### 3.6 International Plant Health Conference, London

An International Plant Health Conference side session was arranged by Euphresco and included approximately 100 delegates from around the world. It included five presentations of effective global research co-ordination in plant health administered through Euphresco, followed by a



facilitated discussion with those present.

As an example of international collaboration, the PBRI Program Director presented research led by Geraldine Anthoine (ANSES, France) in collaboration with European countries and Australia Dr Toni Chapman (DPI NSW) on the detection of *Xylella fastidiosa* in dormant plant material such as almonds, cherries, and grapevine.

The workshop and side session indicated wide support for the concept of global coordination for plant health research – an important prerequisite for moving forward. Next steps included writing a joint white paper to explore tangible options for such an initiative and a follow-up session to explore further options at the International Congress on Biological Invasions in Christchurch in May 2023.

### 3.7 International Day of Plant Health and 2023

The International Plant Health Day Steering Committee delivered several activities to celebrate the day.

- The Global video competition 'Plant Health TV' (see above)
- The DAFF Science Exchange
- IDPH Photography Competition

The Australian Chief Plant Protection Office hosted a photo competition to celebrate International Day of Plant Health.

The entries were judged by the Australian Chief Plant Protection Officer, Dr Gabrielle Vivian-Smith and the Australian Chief Environmental Biosecurity Officer, Dr Bertie Hennecke.

The competition had two categories:

1. Celebrating how plants and pollinators benefit our lives and the environment.
2. The impact of plant pests and diseases on Australia's unique biodiversity and environment.

Each category had an adult and an under 18 winner. Judging was difficult, with 100 high-

quality images submitted.



*Source: Tanya Daniels' 'Blue Banded Bee on her morning collection' was the adult winner for the category 'Celebrating how plants and pollinators benefit our lives and the environment.'*

For more details see the DAFF webpage [here](#).



*Minister Murray Watts opening the IDPH Science Exchange*

### 3.8 The PBRI Symposium 2022

The second Plant Biosecurity Research Symposium was held on the 11 and 12 May at the National Wine Centre in Adelaide in Kurna country. The two-day Symposium, sponsored by the Department of Agriculture, Water and the Environment, included a program of plant biosecurity research, supported by the PBRI member organisations and partners. This event attracted over 150 researchers and industry members and included a Trans-Tasman research session and a partnership panel on enhanced international and national collaboration.

Kurna Elder, Uncle Rod welcomed the delegates to Kurna Country and Ms Loren Ryan

performed the song Flame Trees made famous by Cold Chisel. Ms Ryan is a First Nations Australian from the Gamilaraay people from Northwest, New South Wales.

The program featured a Trans-Tasman session on collaborative research between Australia and New Zealand and a 'Partnership Panel' session, where partners shared their views on strengthening the collaboration with the PBRI into the future. A cross-sectoral Biosecurity RD&E workshop will be held in Canberra in mid-June to capture biosecurity research ideas generated at the PBRI Symposium.

Deputy Secretary, Andrew Tongue, opened the Symposium which included two full days of cross-sectoral biosecurity RD&E (Research Development & Extension).

Keynote Speaker, Mr Ben Harris (Wynns Coonawarra Estate) drew on his years of experience as the Regional Viticulture Manager in his keynote on 'Biosecurity insights from the vineyard. He spoke about biosecurity as a vital part of the overall sustainability of the wine industry.

In addition to managing the Wynns viticulture team he also oversees the Treasury Wine Estates technical viticulture strategy for Australia and New Zealand, vineyard operations in the Limestone Coast and the Riverland as well as vineyard operations and growers' relations in Tasmania, Victoria, Western Australia, and New Zealand.

Mr Harris was born and raised in the Adelaide Hills of South Australia, where he commenced his involvement with the wine industry in 1993. With an interest in wine and agriculture he went on to complete a Bachelor of Agricultural Science (Viticultural Science) at the University of Adelaide. He has worked in several roles throughout Australia, New Zealand, and Bordeaux, which include technical and management roles.

His vision is to continuously improve vineyard performance and sustainability while protecting the vineyards from biosecurity risks. He wants to leverage the latest R&D, innovation, and

technology to create real step change while also applying the key learnings from the past.

Dr Beth Woods, ex - Director General of DAF, gave the symposium dinner address, discussing Partnerships for Research Impact. Beth covered her time as Director General of DAF and spoke in her role as commission for ACIAR.



*Dr Beth Woods, ACIAR*

Mr Joel Willis, Principal Director, Detection Capability and Emerging Technology at DAFF gave the Day 2 keynote on Advancements in technology for biosecurity risk detection. His talk demonstrated the investment made by the Department in new technologies such as 3D X-ray passenger screening.

Mr Willis leads the Detection Capability and Emerging Technology Section, Biosecurity Operations Division, within the Department of Agriculture, Water, and the Environment (DAFF). He and his team are responsible for delivery of the DAFF Detector Dog Program and a range of detection technologies deployed at the border. This includes a particular focus on the department's 3D X-rays and the world's leading auto-detection algorithms for biosecurity risk.



*Mr Joel Willis, Principal Director – Detection Capability and Emerging Technology, Biosecurity Operations Division, DAFF*

In previous roles, Mr Willis led several teams within the Office of Health Protection at the Commonwealth Department of Health including border health, emergency response, pandemic planning, and immunization. Building on this experience, in late 2020, he joined DAFF to help establish an enhanced human health policy capability within the Biosecurity Operations Division.

As an experienced leader of people, Mr Willis has a passion for making a difference at Australia’s frontline.

### 3.9 The Ritman Scholarship

The second day of the Symposium coincided with the International Day of Plant Health – a resolution at the recent UN (United Nations) general assembly. On this day, the inaugural PBRI Ritman scholarship was awarded to four talented Australian Postgraduate students working in the field of plant biosecurity. This travel scholarship enabled the students to attend the Symposium to present their research and meet the Australian plant biosecurity community.

The scholarships were awarded to Fable Eenjes (ANU), Ms Bianca Rodrigues-Jardim (LTU), Ms Rebecca Degnan (UQ) and Ms Salome Wilson (ANU) for demonstrating excellence in plant biosecurity research. Fable Eenjes’s research includes using linked machine learning classifiers to accurately classify species and strains using real-world and simulated fungal ribosomal DNA datasets, including plant

pathogens.

Ms Bianca Rodrigues-Jardim’s PhD project couples metagenomic sequencing with nation-wide surveillance of phytoplasmas in vegetable crops. Her research will contribute to defining the molecular basis of a species or strain in the phytoplasma 16SrII group and improve the detection and diagnosis of phytoplasma diseases of plants.



(From the left) Ms Rebecca Degnan, Ms Bianca Rodrigues-Jardim, Fable Eenjes and Ms Salome Wilson

Ms Rebecca Degnan is studying the impact and mechanisms of exogenous RNAi on rusts through in vitro and in planta assays using myrtle rust and frangipani rust. She showed that RNAi of essential genes significantly reduced germination and inhibited development of infection structures, specifically appressoria and penetration pegs.

Ms Salome Wilson is developing molecular biology tools to validate pathogen avirulence factors in wheat rust fungi. Salome works across host and pathogen species and help to bridge the gap between bioinformatics/computational genetics and molecular biology approaches.

### 3.10 New Plant Health Student Network

In May 2022, the PBRI awarded the Ritman Scholarship to four outstanding PhD students, to commemorate Dr Kim Ritman, a foundation member of the PBRI (see above).

The four students used the scholarship as a platform to create a network for undergraduate, Honours, Masters, PhD students and Early Career







biosecurity. The group activities included developing a plant biosecurity plan at the pathogen-, environment-, and country-level, as well as solving a forensic plant biosecurity case. These activities effectively highlighted the complexity of action plans and research required to mitigate losses by an incursion.



(From the left) Mr Zhou Lee, Ms Bianca Rodrigues Jardim, Ms Zohara Scott, Ms Sucharita Basavarajappa

“We were given firsthand experience in a Biosecurity Safety Level 3 laboratory working with live *Magnaporthe oryzae* Triticum cultures – a fungal pathogen of wheat that is not known to be present in the US. This experience was particularly impactful as it helped me appreciate the increased investment of time, financial costs, and effort required to better understand phytopathogens of biosafety concern.

“There was a session dedicated to plant biosecurity education and training on the second last day of the course. This session brought to the forefront the importance and range of approaches to building capacity and capability in plant biosecurity. During this session, Associate Professor Mohammad Arif presented on the University of Hawaii’s grant supporting the Pacific-Continental Network (Pacon). This federally funded network aims to support the education and training of the next generation of biosecurity professionals from the levels of high school through to PhD researchers. Training and education through this grant are supported through a range of approaches in this network, including facilitating international internships and

supporting workshop/conference attendances.

“I was also given the opportunity to present on the PBRI Plant Health Student Network during plant biosecurity education and training, where I shared the purpose of the student network, information on our online meetings, our Slack and Twitter pages, as well as what network members have highlighted as topics of interest from past meetings.

“The course exceeded all my expectations and aided in improving my knowledge of the biosecurity continuum and what is needed to support it – from in-field practices to the laboratory and policy requirements. The course was consistently thought-provoking and facilitated active discussions. There were also plenty of opportunities to socialise and to build long-lasting global networks with people playing a range of roles in biosecurity, including dinners and a walk through the Konza Prairie.”

### 3.12 Biosecurity Extension Community

The Biosecurity Extension Community (BEC) continued to meet throughout Phase II of the PBRI.

BEC provides a platform for practitioners working across Australian plant industries to come together and discuss ways of improving management practices through tools, knowledge sharing, and through coordinated and consistent biosecurity messaging. The community also connects early career extension personnel with experienced extension practitioners.

An example of speakers at the BEC meetings has included Mr Robert Chin, the Compliance Manager for Biosecurity and Nursery Standards at Bunnings, who spoke about the biosecurity challenges faced by the largest retail nursery chain in Australia – which includes 282 warehouse stores and a total of 53,000 team members. He identified hitchhiker pests as a significant challenge, as is the variation in declared weed species across municipalities. Some of the biosecurity threats Bunnings face include plant pests and diseases such as brown marmorated stink bugs, leaf miners, myrtle rust, feather grass

and cane toads.

Ms Shafiya Hussein, Grains Biosecurity Officer for Biosecurity SA, described her role in an initiative to improve the management and preparedness for biosecurity risks in the grains industry, at farm and industry levels.

Ms Hussein spoke about exotic grain pest surveillance and monitoring practices and identified target pathways such as sentinel silo sites at key grain export ports, grain farms with shipping containers used for storage and stores selling whole grain imports. She also introduced the resources and tools available to grain growers, including advice from agronomists, fact sheets, training workshops, field days, Ag Bureau talks and hotlines.

Mr Jim Moran, from the Grains Farm Biosecurity Program for Agriculture Victoria, spoke about the challenges of engaging a diverse audience to affect changes in biosecurity practices. He noted that the growers he works with are time poor and may have competing priorities, with different crops, farm practices demographics, resources, knowledge, motivations, and experience. Some of the strategies he uses successfully include going on-farm as much as possible, holding field days and releasing regular media updates with consistent messaging. Jim emphasised that the topic and timing of engagement matters!

Mr Paco Tovar, Forest Biosecurity Manager for the Australian Forest Products Association, introduced a new General Surveillance Community of Practice (CoP) with 153 members, including plant, animal, and port sectors. The CoP has a focus on building capacity and capability to support effective biosecurity. This network will provide learning opportunities in general surveillance methodology and opportunities for collaboration on cross-sectoral general surveillance projects.

### **3.13 Northern Australia Biosecurity (NABS) Forum**

The forum was held in Cairns on 23 February 2023. Mr Darren Peck, Director Plant and Animal Surveillance, DAFF, provided an overview of the

NAB Strategy implementation. The biosecurity activities covered under the Strategy includes functions across the biosecurity continuum, including:

- northern government collaboration and reporting
- industry engagement and collaboration (including unrepresented and/or niche producers who are risk creators or particularly vulnerable to biosecurity threats)
- community engagement
- compliance with biosecurity regulations
- biosecurity capacity and capability building
- research development and extension
- diagnostics

The PBRI members participated in the NABS forum which aimed to identify relevant northern Australia research and industry-driven research that need to be built over the next 10 years. The forum also focused on collaborative partnerships across the North for leveraging and investing in research and innovation capacity.

Proposed actions taken directly from the 2030 NABS are:

- Obtain insights into research strengths from academics who can access funding and international research that is relevant to northern biosecurity in both dry monsoonal and wet tropic environments.
- Build strategic influence for research priorities so that requirements are understood by research bodies and research outcomes are applied by northern industries.
- Use or support northern Australia-specific RDCs, CRCs and other research areas, particularly for biosecurity plant health, bush tucker, and aquatic industries.
- Fund higher education programs such as 'master's or 'PhD' projects that support northern priorities, ensuring that partnership participants engage in and help inform projects.

The PBRI will work with NAQS on implementing elements of the strategy, particularly leveraging surveillance activities already underway in the new iMapPESTS project iteration.

## Looking ahead (2023 – 2028)

Phase II established the PBRI as a sustainable cross-sectoral co-investment model for research, development, and extension in the Australian and global plant biosecurity landscape. The PBRI collaboration continued to provide an agile model to leverage investments, with a focus on cross-sectoral biosecurity issues. This model provides an alternative to multiple, individual industry-based investments.

Across Phase II, a total of ten investments valued at \$17.4M were prioritised and commissioned for delivery through the membership base, in addition to the twelve investments worth \$51.0M initiated in Phase I (2017-2020). In 2023, the PBRI and partners have collectively invested in RD&E worth \$68.4M in plant biosecurity research.

Phase II was a consolidation phase, characterised by partnerships that reinforced the goals of the PBRI. These collaborations enabled the members to link with organisations and networks that complemented the work of the PBRI. The partnerships were created to avoid duplication of effort and investment in the field of plant biosecurity research, not only at a national but also at an international level.

The next phase of the PBRI will continue to focus on (i) collaboration, (ii) coordination of RD&E priorities and (iii) co-investment with members and partners. It is anticipated that the PBRI will continue to move towards co-designing large integrated projects, such as the successful RR&D4P projects, iMapPESTS and Boosting Diagnostics.

The members will support the successful PBRI Symposium with three events planned for the next five years. Preparations are underway for the 2024 Symposium in Cairns, featuring a showcase of research supported by the PBRI members and partner.

The calibre of the 2022 Ritman Scholars was outstanding, marked by their commitment in establishing the plant health student network, a legacy for the next round of Ritman Scholars to take forward. In February 2024, we look forward to launching the Expression of Interest call for the 2024 Ritman Scholarships, in honour of past PBRI member, Dr Kim Ritman.

We will continue to explore partnerships that bring value to the work we are doing across industries in line with our 2023-2028 Strategy. The PBRI will work with these partners to build plant biosecurity RD&E that supports and protects plant industries over the long-term.



Dr Jo Luck  
PBRI Program Director

# Glossary

**ACIAR** - Australian Centre of International Agriculture Research

**AgriFutures** - AgriFutures Australia

**ANU** - Australian National University

**B3 NZ** - Better Border Biosecurity New Zealand

**CDU** - Charles Darwin University

**CEBRA** - Centre for Excellence Biosecurity Risk Assessment

**CRDC** - Cotton Research and Development Corporation

**CSIRO** - Commonwealth Scientific and Industrial Research Organisation

**DAF** – Department of Agriculture and Fisheries, Queensland

**DAFF** - Department of Agriculture, Fisheries and Forestry

**DFAT** - Department of Foreign Affairs and Trade

**DPIRD WA** – Department Primary Industry and Regional Development, Western Australia

**DPITT NT** - Department of Primary Industries, Trade and Tourism, Northern Territory

**eDNA** - Environmental DNA

**Euphresco** - European Phytosanitary Research Coordination

**FAW** - Fall armyworm

**FWPA** - Forest and Wood Products Australia

**GRDC** - Grains Research and Development Corporation

**Hort** - Hort Innovation

**HTS** - High Throughput Sequencing

**IGAB** - Intergovernmental Agreement on Biosecurity

**JCU** - James Cook University

**NAQS** - Northern Australian Quarantine Strategy

**NBS** - National Biosecurity Strategy

**NECBRDES** - National Environment and Community Biosecurity Research Development and Extension Strategy

**NFF** - National Farmers Federation

**PHA** - Plant Health Australia

**PHC** - Plant Health Committee

**QAAFI** - Queensland Alliance for Agriculture and Food Innovation

**RD&E** - Research Development and Extension

**RR&D4P** - Rural Research and Development for Profit program (DAFF)

**SRA** - Sugar Research Australia

**UC** - University of Canberra

**UQ** - University of Queensland

**Wine** - Wine Australia

# List of Attachments

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**Attachment 1:** PBRI projects mapped to the investment priorities (2020 - 2023)



## Attachment 1. PBRI projects mapped to the investment priorities (2020 - 2023)

Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>1. Preparedness</b>							
1.1	Facilitate and respond to intelligence on changes to global pest threats that pose a risk to Australian plant industries and the environment (in collaboration with DAWE). Targeting top 42 gaps and others.	Understanding the risk of native insects vectoring in Australia and New Zealand	Underway	\$3,026,437	Phase III	Phase I	Wine, Hort
1.1	Facilitate and respond to intelligence on changes to global pest threats that pose a risk to Australian plant industries and the environment (in collaboration with DAWE). Targeting top 42 gaps and others.	Review of the Biosecurity Plan and Manual for the Viticulture Industry	Completed	\$146,203	Phase II	Phase I	Wine, Hort
1.1	Facilitate and respond to intelligence on changes to global pest threats that pose a risk to Australian plant industries and the environment (in collaboration with DAWE). Targeting top 42 gaps and others.	Fall Armyworm RD&E gaps' online PBRI forum	Completed	in-kind	Phase II	Phase II	PBRI
1.1	Facilitate and respond to intelligence on changes to global pest threats that pose a risk to Australian plant industries and the environment (in collaboration with DAWE). Targeting top 42 gaps and others.	Over the horizon -capturing Biosecurity intelligence' - online PBRI forum	Completed	in-kind	Phase II	Phase II	PBRI

Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>1. Preparedness</b>							
	environment (in collaboration with DAWE). Targeting top 42 gaps and others.						
1.1	Facilitate and respond to intelligence on changes to global pest threats that pose a risk to Australian plant industries and the environment (in collaboration with DAWE). Targeting top 42 gaps and others.	AAPDIS modelling for management decisions - Khapra beetle and HPPPs	Under development	\$250,000	Phase III	Phase III	GRDC, Hort
1.2	Quantify economic impact of key pests to inform RD&E investment and response. Targeting top 42 XS pests.	No action					
1.3	Undertake risk analysis, increase awareness and contingency planning for key threats identified as gaps in top 42 e.g. bacteria, nematodes, seedborne diseases, pasture biosecurity, exotic stink bugs.	Cross-sectoral approach to pest threat analysis	On pause until after review				
1.4	Develop regional preparedness plans for threats with cross-industry impact e.g. Fall armyworm pesticide resistance management.	FAW Insecticide Resistance Management strategy Phase I	Completed	\$110,000	Phase II	Phase II	DAFF, PHA
1.4	Develop regional preparedness plans for threats with cross-industry impact e.g. Fall armyworm pesticide resistance management	FAW Insecticide Resistance Management strategy Phase II	Under development	\$450,000	Phase III	Phase III	GRDC, Hort, SRA, CRDC, AFA

Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>1. Preparedness</b>							
1.5	Respond to audits on adequate resource availability to detect and diagnose HPPPs (in collaboration with SPHD).	Boosting Diagnostics Project Phase I	Underway	\$15,709,380	Phase II	Phase I	GRDC, all members
1.6	Identify and address supply chain biosecurity risk pathways.	Sea Container Hygiene online forum	Completed	in-kind		Phase II	PBRI
1.7	Assess and respond to changing threat status to biology and distribution with climate change.	No action					
1.8	On-farms tools: Field resources for growers for FAW and related noctuids (could be under 6)	Prevention and preparedness for fall armyworm ( <i>Spodoptera frugiperda</i> ) - Output 2 (Continuity plan)	Completed	\$582,229	Phase II	Phase 1	GRDC, CRDC
1.8	On-farms tools: Field resources for growers for FAW and related noctuids (could be under 6)	Podcast for Fall Armyworm management in northern farming systems <a href="https://www.pbri.com.au/pbri-podcasts/">https://www.pbri.com.au/pbri-podcasts/</a>	Completed	\$25,452	Phase I	Phase I	CRDC, Hort, GRDC, SRA, AFA
1.9	Addressing gaps in contingency plans for cross-sectoral nematodes and bacteria.	Boosting Diagnostics Project Phase I	Completed	\$15,709,380	Phase II	Phase I	GRDC, all members

Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>2. Diagnostics</b>							
2.1	Develop new technologies and platforms to support early detection, surveillance, and timely response e.g. next gen sequencing, eDNA, high throughput for viruses, artificial intelligence, remote sensing, technologies specifically targeting clean shipping containers and other supply chains.	The development of environmental DNA detection of the Brown Marmorated Stink Bug and other high priority plant pests.	Completed	\$957,737	Phase II	Phase I	Hort, DAFF
2.1	Develop new technologies and platforms to support early detection, surveillance, and timely response e.g. next gen sequencing, eDNA, high throughput for viruses, artificial intelligence, remote sensing, technologies specifically targeting clean shipping containers and other supply chains.	National Xylella diagnostics	Completed	\$1,762,822	Phase II	Phase I	Hort, (Wine-coordinator linked to this project)
2.1	Develop new technologies and platforms to support early detection, surveillance, and timely response e.g. next gen sequencing, eDNA, high throughput for viruses, artificial intelligence, remote sensing, technologies specifically targeting clean shipping containers and other supply chains.	Rapid diagnostic screening for Post Entry Quarantine	Completed	\$1,609,254	Phase II	Phase I	Hort, DAFF

Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>2. Diagnostics</b>							
2.1	Develop new technologies and platforms to support early detection, surveillance, and timely response e.g. next gen sequencing, eDNA, high throughput for viruses, artificial intelligence, remote sensing, technologies specifically targeting clean shipping containers and other supply chains.	R&D4P project- Boosting diagnostic capacity for plant production industries (Phase I)	Completed	\$15,709,380	Phase II	Phase I	GRDC, all members
2.2	Develop rapid, field detection tools for cross-sectoral pests, pathogens, and \weeds e.g. lamp, dip-stick, field tests, apps, smart traps.	R&D4P project- Boosting diagnostic capacity for plant production industries (Phase I)	Completed	\$15,709,380	Phase II	Phase I	GRDC, all members
	Develop rapid, field detection tools for cross-sectoral pests, pathogens, and \weeds e.g. lamp, dip-stick, field tests, apps, smart traps.	Field based testing for FAW	Completed	\$144,500	Phase II	Phase II	Hort, DAFF
2.3	Address diagnostic gaps in HPPPs or relevant cross-sectoral pests e.g. bacteria and nematodes (build on R&D4P project).	R&D4P project- Boosting diagnostic capacity for plant production industries (Phase I)	Completed	\$15,709,380	Phase II	Phase I	GRDC, all members
2.4	Timely development and validation of National Diagnostic Protocols (NDPs) (in collaboration with SPHD).	R&D4P project- Boosting diagnostic capacity for plant production industries (Phase I)	Completed	\$15,709,380	Phase II	Phase I	GRDC, all members



Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>3. Surveillance</b>							
3.1	Develop early detection methodologies (e.g. hyperspectral image analysis) and AI plant health status change monitoring.	BeXyl- remote sensing Xylella	Under development	\$740,000	Phase III	Phase II	Wine, Hort
3.2	Improved surveillance tools for soil and water-borne pest and disease monitoring and surveillance.	No action					
3.3	Insecticide resistance monitoring across plant industry sectors.	FAW Insecticide Resistance Management strategy Phase II	Under development				GRDC
3.4	Targeted and coordinated surveillance within Australia and with near neighbours (e.g. PNG, Indonesia).	iMapPESTS 1.0	Completed	\$21,657,392	Phase II	Phase I	Hort and all
3.5	Support and respond to strategic review of digital and data systems in plant biosecurity to support market access and coordinated response.	Biosecurity Trakka – Digital architecture for coordinated biosecurity threat monitoring, data sharing and real-time analysis of outbreaks.	Under development	\$6,000,000	Phase III	Phase II	Hort, all
3.5	Support and respond to strategic review of digital and data systems in plant biosecurity to support market access and coordinated response.	iMapPESTS 2.0 – Establishing Regional Surveillance Nodes	Under development	\$20,000,000			

Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>4. Pest management</b>							
4.1	Develop sustainable chemical control for pests and weeds.	R&D4P Area wide management of weeds across sectors	Completed	\$3,943,939	Phase II	Phase I	
4.1	Develop novel, sustainable pest and weed control strategies.	Novel Topical Vegetable, Cotton Virus and Whitefly Protection - BioClay	Completed	\$4,268,690	Phase II	Phase I	
4.1	Develop novel, sustainable pest and weed control strategies.	FAW Pheromone blends for trapping	Underway	\$5,430,462	Phase III	Phase II	Hort. GRDC
4.2	FAW: Develop a pesticide resistance management strategy.	FAW Insecticide Resistance Management strategy Phase I	Completed	\$110,000	Phase II	Phase II	DAFF, PHA
4.3	Coordination of permits across-industry for chemical use during incursions of NPPPs.	No action					
4.4	Technologies and methodologies for supporting business resilience (e.g. Options for multiple containment lines – with modelling and trapping evidence to support containment (e.g. Khapra).	AAPDIS modelling for management decisions - Khapra beetle and HPPPs	Under development	\$250,000	Phase III	Phase III	GRDC, Hort?
4.5	FAW: Establish a national surveillance program to monitor field resistance of FAW.	No action					

Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>4. Pest management</b>							
4.6	FAW: Biological and genetic studies to inform pesticide resistance management.	Prevention and preparedness for fall armyworm ( <i>Spodoptera frugiperda</i> ) - Output 1 Genetic studies	Completed	\$185,461	Phase II	Phase II	GRDC, CRDC

Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>5. Capability building</b>							
5.1	Facilitate extension practitioners' biosecurity 'community of practice' across industry sectors.	Biosecurity Extension Community - A biosecurity extension community that creates value for Australian plant industries through better coordination, collaboration and the sharing of knowledge and tools (across sectors).	Underway	in-kind	Phase III	Phase II	
5.2	Support science conferences, targeted workshops, and biosecurity networking across-industry.	Online PBRI fora on High priority topics	Underway and ongoing	in-kind	Phase II	Phase II	
5.2	Support science conferences, targeted workshops, and biosecurity networking across-industry.	Biannual PBRI Symposia 2019, 2022	Complete	\$185,000	Phase II	Phase I	
5.2	Support science conferences, targeted workshops, and biosecurity networking across-industry.	Biannual PBRI Symposium 2024, 2026, 2027	Under development	\$350,000	Phase III	Phase II	
5.2	Support science conferences, targeted workshops, and biosecurity networking across-industry.	PBRI Sponsored Keynote session International Congress of Biological Invasions in conjunction with B3 Conference May 2024	Complete	\$5,500	Phase II	Phase II	

Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>5. Capability building</b>							
5.2	Support science conferences, targeted workshops, and biosecurity networking across-industry.	IYPH 2020 Coordinator and IYPH activities	Complete	\$175,000	Phase II	Phase I	Hort, all RDCs
5.2	Support science conferences, targeted workshops, and biosecurity networking across-industry.	Ritman Scholarships 2022	Complete	\$4,000	Phase II	Phase II	PBRI
5.2	Support science conferences, targeted workshops, and biosecurity networking across-industry.	ARC Industrial Transformation Biosecurity Training Centre	Under development	\$5,000,000	Phase II	Phase II	FWPA, SRA, Wine, Hort
5.2	Support science conferences, targeted workshops, and biosecurity networking across-industry.	Trans-Tasman program for B3 and PBRI conferences	Complete (ongoing)	\$2,500	Phase II	Phase I	
5.3	Address gaps in capacity through post-graduate training	Boosting Diagnostics Project Phase I	Completed	\$15,709,380	Phase II	Phase I	
5.3	Address gaps in capacity through post-graduate training	Plant Health Student Network	Underway	in-kind	Phase III	Phase II	
5.3	Address gaps in capacity through post-graduate training	iMapPESTS 1.0	Completed	\$21,657,392	Phase II	Phase I	
5.4	Support training & extension with consultants particularly northern production systems.	Facilitating sustainable Fall Armyworm Best Management Practices across the Australian grains and horticultural	Underway and cross-sectoral variation	Unknown	Phase III	Phase II	Hort



Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>5. Capability building</b>							
		industries through nationally coordinated regional Area Wide Management systems	under development				
5.5	Develop and support programs targeting indigenous engagement and biosecurity capacity building.	Understanding cultural aspects of plant health and biosecurity – engaging with Indigenous communities across the north to capture their stories and knowledge.	Under development	\$1,200,000	Phase III	Phase III	AgriFutures
5.6	Offshore training and capacity building in countries where NPPPs are endemic.	Science exchanges TBC under discussion with ACIAR	Under development				

Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>6. Industry resilience</b>							
6.1	Social research – barriers and incentives to adoption of biosecurity practices in general or targeting a specific pest species. – and how to message to create the required behaviour.	Social license for tree removal in urban areas during an eradication response	Under development				
6.1	Social research – barriers and incentives to adoption of biosecurity practices in general or targeting a specific pest species. – and how to message to create the required behaviour.	May 2024 Biosecurity Nudgeathon - How do we improve the value of biosecurity in the community	Under development				
6.1	Social research – barriers and incentives to adoption of biosecurity practices in general or targeting a specific pest species. – and how to message to create the required behaviour	Hort and AgriFutures have a recent project with RMCG					
6.2	Create a coordination function for FAW RD&E activities to reduce duplication and increase cost-effectiveness	Facilitating sustainable Fall Army Worm Best Management Practices across the Australian grains and horticultural industries through nationally coordinated regional Area Wide Management systems	Under development				

Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>6. Industry resilience</b>							
6.3	Industry business knowledge integrated into incursion response plans (e.g. Supply chain, transportation networks).	No action					
6.4	Leverage accumulated scientific information in this gap analysis.	Supported through delivery through each investment project					
6.5	Regional community approach to biosecurity RD&E e.g. Cross sectoral response plans, regional pesticide resistance management for FAW	Facilitating sustainable Fall Army Worm Best Management Practices across the Australian grains and horticultural industries through nationally coordinated regional Area Wide Management systems	Under development				
6.6	Continued importance on extension networks as first detectors and in preparedness and response - cross sectoral opportunity?	Biosecurity Extension Community - A biosecurity extension community that creates value for Australian plant industries through better coordination, collaboration and the sharing of knowledge and tools (across sectors).	Underway	\$5,000	Phase III	Phase II	PBRI

Priority	Key Focus Area	Project Title	Investment Status (no action, under development, underway, completed)	Total Investment value (cash and in-kind)	Completion phase	Start Phase	Supporting member (lead first)
<b>6. Industry resilience</b>							
6.6	Continued importance on extension networks as first detectors and in preparedness and response - cross sectoral opportunity?	Xylella Coordinator	Complete	\$450,000	Phase II	Phase I	

# PLANT BIOSECURITY RESEARCH INITIATIVE

## Acknowledgements

We acknowledge past and present PBRI Committee Members, and their staff, for input into this report.

## Disclaimer

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