

# National Plant Biosecurity Diagnostic Strategy

Version 1.0 July 2012



Plant Health Australia (PHA) is the national coordinator of the government-industry partnership for plant biosecurity in Australia. As a not-for-profit company, PHA services the needs of Members and independently advocates on behalf of the national plant biosecurity system. PHA's efforts help minimise plant pest impacts, enhance Australia's plant health status, assist trade, safeguard the livelihood of producers, support the sustainability and profitability of plant industries and the communities that rely upon them, and preserve environmental health and amenity.

PHA would like to acknowledge the input of the Subcommittee on Plant Health Diagnostic Standards (SPHDS) into the development of this strategy. The principal focus of SPHDS is to maintain and improve plant health diagnostic capacity and capability in support of Australia's economy, environment and community.

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Level 1, 1 Phipps Close  
Deakin ACT 2600

Phone: 02 6215 7700  
Fax: 02 6260 4321  
Email: [admin@phau.com.au](mailto:admin@phau.com.au)

**[www.planthealthaustralia.com.au](http://www.planthealthaustralia.com.au)**

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## Overview



**Plant biosecurity is a set of measures which safeguard the economy, environment and community from the negative effects of plant pests. A fully functional and efficient biosecurity system is a vital part of the future profitability, productivity and sustainability of Australia's plant production industries and is necessary to preserve the Australian environment and way of life.**

Australia has a comprehensive plant biosecurity system in place which supports plant production industries worth \$25 billion annually, along with the regional economies these industries sustain. By international standards this system has performed extremely well. However, due to factors such as growing levels of trade and tourism, the emergence of new pests, the shifting geographic spread of existing serious pests, increasing competition for resources and climate variability, Australia is facing a heightened level of biosecurity threat.

Maintaining and improving the current plant biosecurity system will help keep Australia free from many pests that affect plant production, the natural environment and economies overseas. This will ensure that Australia can maintain a healthy, high quality food supply and continue to have a competitive advantage producing and exporting plants and plant products.

## **National Plant Biosecurity Strategy**

The National Plant Biosecurity Strategy (NPBS) was developed by PHA on behalf of its Members and in close consultation with stakeholders across Australia's plant biosecurity system. It draws together the views of these stakeholders to provide ten strategies to address present and future challenges facing the system.

The NPBS points the way for governments, plant industries and the community to work even more closely together to strengthen Australia's plant biosecurity system over the next decade. It calls for Australia to move toward a more efficient and effective nationally coordinated approach that is characterised by transparency, cooperation and sharing.

## **National Plant Biosecurity Diagnostic Strategy**

Australia's plant pest diagnostic capacity is an essential component of any eradication program as well as underpinning many of the everyday management practices involved in the production and trade of plant products. In summary, diagnostic capacity in the plant biosecurity sector is required to:

- Support everyday decision making in production agriculture
- Enable targeted pest control
- Provide supporting evidence on a country or region's pest status
- Enable early detection of suspected Emergency Plant Pests (EPPs)
- Support response actions on both established and exotic pests

The NPBS provides for the development of an underpinning strategy focussed on the diagnostic aspects of the national plant biosecurity system (Action 8.5 from the NPBS). This National Plant Biosecurity Diagnostic Strategy (NPBDS) provides a vision for the development of a plant biosecurity diagnostic system at the national level that can effectively meet Australia's plant biosecurity diagnostic requirements. The NPBDS will also provide a framework for the development of an implementation plan.

For the context of the plant pest diagnostic system in relation to the overall plant biosecurity system and a summary of the issues and challenges facing the system, refer to the NPBS (available from [www.planthealthaustralia.com.au/npbs](http://www.planthealthaustralia.com.au/npbs)).

# Overview



## Alignment with the NPBS and IGAB

The content and underpinning structure of this NPBDS utilises the diagnostic aspects of the NPBS, namely Recommendations 8, 9, 10 and 15. It was recognised that additional Recommendations and actions from the NPBS impact on the national plant diagnostic system, and while they have not been covered in the NPBDS specifically, the linkages through the overarching NPBS will ensure their implementation will occur in the global context.

The relevant NPBS recommendations and the underpinning actions were reviewed and updated to reflect the ongoing development of the national plant biosecurity system and to focus on their effects on plant diagnostics. As a result, Recommendations D1-D4 have been developed, with a total of 11 underpinning actions (Table 1), and all items remain consistent with the intent of the NPBS.

The key modifications between the NPBS and the NPBDS are:

- The appreciation that NPBS Action 8.1 replicates the overarching complete Recommendation D1, resulting in its removal as an action from this document
- The development of this NPBDS completes NPBS Action 8.5, therefore no corresponding action has been included in this strategy.
- A number of NPBS actions were combined based on considerations of their implementation
- The development of two new actions, D3.3 and D4.1, which have arisen following consideration of the mechanisms for implementing the respective overarching Recommendations

The NPBDS, together with the overarching NPBS, has been developed recognising the Intergovernmental Agreement on Biosecurity (IGAB). This agreement between the Australian, state and territory governments, aims to strengthen the working partnership between governments, broadly identifies their roles and responsibilities and outlines the priority areas for collaborative effort to improve the national biosecurity system. Implementation of the Recommendations contained within this NPBDS will complement and deliver on a number of priority reform areas of the IGAB (see Table 1).

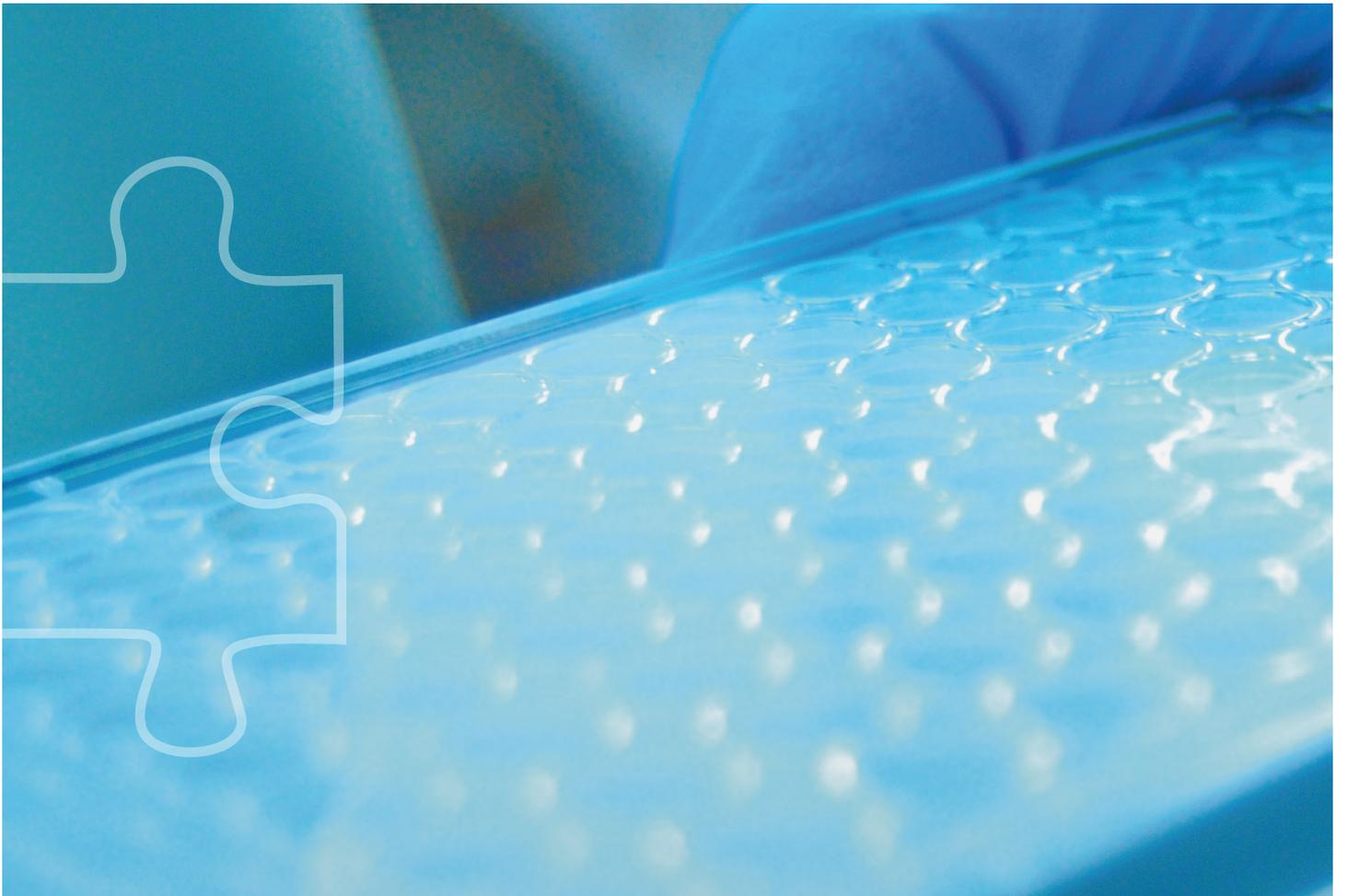


*Sugarcane field research. Image courtesy of Sacron Innovations.*



Table 1. Alignment of Recommendations and Actions in the NPBDS with the diagnostic-related aspects of the NPBS and the IGAB.

National Plant Biosecurity Diagnostic Strategy	NPBS	IGAB
<b>Recommendation D1: Develop a nationally integrated plant biosecurity diagnostic network that underpins Australia's plant biosecurity system</b>	<b>Recommendation 8</b>	<b>Schedule 4, priority reform areas 1, 2, 4 &amp; 5</b>
Action D1.1: Key roles and responsibilities agreed amongst agencies on a nationally coordinated basis	Action 8.4	
Action D1.2: Develop a process to encourage new diagnosticians to enter the field and enable continued professional development of current diagnosticians	Action 8.6	
Action D1.3: Identify network elements and their coordination	Actions 8.2 and 8.3	
<b>Recommendation D2: Implement and maintain appropriate quality management systems in diagnostic laboratories</b>	<b>Recommendation 9</b>	<b>Schedule 4, priority reform area 1</b>
Action D2.1: All diagnostic laboratories in the network have the ability to deliver diagnostic testing to acceptable quality standards	Action 9.1	
Action D2.2: Governments to take responsibility for establishment and ongoing costs of maintaining appropriate quality systems for diagnostic laboratories	Action 9.2	
<b>Recommendation D3: Diagnostic capability and capacity for all HPPs be developed and maintained</b>	<b>Recommendation 10</b>	<b>Schedule 4, priority reform area 4</b>
Action D3.1: Regularly prioritise diagnostic protocols for development and review using a contemporary risk based approach	Action 10.1	
Action D3.2: Develop a national policy to facilitate access to reference material and positive controls for diagnostic tests by ensuring appropriate processes and containment protocols are in place for their importation, storage and handling	Action 10.2	
Action D3.3: Regularly review current and future needs of the diagnostic system in terms of human resources, skills and infrastructure, and implement proactive approaches to ensure these are met	No corresponding action	
<b>Recommendation D4: Establish a national plant biosecurity information management framework to optimise data sharing</b>	<b>Recommendation 15</b>	<b>Schedule 4, priority reform area 2</b>
Action D4.1: Regularly review plant biosecurity information management systems that support diagnostics to ensure they meet the needs of the network and implement mechanisms to address gaps	No corresponding action	
Action D4.2: Develop, implement and maintain standardised information systems nationally, both within government and industry, for the collection, analysis and retrieval of surveillance data, diagnostic information and research outcomes	Actions 15.1, 15.3 & 15.4	
Action D4.3: Develop a system that enables the sharing of diagnostic data nationally and complete a stocktake of existing data management systems in plant biosecurity laboratories	Actions 15.2 & 15.4	



## Recommendations



## **Recommendation D1: Develop a nationally integrated plant biosecurity diagnostic network that underpins Australia's plant biosecurity system**

Australia requires a nationally integrated diagnostic network with capability and capacity to diagnose exotic and established plant pests, maintain core capacity and deliver services in a cost effective and timely manner across a full range of diagnostic needs.

The diagnostic network will:

- Have comprehensive coverage of both exotic and established pests
- Provide a quick turnaround of results
- Have the capacity to deal with large numbers of samples
- Be cost effective and reliable
- Allow low levels of target organisms to be detected reliably
- Provide access to all technologies required to make an effective diagnosis
- Fit within broader international networks and standards on diagnostic testing protocols

Australia needs to establish a comprehensive network of expertise covering all significant pest groups that operates in a cooperative manner across all agencies and across state borders. In building an effective operational network, challenging issues will have to be overcome, including defining responsibilities, addressing resources and the current lack of a national policy on pest diagnostics.

The mandate for the development of an enhanced National Plant Biosecurity Diagnostic Network (NPBDN) already exists. Australia already has both international (e.g. IPPC) and national obligations to maintain capability and capacity in plant biosecurity diagnostics. At the national level, as signatories to the EPPRD, state and territory governments are committed to maintaining response capacity for EPP incursions and, where possible, internationally recognised diagnostic standards should be used. The availability and accessibility of these diagnostic standards will be important, as any action taken when a pest is detected must be based on accurate identification.

An enhanced NPBDN is required to ensure greater coordination of resources, thereby building core capacity and facilitating the dissemination of information between stakeholders.

### ***Action D1.1: Key roles and responsibilities agreed amongst agencies on a nationally coordinated basis***

In order to prevent overlap and duplication of valuable resources, networked laboratories should be resourced to develop and maintain agreed diagnostic standards for plant pests. These should be distributed among laboratories in a national context.

With responsibilities agreed and allocated, these national diagnostic centres will be charged with retaining a rapid diagnostic capability for specific priority pests and linked back to relevant processes for the identification of high risk pest threats on a national basis. In this way, state and territory governments will be able to support other states and territories by providing diagnostic services in the event of a plant pest emergency.

Allocation of roles and responsibilities should be coordinated and facilitated on a national basis and advice forwarded to the relevant authorising body for implementation.

# Recommendations



## ***Action D1.2: Develop a process to encourage new diagnosticians to enter the field and enable continued professional development of current diagnosticians***

A process to encourage new diagnosticians to enter the field of plant biosecurity diagnostics and to enable the continued professional development of current diagnosticians is necessary to maintain an adequate degree of capability and capacity. In the past decade, many specialist diagnosticians have retired from the field, leaving gaps in the capability. A mechanism to introduce new diagnosticians and support existing diagnosticians in plant biosecurity diagnostics is necessary to maintain an appropriate level of expertise. The options for maintaining this capability may include succession planning, mentoring programs, scholarships and training opportunities.

Plant biosecurity diagnostic capability and capacity includes:

- Maintenance of skills, expertise and knowledge across plant pathology and entomology, including specialist disciplines (e.g. bacteriology, mycology and nematology) and a range of skill bases (e.g. taxonomy, field pathology and molecular biology)
- A national approach to maintain core capability and minimise duplication
- Linkages and access to regional, state and national expertise
- Linkages and access to overseas expertise
- Access to biological resource collections
- Education and training
- Mentoring capacity
- Professional development and career path options for diagnosticians
- Facilities and equipment
- Identification and coordination of surge capacity

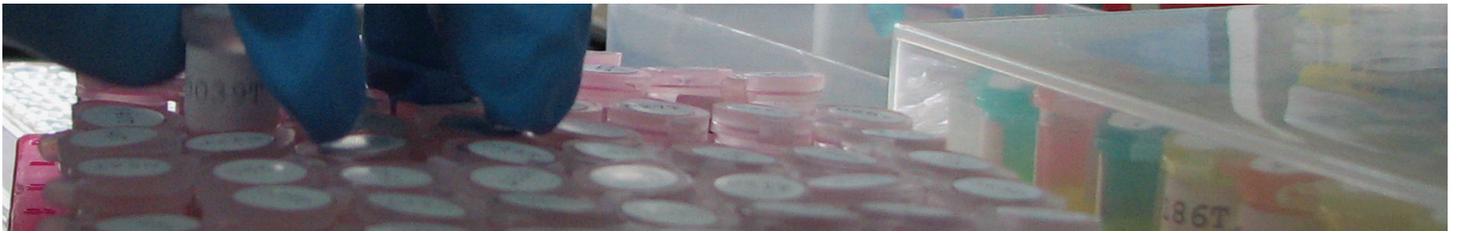
## ***Action D1.3: Identify network elements and their coordination***

The NPBDN must be supported by an integrated and coordinated network of laboratories that collectively develop, adopt and implement a wide range of diagnostic technologies across a broad range of pests. In addition, effective delivery of plant diagnostics through the network of laboratories requires the utilisation of further elements, which will be included in the overall NPBDN. These integrated elements will include a range of capabilities such as pest reference collections, sample transport operators, surveillance, extension and information technology providers.

As a key component of Australia's plant biosecurity diagnostic infrastructure, the network of laboratories should encompass general plant pathology, entomology, virology, phytoplasmology, bacteriology, molecular biology, mycology, nematology, botany and weed science with coordinated and targeted funding from the Australian Government, state and territory governments and industry.

The laboratories will provide:

- The development and maintenance of national diagnostic standards
- A focal point for Australia's plant pest diagnostics, both domestically and internationally
- Access and proficiency at all locations in a wide range of diagnostic tools and technologies
- Development and adoption of new technologies resulting from research innovation and adoption/adaptation from overseas
- Specialist training in key High Priority Pests (HPPs), pests under official control and economically important established pests for which accurate and timely diagnoses are essential for early detection, market access and effective pest control
- Support and training in existing and new technologies for regional diagnostic operational reference and field laboratories around Australia



## **Recommendation D2: Implement and maintain appropriate quality management systems in diagnostic laboratories**

A laboratory quality management system is a tool for estimating and managing risk. The adoption of an accreditation standard has the advantage of covering both management and technical elements of a laboratory quality system and there are a number of independent standards that can be used to provide a comparative benchmark on the status of each laboratory. Accreditation provides an unbiased review of staff competency, documented procedures, internal quality control, proficiency testing and performance monitoring and improvement procedures.

### ***Action D2.1: All diagnostic laboratories in the network have the ability to deliver diagnostic testing to acceptable quality standards***

The development and implementation of laboratory quality systems within plant biosecurity diagnostic laboratories is essential to mitigate the substantial risks associated with plant diagnostics. In addition, the implementation of appropriate quality systems in all laboratories in the NPBDN will ensure an acceptable baseline of diagnostic standards is set within the network, providing confidence to users in the diagnostic outcomes.

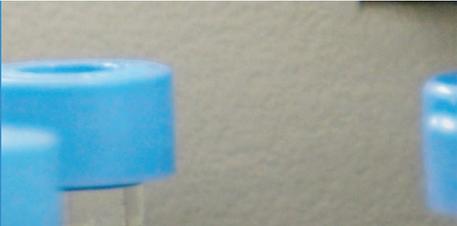
In Australia, all government animal health diagnostic laboratories are accredited by the National Association of Testing Authorities (NATA) to the international ISO/IEC 17025 standard. Conversely, only three plant biosecurity laboratories are currently accredited to this level. During the development of the NPBDN, the acceptable level for quality standards of the laboratories will be determined, whether this is ISO/IEC 17025 or an alternative defined standard. Whatever the outcome, this will not preclude laboratories within the network achieving higher levels of accreditation as required by the users of their services.

### ***Action D2.2: Governments to take responsibility for establishment and ongoing costs of maintaining appropriate quality systems for diagnostic laboratories***

At present, the majority of the state and territory government plant biosecurity laboratories do not have formal laboratory quality management systems in place. Through Action D2.1, laboratories in the NPBDN will implement acceptable quality standards to ensure consistent delivery of plant pest diagnostics. As a result of their commitment to provide plant pest diagnostic services, particularly as signatories to the EPPRD, state and territory governments, together with the Australian Government, will take the responsibility and meet the ongoing costs, of implementing these quality systems in the laboratories in the network.

As the NPBDN develops, privately run diagnostic facilities may join to support the services delivered by government run laboratories. In these cases, it is envisaged that the cost of implementing and maintaining quality systems in private facilities will be met by each individual facility. However, management and defining of the appropriate levels for the quality systems at the national level will continued to be supported by governments.

# Recommendations



## **Recommendation D3: Diagnostic capability and capacity for all HPPs be developed and maintained**

The NPBDN will provide the capacity to diagnose exotic and established plant pests in Australia. However, it is unfeasible to have full diagnostic capacity for all exotic pests, due to their large numbers together with the unknown nature of many potential plant pests. To provide appropriate diagnostic capacity for exotic pests, the HPPs identified through the industry biosecurity planning process provides an excellent starting point. These 300 plus plant pests have been identified by industry and government experts as the highest threats to plant production industries in Australia and provide coverage of all major plant pest groups.

An important aspect of diagnostic capacity is the development of diagnostic protocols, which contain detailed information about a specific plant pest, or a related group of pests, relevant to its diagnosis. In the absence of international standards, the diagnostic protocols provide a routine set of protocols for identifying an unknown pest, or group of pests, to a defined level. Such information is crucial for the management of exotic pests, including:

- General surveillance for pest status
- Testing of material for compliance with phytosanitary certification procedures
- Surveillance as part of an official control or eradication program
- Routine diagnosis for pests found in imported consignments and detection of a pest in an area where it is not known to occur

### ***Action D3.1: Regularly prioritise diagnostic protocols for development and review using a contemporary risk based approach***

There are currently over 300 HPPs for which diagnostic protocols should be developed. Efficient and effective development and review of diagnostic protocols requires that a risk based approach is taken to prioritising the order in which protocols are developed and reviewed. Factors to consider in prioritising the development and review of diagnostic protocols include:

- The risk of entry, establishment and spread of the pest
- The degree of difficulty managing the pest if it was to become established in Australia
- The availability of appropriate skills and expertise for the particular plant pest

### ***Action D3.2: Develop a national policy to facilitate access to reference material and positive controls for diagnostic tests by ensuring appropriate processes and containment protocols are in place for their importation, storage and handling***

The development and validation of diagnostic standards requires access to positive and negative controls. These materials often need to be imported from outside Australia and a national policy must be established for the routine importation, containment, storage and handling of reference materials as required. This policy needs to take account of the risks involved in importing positive controls, appropriateness of import conditions and be responsive to the needs of all government and industry stakeholders.



***Action D3.3: Regularly review current and future needs of the diagnostic system in terms of human resources, skills and infrastructure, and implement proactive approaches to ensure these are met***

To ensure the NPBDN is capable of delivering quality diagnostic services to Australia's plant production industries, it is essential that appropriate levels of skilled staff and the essential equipment are maintained and accessible when required. While the diagnostic services of the network will be delivered through individual laboratories across the country, a regular national stocktake should be undertaken to ensure the NPBDN as a whole has the capability to deliver the required diagnostic services.

This stocktake should encompass:

- Human resource levels
- Skill sets
- Laboratory facilities
- Specialist equipment

The results of the stocktake should be analysed against the current and predicted future needs of the network, with risks and potential gaps identified. Using this information, proactive processes can be implemented to ensure the fundamental diagnostic capability is always maintained at the national level.



*Image courtesy of Nursery and Garden Industry Australia*

# Recommendations



## **Recommendation D4: Establish a national plant biosecurity information management framework to optimise data sharing**

The ability to share consistent and accurate information across the plant biosecurity continuum is an essential feature of an advanced and effective plant biosecurity system. To achieve this, a national biosecurity information framework that improves decision making at the regional, state and national levels is required. It will provide access to a wide range of relevant biosecurity information, including diagnostic resources, surveillance data, risk analysis tools and research outcomes, sourced from all states and territories.

A national framework for sharing plant biosecurity information would have the following features:

- Promote collaboration between states and territories and other stakeholders
- Demonstrate high technical interoperability and compatibility
- Exhibit common standards for data and timely reporting
- Provide for consistent data input, recording and dissemination
- Meet privacy, security and legal obligations
- Minimise duplication across systems
- Meet international trade obligations

### ***Action D4.1: Regularly review plant biosecurity information management systems that support diagnostics to ensure they meet the needs of the network and implement mechanisms to address gaps***

The delivery of plant pest diagnostic services is reliant on a number of IT systems and is expected to become more so over time as new tools become available. These range from online resources, such as PaDIL and the Australian Plant Pest Database, through to sample tracking software and information sharing resources.

New tools are constantly being developed and upgraded, so to ensure these are effectively utilised and integrated into the NPBDN a global analysis of current systems needs to be undertaken. Through this process a stocktake of currently used systems will be developed together with the identification of new tools that will enhance the delivery of diagnostic outcomes. This review would be undertaken on a regular basis to ensure the rapid uptake of new tools and technologies and would make recommendations on any overlaps or duplications in the tools being developed.

This process would also identify requirements of the network that are not being met by current information management systems and through the NPBDN, service providers could be engaged to address these gaps. This approach would focus the development of biosecurity tools on areas of greatest need and ensure the resulting products are employed by the network participants.



***Action D4.2: Develop, implement and maintain standardised information systems nationally, both within government and industry, for the collection, analysis and retrieval of surveillance data, diagnostic information and research outcomes***

Through the NPBDN, a mechanism to facilitate of sharing of data across different IT systems must be developed and implemented. Through this mechanism, surveillance, diagnostic and research related information entered by laboratories and other stakeholders in the network, would not be limited by the disparate systems used for data entry.

The mechanism for data sharing would not require a central repository of information in all cases, instead relying on agreed standards for data entry. IT systems would be developed to link the disparate information systems and allow interrogation of the information at the national level. Through this approach, data could be shared not only between jurisdictional data sets, but also linkages between surveillance, diagnostic and research data could be implemented and maintained.

Currently at the national level, there are a number of new systems for data collation and exchange at various degrees of development (e.g. BioSIRT, Australian Biosecurity Intelligence Network, Atlas of Living Australia and PaDIL). These systems should be continued to be developed and expanded over time with consideration of the developing needs of the national plant biosecurity system (as identified through Action D4.1).

***Action D4.3: Develop a system that enables the sharing of diagnostic data nationally and complete a stocktake of existing data management systems in plant biosecurity laboratories***

It is envisaged that under a NPBDN (see Recommendation D1), a national data management system would build on existing systems/tools where possible and practical, and with sufficient capacity and flexibility be able to manage, deliver and link to a variety of information pertinent to plant biosecurity. This would include diagnostic protocols, image libraries, symptom libraries, contingency plans, web based identification tools and guides, and expertise registers.

These would also enhance the capacity to deliver distributional records (including Geographic Information System data), biological information and related literature. There will also be links to tools for predictive modelling, spatial analysis, economic assessment, risk assessment and early warning reports.



*Image courtesy of DAFF, Queensland*



## Acronyms and abbreviations



<b>BioSIRT</b>	Biosecurity Surveillance, Incident Response and Tracing
<b>EPP</b>	Emergency Plant Pest
<b>EPPRD</b>	Emergency Plant Pest Response Deed
<b>HPP</b>	High Priority Pest
<b>IEC</b>	International Electrotechnical Commission
<b>IGAB</b>	Inter-governmental Agreement on Biosecurity
<b>IPPC</b>	International Plant Protection Convention
<b>ISO</b>	International Organization for Standardization
<b>NATA</b>	National Association of Testing Authorities
<b>NPBDN</b>	National Plant Biosecurity Diagnostic Network
<b>NPBDS</b>	National Plant Biosecurity Diagnostic Strategy
<b>NPBS</b>	National Plant Biosecurity Strategy
<b>PaDIL</b>	Pest and Disease Image Library
<b>PHA</b>	Plant Health Australia



## Glossary



<b>Pest</b>	Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants, plant products or bees.
<b>Diagnostics</b>	Processes and standards associated with the accurate identification of a pest.
<b>Emergency Plant Pest</b>	A pest that is included in Schedule 13 (of the EPPRD) or which is determined by the Categorisation Group to meet one or more of the following criteria: <ul style="list-style-type: none"><li>A. It is a known exotic Plant Pest the economic consequences of an occurrence of which would be economically or otherwise harmful for Australia, and for which it is considered to be in the regional and national interest to be free of the Plant Pest.</li><li>B. It is a variant form of an established Plant Pest which can be distinguished by appropriate investigative and diagnostic methods and which, if established in Australia, would have a regional and national impact.</li><li>C. It is a serious Plant Pest of unknown or uncertain origin which may, on the evidence available at the time, be an entirely new Plant Pest or one not listed in Schedule 13 and which if established in Australia is considered likely to have an adverse economic impact regionally and nationally.</li><li>D. It is a Plant Pest of potential economic importance to the area endangered thereby and not yet present there or widely distributed and being officially controlled, but is occurring in such a fulminant outbreak form, that an emergency response is required to ensure that there is not either a large scale epidemic of regional and national significance or serious loss of market access.</li></ul>
<b>Emergency Plant Pest Response Deed</b>	A pre-agreed cost sharing and response framework for dealing with an incursion of an EPP.
<b>Established pests</b>	A pest that is perpetuated, for the foreseeable future, within any area and where it is not feasible (whether in terms of technical feasibility or a benefit/cost analysis) to eradicate.
<b>Exotic pests</b>	Plant pests that do not normally occur in Australia.
<b>High Priority Pest</b>	An exotic pest that has been identified to have one of the highest potential impacts to a particular plant industry as identified through the industry biosecurity planning process or listed in Schedule 13 of the EPPRD.
<b>Plant biosecurity</b>	Plant biosecurity is a set of measures which protect the economy, environment and community from the negative impacts of plant pests. A fully functional and effective biosecurity system is a vital part of the future profitability, productivity and sustainability of Australia's plant production industries and necessary to preserve the Australian environment and way of life.
<b>Plant industries</b>	Covers the industry sectors of agriculture, horticulture, forestry and the environment and amenity plants.
<b>State and territory governments</b>	The state and territory governments of Australia.



Plant Health Australia  
Level 1, 1 Phipps Close  
Deakin ACT 2600

[www.planthealthaustralia.com.au](http://www.planthealthaustralia.com.au)  
Phone: +61 2 6215 7700  
Email: [admin@phau.com.au](mailto:admin@phau.com.au)