ANALYSIS OF PLANT PEST PREPAREDNESS CAPABILITY

A report to the Department of Agriculture and Water Resources

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Contents

EXECUTIVE SUMMARY

This analysis examines the current Department of Agriculture and Water Resources (departmental) and national preparedness arrangements for exotic plant pest incursions and identifies areas where improvements could be made. The department has already identified a number of areas for improvement to the current system, and has initiated work to address these areas. These initiatives are acknowledged in the report and some comments are made.

The findings of the report are presented under three themes, “Prevention”, “Early Detection” and “Response”. Under “Prevention”, the report examines how approaching threats are identified and Australia’s import conditions are managed to reflect the identified pest risks. Under “Early Detection”, the current pest surveillance and diagnostic systems are examined, including impediments to early pest reporting. Finally, under “Response”, the report looks at the continued use of Contingency Plans, the arrangements for managing responses on land under Commonwealth control, managing pests that predominantly impact on the environment and the arrangements for managing pest detections in northern Australia.

In preparing this report, broad consultation was undertaken within the department, some states/territories and selected industry organisations, during which a number of themes emerged. Among the findings, the most consistent relate to pest surveillance and diagnostics, and the need for a review of import pathways, with particular emphasis on imports of seed for sowing.

With hundreds of exotic plant pests potentially threatening Australian agriculture and the environment, it would be useful to consider targeting and coordinating activities for a manageable number of high priority pests. A national exotic priority plant pest list of no more than 50 pests, developed along the lines of the United States (US) system , would allow greater focus of national investment on the development of national diagnostic and surveillance protocols for a manageable number of national priority pests. A national priority plant pest list could also be used to inform departmental surveillance activities at the border and if required, in states and territories and by industry, and provide a focus on ensuring that Contingency Plans are produced for these pests and endorsed nationally.

Industry surveillance remains an important source of information for government agencies, in the context of early detection of exotic pest introductions and the collection of data on pest absence to support export certification. Some industries have programs which incorporate on-farm surveillance in their biosecurity plans, however the take-up by their members appears irregular. Some industries have commented that their members will not share pest information with the government, and are reluctant to allow government personnel onto their farms, due to the perceived risk of spread of pests and the fear that if an exotic pest is detected their crops may be destroyed. Other industries seek to partner with state/territory governments in delivering surveillance.

The development of national diagnostic protocols has been an ongoing task for many years. Whilst some very good work has been done, it may be considered unmanageable to prepare and maintain national protocols for all of the 350 plus pests identified in Industry Biosecurity Plans. A three tiered system for the development of national diagnostic protocols, with the highest level for the national priority plant pests could be considered. The establishment of a dedicated resource to nationally coordinate diagnostic capability to implement recommended changes and provide national management could also be advantageous.

Reporting suspect exotic pests can result in severe outcomes such as the quarantining of the owners premises and destruction of the crop. Under the Emergency Plant Pest Response Deed (EPPRD), owners of properties whose organisations are not signatories to the Deed are not eligible for specified losses in an emergency response, but even if their organisation is a signatory to the Deed, they may not be eligible for reimbursement of specified losses if the pest is declared not eradicable prior to a Response Plan being implemented. Hence

there is the risk that reporting suspect pest symptoms could result in loss of the crop with no reimbursement guaranteed. This has been reported as a disincentive for growers to report suspect symptoms, and may impede early detection of exotic pests. Some options to address this issue have been suggested in the report.

The usefulness of Contingency Plans has been raised during the course of the review. Whilst there is a great deal of variation in the content and detail of Contingency Plans developed to date, they serve a very useful purpose in focusing industry's attention on the identified pest threats, and there is a clear commitment from industry and Plant Health Australia (PHA) to continue their development. Contingency Plans are not approved at a national level, and since their content is designed to be used in the case of an emergency pest response, national approval should be considered, commencing with those plans developed for national priority pests. Whilst pest specific Contingency Plans provide a useful resource for high priority pests, the development of more generic plans may be beneficial and less resource intensive.

Concerns have been raised regarding the introduction of pests that impact on the environment and/or social amenity. The current system focuses largely on pests of commercial crops and the EPPRD excludes pest plants (weeds). The National Environment Biosecurity Response Arrangement (NEBRA) covers pests that impact on the environment and/or social amenity where they are not already covered under other cost sharing mechanisms. A Taskforce has been established by the National Biosecurity Committee to develop arrangements for responding to an exotic production pest plant (weed) incursion. There are currently limited Contingency Plans for pests that impact on the environment and/or social amenity, and the development of additional plans would be extremely useful in managing incursions.

Responsibilities and arrangements within the government for dealing with pest incursions on land administered by the Department of Defence are well established, however should be made clearer for responses in Commonwealth National Parks and External Territories. Whilst the government has jurisdiction in these areas, the relevant responsible agencies need to be identified and response arrangements agreed. It would also be beneficial to document the responsibilities and arrangements currently in place for wharves, airports and Quarantine Approved Premises.

Although any system can be improved, Australia appears to manage its pest incursions quite well. There are systems in place to respond quickly to the detection of pests, Australia is recognised internationally as having a strong biosecurity system in place, and the roles of the Australian Government, states and territories and industry are well defined in an incursion response.

Whilst the national subcommittees on surveillance and diagnostics have achieved much within their existing resourcing levels, additional resourcing focusing on improved coordination and developing standards and protocols for national high priority pests would be beneficial and be consistent with the Agriculture Competitiveness and Developing Northern Australia White Papers emphasis on improved surveillance and analysis.

SCOPE

The scope of this analysis is to consider the current departmental and national preparedness arrangements for exotic plant pest incursions, identify strengths and areas for improvement and suggest options on priority areas to enhance departmental and national plant pest preparedness.

This analysis has not sought to comment on the manner in which the Consultative Committee on Emergency Plant Pests or the EPPRD or NEBRA operates, except where it is relevant to an identified issue.

CONSULTATION

Consultation within the department, some states/territories, Plant Health Australia and industry groups were an important part of this review, and the views expressed and information provided during the consultation phase of this review were extremely helpful in identifying areas for improvement and options for improvement.

It was not possible to consult with all potential industry groups that might be affected by a plant pest incursion, and priority was given to those groups who had experience in dealing with a pest incursion affecting their industry. During the course of the consultation with industry groups and the states/territories, a number of recurring themes emerged.

A list of those groups and organisations consulted is at Attachment A.

INTRODUCTION

The Australian Government places a high priority on biosecurity in order to protect industries and the environment from the threat of exotic pests and to support the export of Australia's agricultural produce. The Agriculture Competitiveness and Developing Northern Australia White Papers released this year reinforce the government's commitment to improving Australia's biosecurity.

The Agriculture Competitiveness White Paper, which was released by the government in July 2015, recognises that Australia manages its biosecurity risk to a very high standard. It also commented that "with biosecurity risks rising, better surveillance and intelligence is needed to safeguard Australian produce from these threats."

The White Paper also stresses the importance of a strong biosecurity system in maintaining overseas market access, and has proposed initiatives to improve surveillance and analysis in order to reduce the risk of entry of exotic pests (including weeds) and to support market access. The government has announced that it will invest $200m over four years to improve biosecurity surveillance and analysis.

The White Paper on Developing Northern Australia was released by the government in June 2015, and announced that additional resources will be provided to ensure specific regional biosecurity risks are suitably managed. The government has committed $12.4m to expand surveillance and compliance activities in northern Australia for Indigenous Ranger groups, to improve the early detection of potential threats to Australia's biosecurity.

The Intergovernmental Agreement on Biosecurity (IGAB) recognises the importance of emergency preparedness and response arrangements to minimise the impact of pests and diseases on Australia's economy, environment and the community. A key component of IGAB's strategy is to achieve an enhanced level of preparedness and consistent response arrangements across jurisdictions to assist in the effective and timely management of biosecurity incidents and emergencies. A number of projects have been identified including;

- a national emergency response qualification and training framework

- an exercise management guide and program to enable jurisdictions to test, evaluate and practise emergency response arrangements skills and knowledge
- organisational capability assessments to allow jurisdictions to identify gaps in their preparedness and response capability
- national collaboration, coordination and communication arrangements to ensure that resources are available to respond to biosecurity incidents.

The government, through the department has also committed significant resources through the Stronger Biosecurity and Quarantine Initiative (SBQI) to enable early response assistance for pest incursions and to strengthen Australia's biosecurity preparedness. A significant activity under this initiative has been the funding of personnel and qualified private contractors to assist the relevant state/territory in the early stages of a response.

Animal and plant emergency pest and disease responses are managed through animal and plant deeds – the Emergency Animal Disease Response Agreement (EADRA) and the EPPRD, managed by Animal Health Australia and Plant Health Australia respectively. The Australian Emergency Plant Pest Response Plan (PLANTPLAN) is a Schedule to the EPPRD and provides technical guidelines for the management and response to plant emergency pest incidents affecting plant industries.

The EPPRD was ratified in 2005, and provides a number of benefits in managing emergency plant pest incidents, including formal industry involvement in decision making and an agreed national approach for managing plant pest incursions. An important part of signatories' responsibilities under the EPPRD is notification of a suspect emergency plant pest.

The EPPRD also sets out cost sharing arrangements for the management of an emergency plant pest for participating industries, and the arrangements for owner reimbursement costs, where applicable. There are 34 organisations that are members of PHA, however not all industry groups are signatories (currently there are 31 industry signatories) and some that are neither members of PHA or signatories. Should an emergency plant pest incident occur affecting a non-signatory industry, the benefits of the EPPRD, including representation on the Consultative Committee on Emergency Plant Pests and the National Management Group, and eligibility for owner reimbursement costs, under a response are not available to the non-signatory industry.

An independent formal review of the EPPRD is currently being undertaken, as part of the normal commitment of regular five yearly reviews.

Pests that predominantly impact on the environment and/or social amenity are managed in accordance with the NEBRA, to which only governments are signatory. Collectively, these documents detail the relevant responsibilities of government and industry in an emergency response as well as the applicable cost sharing arrangements, and are key documents in an emergency pest or disease response.

The department also draws on a number of high level plans and strategy documents in responding to an emergency pest, namely:

- The Australian Government Agricultural Emergency Plan
- The department's Emergency Preparedness Strategy, and
- The department's Critical Incident Response Framework and Plan.

An internal audit was undertaken by the department in 2012, which recommended that these documents be reviewed and updated. The reissued documents are due for another review in 2015. Nevertheless, the internal

audit found that the department is effectively completing its responsibilities in relation to incursion management.

Australia has comprehensive plant and animal emergency response arrangements, which are well regarded both domestically and internationally. Other countries which have well regarded biosecurity systems include the US, Canada and New Zealand. During the course of this analysis, some elements of these countries preparedness systems were considered, particularly in relation to surveillance and diagnostics, as these were important issues identified through stakeholder consultation.

In Canada, its surveillance priorities include quarantine pests with limited distribution, a few general invasive exotic species to detect new populations of quarantine pests and those pests relevant to market access. The selection of pests to include in its surveillance program is based on an assessment of the importance of the survey information and its relative urgency. The following factors are considered in the selection of pests for surveillance;

- contribution of the survey in detecting new pests
- degree to which the survey data will contribute to progressing an issue
- degree to which the survey data is needed for critical decision making
- degree to which trade and the associated industry may be jeopardised
- whether the pest is rapidly evolving or highly visible
- contribution of the survey to reporting on broader business initiatives.

Whilst the economic impact of the pest is important, it does not appear to be the major factor in driving surveillance. Economic impact is assessed through its import risk assessment process, using expert opinion to determine the level of impact, similar to Australia.

New Zealand and Australia have many similarities in managing pest incursions. New Zealand has developed a Government Industry Agreement (GIA) that introduces cost-sharing arrangements between government and industry. It has also developed a Deed, which sets out the cost-sharing arrangements in more detail, as well as governance arrangements for decision making, resourcing and operations. Operational Agreements between industry and government may be developed under the Deed but are not compulsory.

Operational Agreements provide for joint decision-making and investment, in order to achieve specific outcomes for readiness and response. They involve the Ministry for Primary Industries and one or more industry Signatories and focus on achieving agreed biosecurity outcomes.

Like Australia, New Zealand has a number of different pest lists. There is a list of high impact economic pests associated with fresh imports that is used to target diagnostics. There is a different list generated under the GIA that is used for surveillance and response, including response preparedness. New Zealand also has a list of notifiable organisms under their legislation and a list of regulated organisms. Whilst New Zealand does not have a national priority pest list, it has advised that it now has the capacity to generate ranked lists, and could generate a national list if required.

New Zealand' surveillance programmes fall into three main groups,

- High Risk Site Surveillance, targeted at forestry and some fruit tree crop pests, and involving surveillance at entry ports and other identified high risk sites
- targeted surveillance for a number of identified pests
- passive surveillance activities, including the pest and disease hotline.

New Zealand does not generate Contingency Plans as such but focuses on generic readiness.

The US has produced a number of guidance documents and plans for managing plant pest emergencies.

The "*Emergency Support Function #11 – Agricultural and National resource Annex*" provides guidance for all USDA agencies during an emergency, including plant health and non-plant health responses.

State departments are encouraged to develop their own plant heath emergency response plans. These plans are developed using guidelines set out in the "*Standards for Plant Health Emergency Management Systems"*.

New Pest Response Guidelines (NPRG) are developed by the US Animal and Plant Health Inspection Service's (APHIS) Plant Protection and Quarantine (PPQ) emergency management staff in consultation with subject matter experts and specialists. These documents provide guidance for individual pests or groups of pests and contain similar information to some Contingency Plans used in Australia, for example information on the biology of the pest(s), control methods and pest pathway information. These guidelines provide basic information for the development of site-specific action plans.

Recognising that there is potentially a vast range of plant pests that might enter and establish in the US, APHIS consider the following criteria when deciding whether to develop an NPRG.

- Proximity of the pest threat
- Economic importance of the affected crop
- Pest's potential to cause damage
- Identification of pest pathways
- Inclusion of the pest on more than one list of pests including the following:
    - Cooperative Agricultural Pest Survey program (CAPS)
    - New Pest Advisory Group
    - Offshore Pest Information System.

The US CAPS program provides a survey profile of exotic plant pests in the US deemed to be of regulatory significance through early detection and surveillance activities. The CAPS program conducts science-based national and state surveys targeted at specific exotic plant pests, diseases, and weeds identified as threats to US agriculture and/or the environment. These activities are accomplished primarily under USDA funding that is provided through cooperative agreements with state departments of agriculture, universities, and other entities. The program is continuing to develop commodity-based and resource-based surveys. These surveys enable the program to target high-risk hosts and commodities, gather data about pests specific to a commodity, and establish better baseline data about pests that were recently introduced in the US.

(https://www.aphis.usda.gov/wps/portal/aphis/ourfocus/planthealth/sa_domestic_pests_and_diseases/)

The US has developed a prioritised pest list, as a cooperative program between the USDA Plant Protection and Quarantine group and the states, in order to identify high impact exotic pests to better focus surveillance. The aim is to support early detection of exotic pests. The CAPS program takes this prioritised pest list into account in conducting its annual surveys.

The US approach to developing a prioritised plant pest list of 50-60 pests to focus surveillance and diagnostics efforts is a model that could be considered for Australia. This concept is discussed further in the section entitled "National Priority Pest List".

The US has advised that it is looking at reviewing its model, which may provide opportunities for further collaboration with it in developing an Australian prioritisation system.

Also of interest to Australia is the US National Plant Diagnostic Network (NPDN). The NPDN is discussed further in the "Diagnostics" section.

FINDINGS

PREVENTION

Prevention is always better than cure. The prevention of exotic pests entering and becoming established in Australia is a key priority, and having in place mechanisms to identify approaching pest threats and robust biosecurity policy and procedures to manage the risk of their introduction are important issues.

Australia is internationally recognised as having a well-developed and stringent biosecurity system, and many countries have sought to learn from Australia over the years in order to strengthen their own quarantine systems. Nevertheless, pests do penetrate the border and become established in Australia through a variety of mechanisms. There is a need to identify approaching threats, and regularly review import conditions and biosecurity systems at the border in light of changing risk profiles.

Approaching Threats

There are a number of sources of information that are useful in identifying approaching pest threats. One important source is interception data obtained from inspections at the border. High numbers or changing patterns of interceptions of identified quarantine pests at the border can indicate an elevated risk of introduction of these pests. For example, the department has responded to increased detections of the brown marmorated stink bug at the border through revised import conditions and has used this pest in a pilot project through Plant Health Australia to improve the structure of Contingency Plans.

Other sources of information on pest threats can be obtained from reports from our trading partners of new pests or extended pest ranges, published pest reports through the International Plant Protection Organisation, regional surveillance, news releases and scientific literature. The department has also identified a number of sources of information on plant pests, including their taxonomy and distribution, which are available on the department's Techspace system and in table format. Some examples are reproduced at Attachment B.

These resources are used to determine the quarantine status of pests and to identify pests that are present in countries or areas that may pose a threat through trade. For example, information regarding the detection of the psyllid vector of the citrus disease Huanglongbing in California a number of years ago prompted a review of import conditions for citrus from that state.

Analysis of available data

Although there is a wide variety of pest data available, there does not appear to be an established system within the department to analyse the available data and identify approaching pest threats.

At present, the identification of a new plant pest potentially on an import pathway will usually trigger a review of import conditions by Plant Division which may then result in revised import conditions or, in extreme cases, the suspension of trade until appropriate import conditions can be developed. For example, when New Zealand advised Australia of a new pest affecting tomato plants in 2008, Australia suspended imports of solanaceous plant products from New Zealand whilst the identity of the pest was determined. Following research by New Zealand that identified the pest as *Liberibacter solanacearum*, the pathogen causing zebra chip in potatoes, Australia conducted a pest risk analysis and developed revised import conditions for solanaceous crops such as tomatoes and capsicums. Similarly the detection of a highly virulent strain of *Pseudomonas syringae actinidiae* in New Zealand prompted a review of import conditions in Australia for kiwifruit planting material and pollen.

Whilst the above examples reflect positively on the department's ability to react quickly and effectively to the identified threats, some threats are not identified before they can enter and establish in Australia. A current example is cucumber green mottle mosaic virus, which was detected recently in the Northern Territory and Queensland in commercial crops. This virus is seed borne, however the import conditions at the time did not specify measures against this virus. This has now been rectified; however, this example highlights the value of regular review of import conditions, especially in relation to propagating material such as seeds for sowing.

The department has developed the International Biosecurity Intelligence System (IBIS) to identify relevant newly published pest information on the internet. Whilst refinement to this system is ongoing, IBIS is currently being used successfully in animal and aquatic health to identify potential biosecurity risks. It has been reported that an impediment to the broader adoption of IBIS on the plant side is the number of pest/host combinations that make it difficult to extract the relevant information. More development is underway to enable IBIS to be an effective tool for plant pests.

Import compliance data can be obtained through (AQIS) Import Management System and Incidents databases, the results of inspections and identification of intercepted pests by the Operational Science Support (OSS) program. The data obtained is reported quarterly and can be analysed for trends and emerging risks.

Analysis of this data is important in identifying potential threats and allocating resources to either investigate further or to review import pathways. A program of targeted inspection and identification of intercepted pests to species level could be utilised when high levels of pests are detected. Conversely, pathways that demonstrate low levels of interceptions can also be identified and resourced accordingly to reflect the potential risk. Feedback on actions taken could be communicated to field officers so that they are aware of how the data is used to better manage the pest risk.

Whilst there are a number of activities currently being undertaken to identify approaching threats, there does not appear to be an analytical group responsible for considering all of the available pest information and recommending action. Consideration should be given to establishing a group in Plant Division, who would meet regularly to study data from all sources, identify any significant approaching threats and recommend action to address the risk.

Suitable people could be drawn from Plant Import Operations, Plant Biosecurity and the OSS program, and should be experienced enough to be able to identify potential threats and risk pathways. Outputs of this group could include recommendations regarding the need for pathway reviews, the review or commencement of pest risk analyses, targeted border, or other, surveillance for a particular pest and improvements to data collection.

Finding

Consider the establishment of a group within Plant Division to analyse new pest information from overseas and the Australian border, identify potential threats and recommend further action.

Import Pathways

Pest incursions can arise through a number of pathways – natural, regulated or illegal. Some pathways, such as illegal introductions and natural spread are difficult to address, but regulated pathways can also pose a serious threat if the import conditions do not adequately address the pest risk. Importations of plant propagating material, such as live plants, cuttings and seeds for sowing, pose a particularly high threat as the purpose of the introductions is to establish new plantings. If pests are introduced with propagating material they have a ready-made environment to establish and spread within Australia. Therefore the import conditions for plant propagating material need to be regularly reviewed to ensure that they fully address the pest risk, and take account of any new available science that might influence the pest risk. Relevant new science might include

improved pathogen testing techniques, information on the expanded host or geographical range of a pest and new identified pests associated with the pathway.

Plant Biosecurity has completed a number of reviews of import pathways for propagating material as well as other commodities. The priority for conducting import condition reviews is determined by consultation with industry through the Post Entry Plant Industry Consultative Committee, pest outbreaks, such as cucumber green mottle mosaic virus (CGMMV) and potato spindle tuber viroid disease, and information on vulnerable pathways, such as the detection of the psyllid vector of Huanglongbing in California.

A pathway vulnerabilities project in Plant Division has been initiated to identify vulnerabilities in import pathways for exotic high priority pests identified through industry biosecurity plans. This project will also look at whether the current surveillance systems at the border and post border are targeted appropriately to provide early detection of exotic high priority pests.

The pathway vulnerability project is still in the development phase, and initial work has focused on seed-borne viruses and viroids identified in industry biosecurity plans. The potential risk of seed-borne pathogens entering Australia through import pathways has been raised as a concern during industry consultation in this review, no doubt reinforced by the CGMMV outbreak in the Northern Territory in 2014. The grains industry has also raised some concerns about the potential risk of unregulated seed imports which are ornamental hosts of pathogens of commercial grain and oilseed crops, such as sunflower. Apart from the deleterious effect on crop production, the establishment of exotic pests in these industries has the potential to significantly affect exports.

This process for identifying pathway vulnerabilities, with funding provided through the Agricultural Competitiveness White Paper, provides a good framework for the review of import pathways for those pests identified through Industry Biosecurity Plans. The initial focus on seed-borne pathogens is strongly supported, as propagating material provides a direct pathway for the establishment and spread of exotic pests, and would address industry concerns in this area. However, proactive review of the Incident database to ascertain current biosecurity risks and changes in import risk pathways should be performed on a scheduled regime. This would enable reviews to focus on actual biosecurity risks at the border. The proposed group within Plant Division which analyse new pest information (see above) should also be responsible for preliminary pathway risk analysis.

Additional work within the department is being undertaken to review the biosecurity risks and regulation associated with a number of plant genera, including Apiaceae, Cucurbitaceae and Solanaceae.

The department is also proposing to convene a working group with departmental and relevant industry representation to assist in identifying new and emerging risks associated with the risk of imported seed for sowing, and related activities.

Finding

Reviewing vulnerable pest pathways is an important step in preventing pests entering and establishing in Australia. The current departmental project and the proposed working group mentioned above should provide a strong focus on identifying vulnerable pest pathways, especially seed for sowing pathways, and establishing priorities for pathway review.

EARLY DETECTION

History tells us that all countries will inevitably face new incursions of exotic pests, even those with highly regarded biosecurity systems. These pests may be very serious ones, such as the citrus canker outbreak in Emerald, Queensland, the outbreak of Huanglongbing in Florida, US and the outbreak of zebra chip in New Zealand, or less serious pests which may not trigger a response.

Early detection of exotic pests gives the best chance of eradication, as the spread of these pests is likely to be relatively limited. Even if eradication is not considered feasible, decisions regarding containment and long term management of pests will be facilitated by early detection and limited spread.

Surveillance and the ability to identify exotic pests are key components of early detection, as is early reporting of suspect symptoms by industry and the general public. Surveillance is undertaken by the department, state and territory governments and industry. Developing systems that facilitate the sharing of surveillance information between these groups is a continuing challenge.

National Priority Pest List

The development of a national priority pest list has been a subject of discussion within a variety of national forums, including Plant Health Committee and its subcommittees and was a recommendation arising from the 2008 independent review of Australia's quarantine and biosecurity arrangements (the Beale review). The Australian Government, through the Agriculture Competitiveness White Paper, has also recently committed to identifying priority plant pests to focus surveillance effort.

Like many countries, Australia has developed a number of pest lists for a variety of purposes.

The Northern Australia Quarantine Strategy (NAQS) maintain a surveillance pest list, which includes a number of pests that impact on the environment and/or social amenity that may enter Australia via Northern Australia, and the department has identified a large number of exotic pests relevant to particular commodities through pest risk analyses.

Other pest lists used within the department include actionable and non-actionable pest lists used at the border for imported goods, border surveillance pest lists used by the OSS program and pests listed on the Incidents database.

State and territory governments also maintain pest lists for surveillance and other purposes, which include exotic as well as established pests of concern.

Industry has identified a large number of their high priority pests, in excess of 350, through the development of Industry Biosecurity Plans, in collaboration with PHA; and the EPPRD lists categorised Emergency Plant Pests in Schedule 13 to the Deed.

Although it is recognised that the states, territories and industry will have their own priorities for pest surveillance, which will include domestic as well as exotic pests, an agreed national exotic priority plant pest list will enable governments at the Australian and state/territory level, as well as industry, to focus resources on a defined set of exotic pests that pose a significant threat to Australian agriculture and the environment. Factors that need to be considered in developing an agreed national priority pest list include the:

- presence of established pathways for the pest to enter, establish and spread in Australia
- frequency of border interceptions
- impact of the pest
- value of the industry potentially affected
- environmental and social amenity impact

- ability of the pest to establish and spread
- impact on exports.

The US has developed a prioritised pest list, as a cooperative program between the USDA Plant Protection and Quarantine group and the states, in order to identify high impact exotic pests to better focus surveillance. The aim is to support early detection of exotic pests.

The US goal is to identify 50-60 high impact, exotic pests of national concern, which are reviewed every two years. The US system uses a numerical scoring structure to assess pests for inclusion in their pest list and focuses on the environmental and economic impact of pests under assessment. These categories are further broken down into sub-categories. To be included in the prioritised pest list, each pest has to have a suitable surveillance system and diagnostic capability in place.

By keeping the pest list to 50-60 exotic pests, the surveillance and diagnostics capability can be kept to a manageable size. In assessing plant pests, the US system draws on the Australian Weed Risk Assessment model and the similar US Weed Model.

The US has advised that it is looking at reviewing its model, which may provide opportunities for further collaboration with the US in developing an Australian prioritisation system.

Plant Health Committee has recently agreed to develop a nationally agreed approach to prioritisation of national priority plant pests. The framework will address the national significance and interest principles developed by the National Biosecurity Committee; and will be consistent with the policy intent of the IGAB. It also incorporates core criteria developed by the Subcommittee on National Plant Health Surveillance (SNPHS) for identification of surveillance priorities.

Plant Health Committee has also agreed that interim national priority pests are identified through a semi-formal expert elicitation process, as a proof of concept and to guide surveillance efforts through the National Plant Health Surveillance Program and other preparedness activities. To support this work, the department has identified over 700 exotic plant pests from Industry Biosecurity Plans, those intercepted at the border, the NAQS target list, the National Plant Health Surveillance Target List, and a number of other pest lists that could be considered to meet the criteria of a national priority pest. Two research projects are underway which are expected to provide a model that meets the needs for a transparent and robust prioritisation method.

Identifying a small group of priority pests reviewed every two years, as the US does, would be extremely valuable as this list could focus attention on ensuring that surveillance and diagnostics capabilities were in place for these pests and kept up to date. For example, border surveillance and NAQS could draw on this priority listing in developing their target surveillance lists, the states and territories could incorporate these pests into their surveillance and industry could consider these listings for their on-farm surveillance for the appropriate crops. Pest prioritisation could also drive research priorities and planning.

In addition, once the priority pests have been agreed, nationally endorsed Contingency Plans or equivalent could be developed. This is discussed further in the section on Contingency Plans.

Although identifying priority pests would provide a clear focus for national surveillance and diagnostics, it would not preclude surveillance for other pests. Each industry group would still focus on the pests of significance to their industry, including those necessary to support export certification, and NAQS and border surveillance could still maintain their specific pest lists.

As the identification of the national priority pests may take some time to complete, it might be useful to start with a smaller number of pests that could be used to review surveillance, diagnostics and Contingency Plans.

These pests could be selected from those pests identified by key industry and environmental groups, including those pests relevant to export market access.

Finding

Consider identification of a manageable number of exotic priority pests to be agreed nationally to better inform national surveillance, including on-farm surveillance, diagnostics, Contingency Plans and other preparedness activities. It is suggested that the number of national priority pests should not exceed 50, and that this list should be reviewed regularly to ensure its continued relevance.

Surveillance

Surveillance is recognised as an important element in any pest preparedness strategy, and has featured strongly in the national approach to ensuring that Australia has an effective national biosecurity system.

The Agricultural Competitiveness White Paper recognised that investing in surveillance will improve Australia's ability to detect and manage biosecurity risks early. The government will invest $200m over four years to improve biosecurity surveillance and analysis. Australia's ability to respond successfully to pest incursions depends largely on its ability to detect pest incursions quickly. Delays in detecting pest incursions can mean that they become established, making the job of containment and eradication much more difficult and resource intensive.

Surveillance is carried out by the department, the states and territories and industry. The department's surveillance focuses on exotic pests, whilst the states and territories and industry target both domestic and exotic pests. The surveillance data generated is collected in a number of systems but is not collected in any national system. Some projects are underway that may allow national data to be collected and/or shared.

The National Plant Biosecurity Surveillance Strategy (NPBSS) was developed in 2012 by the Subcommittee on National Plant Health Surveillance (SNPHS) in collaboration with PHA. The strategy was endorsed by the Plant Health Committee in March 2013. The NPBSS identifies five key elements of the national surveillance strategy, with supporting recommendations and actions.

A draft NPBSS implementation plan was developed in 2014 and considered by Plant Health Committee at its meeting in November 2014. PHC did not endorse the full plan at that time, and requested some specific activities to be developed, which are being progressed.

Finding

The finalisation of the draft implementation plan for the NPBSS, focusing on identifying priority projects under each of the five recommendations of the NPBSS, would be useful to consider, as it will allow a structured approach to implementation and will identify the resources needed for full implementation.

Surveillance in Northern Australia and near neighbours

The department conducts onshore and offshore surveillance focusing on exotic pests.

The department's Northern Australia Quarantine Strategy (NAQS) conducts a range of surveillance activities in the northern parts of Australia. Strong engagement and relationships with Indigenous leaders and communities are an important part of this program and enable NAQS to provide valuable front line defences against the introduction of pests from the north. The NAQS program is further discussed in the section entitled "Pest Detections in Northern Australia". The department's International Plant Health Program conducts offshore surveillance, in collaboration with the governments of Papua New Guinea, Timor Leste and Solomon Islands.

The pest information received from these surveys is important in not only identifying incursions into northern Australia but in identifying approaching pest threats.

Surveillance at the border

The growing volume, range and composition of imported goods have increased the biosecurity risks posed to Australia. The department needs increased capacity and capability to ensure that surveillance activities continue to be effective. Improved surveillance and intelligence is required to minimise the risk of incursions and prevent harm to Australia's agricultural production or environment. The information gained from these activities also allows the department to continue to effectively target biosecurity activities across the biosecurity continuum and inform pathway risk assessments.

The department is proposing to expand its border surveillance and intelligence activities. This includes additional general surveillance, enhanced trapping and testing, and the implementation of a nationally consistent regime for collecting, analysing and disseminating biosecurity intelligence.

The OSS program has responsibility for oversighting surveillance at the border, with additional resources being transferred to the team in July 2015. The OSS program provides a valuable source of scientific expertise to drive border surveillance. In addition to surveillance, this program undertakes identification of pests intercepted at the border.

Identification of intercepted pests to species level has increased from 25% to approximately 40-45% of all interceptions over the past 15-20 years, however these are mostly arthropod specimens. Identification of pathogens beyond family or genus remains operationally challenging within the time constraints of border operations. Importantly, importers are seeking outcomes that allow consignments to move within hours, not days, and this often limits options to reconditioning consignments, re-export or destruction.

The border surveillance program monitors pests at some ports and Quarantine Approved Premises (QAPs). Initially staffed by up to 5-10 dedicated inspectors in each Region, inspectors worked closely with OSS personnel to conduct general surveys for targeted and other pests.

The following pests are specifically targeted by border surveillance, although any suspicious detections are investigated;

- snails
- Asian gypsy moth (in southern ports)
- khapra beetle
- bee and bee mites (eg varroa mite)
- burnt pine longhorn and other longhorn beetles
- weeds species
- disease vectoring mosquitoes.

In addition, state/territory governments conduct port of entry trapping for exotic fruit flies with support from departmental funding, and state governments undertake screwworm fly surveillance. State/territory governments also undertake a range of vector mosquito monitoring that complements the department's activities.

Data on pest interceptions at the border are recorded onto a Sharepoint site. There is currently only a limited capacity to separately record surveillance data through the Incidents database, making detailed surveillance reporting difficult. Reports on cargo surveillance interceptions are generated and circulated to the department's Executive, however it would be desirable for this surveillance data to be captured electronically, with the ability

to share the data. The department's Enterprise Surveillance System (currently being developed) should enable an integrated solution to data collection and reporting.

Trace-back to likely entry pathways is attempted where feasible, and where the pest can be linked to the entry pathway, a review of the pathway can be triggered. For example, the increased frequency of detections of burnt pine longhorn beetle in 2013 and brown marmorated stink bug in 2014 both resulted in pathway reviews.

The detection rate of exotic pests during border surveillance activities is relatively significant, with up to 5% of surveillance events since 2013 identifying an exotic pest. In the period from January 2014 to March 2015, only around 25% of all QAPs were surveyed, with rates as low as 4–10% reported in some regions. This low rate is likely to be appropriate to provide useful data to inform pathway reviews and to prioritise other work; however it would be beneficial to examine the policies or constraints behind these rates.

A potential issue is the availability of suitably trained staff to undertake effective surveillance activities. Initial training for officers carrying out border surveillance was provided by OSS personnel and through e-learning programs, work instructions and job cards. Changing demands and reduced resourcing has meant that these officers are no longer dedicated to the single task of surveillance. Much of the surveillance activity is now carried out by inspectors as part of their general inspection duties.

The surveillance rates in the Regions are quite varied, as the above figures indicate. As exotic pests are being detected even at this low surveillance rate, it is likely that exotic pests are present but not being detected. An increase in border surveillance activities could reveal much higher numbers of exotic pest detections.

The pest list for surveillance currently being used by the OSS program was developed some time ago and it would be timely to review its continued relevance. It is noted that surveillance activity has been tailored to reflect higher risk port areas for certain pests. For example, tropical pests have low priority for surveillance in the southern ports. This is a sensible use of limited resources. The proposed development of national priority plant pests could be used to target certain pests at the border, bearing in mind that the likelihood of detecting pathogens in port areas and QAPs is relatively low. Hence the continued focus on arthropods and molluscs is considered appropriate. Whilst national priority pests should be incorporated into the border target pest list, it may not be practical or appropriate to include all national pests in this target list. Additionally, there may be other pests that are not national priority pests that warrant targeting in border surveillance.

Finding

Currently, high risk QAPs are surveyed regularly in the major ports including airports, but there are many other QAPs where this does not occur regularly. With the expected provision of additional funding through the reviewed biosecurity cost recovery arrangements, there is opportunity to review priorities and ensure surveillance activities are aligned with the risks posed on specific pathways or in particular locations and facilities. The additional funding also presents an opportunity to increase surveillance infrastructure and activity.

When identifying border surveillance targets and locations, consideration should be given to including national priority pests and the likelihood of entry based on pathways and establishment.

Surveillance in the states and territories

Pest surveillance is carried out by the states and territories with support from the Australian Government. The department provides funding for surveillance activities for exotic pests and provides the Secretariat for SNPHS and coordinates national surveillance programs undertaken by the states and territories.

Departmental funding provides only a portion of the total investment by the states and territories in surveillance. The bulk of the surveillance is funded by the states and territories, and includes surveillance for exotic and domestic pests of importance to the individual state or territory.

The department provides funding of approx. $0.75m pa to the states and territories to undertake surveillance activities. The department provides guidance on port of entry exotic fruit fly trapping and Asian gypsy moth surveillance, but does not specify other exotic target pests for surveillance. Essentially the states and territories propose individual exotic pest surveillance programs targeting exotic pests of their choice for endorsement from the department.

At present, there is no nationally agreed exotic plant pest surveillance target list to provide overall guidance on national surveillance. The proposed development of a national priority pest list will enable better coordination of exotic pest surveillance, based on agreed national priorities, as agreement can be reached between the department and the states and territories on a priority target list and surveillance programs in the states and territories can be designed accordingly. This approach will be similar to the US national surveillance system that uses a prioritised pest list of 50-60 pests to drive its national surveillance program (the CAPS program).

The states and territories have significant technical expertise in pest surveillance and identification which places them in a good position to deliver high quality services. Partnering with industry groups in delivering surveillance, as has occurred, has great potential benefits.

Finding

National coordination of surveillance for exotic pests could be improved to ensure that there is a consistent approach to surveillance. Whilst the SNPHS does a good job within its resourcing, better coordination of national surveillance could be achieved through additional resourcing. A dedicated national coordination resource could be considered to assist SNPHS in undertaking its role.

The coordination resource could focus on developing an agreed national surveillance plan for national priority pests and developing suitable standards and protocols for these pests. The department could also investigate options for the wider integration of state/territory and on-farm surveillance programs that target national priority pests.

As part of the coordination responsibilities, the coordinator should ensure that suitable surveillance standards and protocols are developed, if not already available, for the targeted national priority plant pests.

Industry surveillance

Industry also engages in surveillance activities on-farm to identify production pests and support integrated pest management (IPM) systems. Some businesses use crop monitors, others utilise trained farm personnel or other systems to monitor pest presence. The level of surveillance activities appears to vary significantly among individual farms in the horticulture and grains industries, although it is difficult to obtain accurate information on the level of participant rates across these industries.

There are currently 136 industry surveillance programs in place in the grains and horticulture industries, with 88 of these in the grains industry. Most of these programs are run by the industry groups, however some industries also invest with the state governments in delivering their surveillance programs. A key driver for many of these programs is the need to demonstrate pest status for export certification (including inter-state trade), rather than early detection of exotic pests, although the quality of the data may not be sufficient in all cases to demonstrate area or production site freedom. Summary data from these programs is captured in the National Plant Surveillance Reporting Tool, maintained by PHA.

Ensuring the surveillance programs are designed to meet appropriate standards with the resultant data captured in detail (especially recording absence of a pest) is an effective way of supporting export certification. Including high risk exotic pests in regular surveillance programs that are identified in Industry Biosecurity Plans is encouraged by PHA, as is the collaboration by industry groups with their state or territory in delivering surveillance activity.

Nursery and Garden Industry Australia (NGIA) has developed an on-farm BioSecure HACCP program which includes surveillance, monitoring and management of pests and diseases. This program is voluntary for production nurseries and supports inter-state certification arrangements. Growers are responsible for alerting the relevant biosecurity agency of suspect emergency pests and for seeking pest identification. A pest/disease database (subscription based) with support images is also available through the NGIA. The NGIA audits participants in the program to ensure compliance.

The NGIA has advised that acceptance of this program by its growers is largely to support inter-state certification, although the benefits of the BioSecure HACCP program are much wider than certification.

Industry programs like BioSecure HACCP are a valuable source of pest information, both for detecting the presence of new pests and in supporting export certification, however this information currently does not link into national surveillance systems.

A recent pilot program being run by Citrus Australia, in conjunction with PHA, focused on training citrus pest scouts to identify all high priority pests for citrus listed in the citrus industry Industry Biosecurity Plan. The results are held by the pest scouts, with summary data lodged in the National Plant Surveillance Reporting Tool. As part of this program, the citrus industry is conducting joint surveillance with the NAQS program in the Ord River for four citrus pests.

The next phase of the project is to develop a national surveillance plan for the citrus industry.

A similar program could be used with other industries to enhance their surveillance activities. The challenge is then for this information to be stored in an accessible form and used to inform plant health status and support export certification.

The Department of Agriculture and Food Western Australia has been running a program (MyPestGuide) with the grains industry using a smart phone application which allows growers to photograph suspect pest symptoms and send these images to the department for identification. This program commenced 12 months ago and is funded by the WA government until 2018. Growers may also contact the department by telephone or computer to submit images. The focus of this program is to target pests that support export market access, and is not specifically designed for early detection of exotic pests, although such pests may be picked up coincidentally. The program focuses on arthropod pests, diseases and weeds.

The use of phone applications as an easy way of submitting suspect pest images for identification is a good example of how technology can be used to gather surveillance data. There is an opportunity to expand this program to focus on significant exotic pests as well as pests important for export certification. A collaborative trial in conjunction with the WA department and the grains industry to include exotic pests could be considered.

It is important that industry surveillance data can be captured and shared nationally, both to support export certification and to aid in early detection of pest incursions.

Despite the continuing efforts of PHA and the states and territories, some industries have commented that their members will not share pest information with the government, and are reluctant to allow government personnel onto their farms, due to the perceived risk of spread of pests and the fear that, if an exotic pest is detected, their

crops may be destroyed. Nevertheless, on-farm surveillance remains an important source of information for government agencies, in the context of early detection of exotic pest introductions and data on pest absence to support export certification. This is recognised by industry bodies, however many individual growers are yet to be convinced. This issue is discussed further in the section Owner Reimbursement Costs.

Encouraging industry to adopt surveillance systems for key pests and share the resultant data, especially for national priority plant pests and those pests important for market access, is an important challenge. The wider adoption of surveillance and reporting systems for key pests across the horticulture and grains industries would assist enormously in the early detection of pest incursions and in strengthening Australia's international market access.

Partnerships between the states and territories and industry in developing and implementing surveillance programs is a very effective way of undertaking pest surveillance, as the states and territories have the technical expertise available to design surveillance systems and identify pests. The department could also assist through national coordination of surveillance programs for exotic pests, advising on standards for export certification and through promoting the sharing of surveillance data nationally.

Finding

It would be beneficial to consider programs to improve farm biosecurity practices in conjunction with specific states/territories and industries to build preparedness for exotic pests, including the wider adoption of on-farm pest surveillance and recording of exotic pests of significance to the industries involved. As part of these programs it would be important to establish and maintain the credibility of the data, for example via auditable or verifiable systems that could help to support proof of freedom and market access negotiations. Pests on the national priority pest list relevant to the particular industry could be targeted and the survey design for all pests should be suitable to detect the pest if present and provide evidence of freedom.

Surveillance Data

Capturing and analysing data obtained through pest surveillance in a national system is a continuing challenge. At present, surveillance data is held in a number of systems and much of the on-farm surveillance data is captured only as summary data.

The department has commenced development of an Enterprise Surveillance System (ESS), which is designed to capture and report on the department's surveillance data generated by NAQS, onshore, offshore and border surveillance, and will have the capacity to eventually capture relevant jurisdictions' and industry surveillance data. The ESS is piloting NAQS fruit fly surveillance activities, with capacity to manage other surveillance programs over the next two years. The government has funded a project through PHA to establish a national system capable of receiving, collating and reporting on surveillance information on plant pests, including pest plants (weeds). The "Virtual Coordination Centre" is a two year project which will enable sharing between existing surveillance databases and systems, including the ESS.

The development of these systems may enable sharing of national surveillance data generated by the department, states, territories and industry, providing issues such as the confidentiality of information can be resolved.

Export Certification

The Agriculture Competitiveness White paper recognises that "boosting surveillance will grow the evidence base around our pest and disease status…and help Australia to negotiate favourable protocols to start new trade…and prove compliance with importing country requirements when disputes arise." Pest surveillance

programs can play an important part in acceptance by our trading partners of area and country freedom for certain pests required for export certification.

For example, Tasmania and the tri-state area have established a fruit fly trapping program to support claims of area freedom for Queensland fruit fly. This is a long-standing program that is accepted by many countries around the world, allowing Australia to certify fruit fly host produce to countries that accept the fruit fly freedom status of these areas.

Chile has established a pest surveillance program which conducts pest surveys across all of its production areas for exotic pests which are identified through their legislation, surveying approximately 20% of its production area each year. Production nurseries are surveyed separately. Any plants with suspect disease symptoms are sent to the government laboratories in Santiago for analysis. In addition, samples are taken of symptomless plants for analysis, using a sampling rate giving 95% confidence levels.

The Chilean surveillance system generates extensive surveillance records for legislated pests over many years, which is important in obtaining recognition by their trading partners of area and country freedom.

These examples underline the importance of surveillance in supporting export certification.

Diagnostics

Recommendation 58 of the 2008 Beale review of Australia's quarantine and biosecurity arrangements states that; "The National Biosecurity Authority should ensure Australia has the laboratory capability and capacity to manage exotic pest and disease incursions of national significance. The Panel recommends that the Authority, working with the states and territories, should improve the quality and use of state and territory laboratories to support national biosecurity priorities."

More recently, the Agricultural Competitiveness White Paper has identified that improvements to surveillance and analysis are needed to reduce the risk of entry of exotic pests and support market access. A robust and well resourced diagnostic system is needed to support an effective surveillance system, as well as to provide the capacity to accurately identify suspect exotic pests.

There are a number of government laboratories in Australia capable of performing this role, and considerable work has been done over the years in identifying potential pest threats and developing national diagnostic protocols for these pests. A key group responsible for the development of national diagnostic protocols is the Subcommittee on Plant Health Diagnostics (SPHD). SPHD has developed approximately 30 national diagnostic protocols (NDPs), with more than 60 in draft form. Between 2010 and 2015, 28 protocols were developed. The overall strategy is to develop diagnostic protocols for high priority pests, however as there are over 350 high priority pests identified through Industry Biosecurity Plans, the task is quite challenging.

Advances in diagnostics worldwide can result in diagnostic protocols becoming out of date very quickly, and the resources required to update large numbers of protocols can be extensive. It has been suggested that a more pragmatic approach is to focus on producing protocols for a discrete number of high priority pests, which can be regularly updated. This approach would inevitably include a number of high priority pests listed in Industry Biosecurity Plans.

Under this approach, the highest level of preparedness for diagnostic protocols would be for pests identified in the proposed national priority pest list. With this list envisaged to contain no more than 50 pests, detailed NDPs could be developed and maintained. Other pests on IBPs could be managed in a less resource intensive manner.

Three levels of preparedness of diagnostics could be established.

1. Deployment ready for pests identified as national exotic priority pests (up to 50 pests)
2. Good preparedness for 50 -100 of the High Priority Pests in Industry Biosecurity Plans (i.e. good protocols and general awareness)
3. General capability, capacity and expertise to support the balance of the 350 plus pests identified in Industry Biosecurity Plans

National priority pests are yet to be agreed, however, it is likely that many of these pests will already have diagnostic protocols being used in post-entry quarantine facilities in Australia. As these protocols are used regularly to screen imported plant material, they should be useful in establishing national protocols where they do not already exist.

Finding

In order to better manage the development of national diagnostic protocols for all of the high priority pests identified through Industry Biosecurity Plans, consideration should be given to applying three levels of diagnostic preparedness, as detailed above, with the highest level of preparedness developed for the national priority pests.

The National Plant Biosecurity Diagnostic Network (NPBDN)

In 2011 Australia formed the National Plant Biosecurity Diagnostic Network (NPBDN) as an initiative of SPHD. It is the nationally integrated network for plant diagnosticians. The NPBDN is being developed along similar lines to the US National Plant Diagnostic Network (NPDN).

The US established NPDN in 2002 with federal funding to provide national diagnostic capability, with the focus on rapid detection, diagnosis and communication of high priority plant pathogens. There is a significant training element in the program to ensure network personnel are able to perform diagnostic tests to the required standard.

The NDPN is funded by state and federal governments, and includes specific federal funding for diagnostic testing of their high priority pests, training of personnel in diagnostic techniques and accreditation of laboratories. A review of the NPDN, conducted in 2007, commented that “the implementation of the NPDN reversed a trend of dwindling resources dedicated to diagnostics of plant related problems. The NPDN has brought a renewed emphasis to…diagnostics …and has started to provide infrastructure for the rebuilding of the linkages between the diagnostics laboratories and extension, regulatory agencies and the broader community of agricultural practitioners”.

The NPBDN has many similarities to the US NPDN, however the US system has substantially more funding than the Australian NPBDN, which has a large part of the NPBDN resourcing consisting of in-kind contributions. The USDA invests into the NPDN to provide diagnostic services, and people are employed by the NPDN. The Australian NPBDN does not provide diagnostic services. It is currently tasked with making the existing services more efficient. In Australia, there are no staff employed directly by the NPBDN.

There are two intended stages to the NPBDN, individual and organisational. Extending formal membership to states/territories and organisations is the proposed next step.

In Australia, state and territory laboratories are utilised for the diagnosis of plant pests associated with incursions and for diagnostics for surveillance activities. State/territory laboratories are funded by the relevant government and some commercial activities, and have the costs of diagnostic testing of pests during an emergency response reimbursed through cost sharing arrangements, where applicable, however the costs of diagnostic testing for surveillance activities does not appear to be separately funded.

Funding is provided by the department for proficiency testing of laboratories in the NPBDN. This proficiency testing can form the basis for the future recognition of laboratories for specific testing. The department also provides funding for the professional development of diagnosticians, including running laboratory residentials and supporting overseas visits to improve professional skills.

Recognition of Laboratories for testing specific pests

Recognition of laboratories in Australia for specific diagnostics of high priority pests under the NPBDN, similar to the US system, could be considered.

Not all laboratories in Australia need to be proficient in the diagnosis of large numbers of exotic pests. This has been recognised in the National Plant Biosecurity Strategy, and some specialisation is occurring, although not formally. It is important to recognise that laboratories will maintain general diagnostic capability across a range of domestic and exotic pests to support their state/territory' requirements. The recognition of a laboratory for diagnostic capability for one or more pests would not preclude other laboratories from maintaining their capability, however the recognised laboratories would act as the lead laboratories.

The identification of national exotic priority pests will allow laboratories with expert capability in diagnostics for some of these pests to be recognised. Formal accreditation through organisations such as the National Association of Testing Authorities, Australia (NATA) has been considered for each diagnostic test, however NATA accreditation is expensive and may not be necessary. It is suggested that at least two laboratories should be recognised for diagnostic testing for the national priority pests. These laboratories could have the responsibility for maintaining the currency of the national diagnostic protocol.

Similar to the US model, specific Australian and state and territory government resourcing could be considered to support the ongoing work of recognised laboratories to maintain these national protocols in a deployment ready state.

Further developing the NPBDN will involve national coordination of activities, similar to those proposed for the national surveillance dedicated resource. Deployment ready diagnostic protocols will need to be developed where they do not already exist, and standards for the proposed three levels of diagnostic preparedness will need to be established and implemented.

Whilst adoption of a three-tiered system for the development and maintenance of national diagnostic protocols should be less resource intensive than the present system, the level of resourcing will remain a key issue.

Finding

Consider establishing a dedicated resource to nationally coordinate exotic pest diagnostic activities, focusing on the development of deployment ready diagnostic protocols for national priority pests, standards for the three levels of diagnostic preparedness proposed and further development of the NPBDN, including the recognition of laboratories for the diagnosis of high priority pests. Additional resourcing to further enhance the skills of diagnosticians and increase the capacity of laboratories in the NPBDN for the diagnosis of national priority pests could be considered.

Owner Reimbursement Costs

Property owners need to be encouraged not only to conduct surveillance for exotic pests, but to report any suspect symptoms as soon as they are noticed. Industry organisations that are signatories to the EPPRD must take reasonable steps to encourage their members to notify the relevant state/territory of any suspect pest symptoms. Both PHA and industry groups actively encourage property owners to undertake this reporting, even

in industries which are not signatories to the EPPRD. There is also regulatory responsibility in the states and territories for people to report suspect pests that are listed in the relevant state/territory, covering certain exotic and domestic pests.

Reporting suspect exotic pests can result in severe outcomes such as the quarantining of the owners premises and destruction of the crop. Under the EPPRD, owners of industries that are signatories to the EPPRD or small industries valued at <$20 million local value of production may be eligible for reimbursement of some of the losses incurred because of an emergency response. If an organisation is not a signatory to the EPPRD or, even if a signatory, if the pest is declared not eradicable prior to a Response Plan being implemented, there is no provision under the EPPRD for reimbursement of costs. Hence there is the risk that reporting suspect pest symptoms could result in loss of the crop with no reimbursement available. This has been identified as a disincentive for growers to report suspect symptoms, and militates against early detection of exotic pests.

There is a need to address this issue in order to give owners some certainty that their costs may be eligible for reimbursement should an emergency pest be confirmed on their property. Some options have been suggested, including a government underwritten insurance scheme, or limited government coverage of grower costs, (which is cost shared with the affected industry), where reimbursement of owner costs are not otherwise dealt with under the existing arrangements. These options could be tied to growers agreeing to implement on-farm biosecurity plans that include surveillance and reporting. The affected industry being a signatory to the Deed should be a prerequisite to any action in this area.

This issue is not limited to growers. Importers who report suspect exotic pests have biosecurity actions imposed that may have profound economic consequences for their business. In order to encourage importers to report suspect pest detections, it is important to minimise any financial loss as a consequence.

Finding

Options could be developed to ensure that people or businesses that report suspect pest detections are not financially disadvantaged, and that incentives are considered to adopt on-farm surveillance and reporting systems.

RESPONSE

Australia responds to exotic pest incursions through a partnership approach between the Australian Government, states and territories and the affected industries, with each group having a significant role to play. The arrangements for responding to an exotic pest incursion in the states and territories and on land administered by the Department of Defence are well documented, however the responsibilities and arrangements within the government for dealing with pest incursions in Commonwealth National Parks and External Territories need clarification, and the arrangements for Quarantine Approved Premises, wharves and airports need better documentation. The Memorandum of Understanding (MoU) with Defence for responses on land managed by the Department of the Defence is due for review and needs to cover arrangements for pests other than disease vectors.

When an emergency plant pest is detected and notified to the department, a Consultative Committee on Emergency Plant Pests (CCEPP) is convened in accordance with the EPPRD, which is chaired by the Australian Chief Plant Protection Officer and includes representation from all of the states, territories and the relevant industry(ies). A similar process is followed for pests that predominantly impact on the environment under the NEBRA, with the exception that industry is not a contributor.

The initial response is undertaken by the affected jurisdiction(s), and the consultative committee then makes recommendations to the National Management Group concerning further action, such as eradication, containment or no action. Cost sharing arrangements as outlined in the EPPRD or the NEBRA are also agreed.

The consultative committee draws on information from a number of sources in making its recommendations to the National Management Group, including;

- Industry Biosecurity Plans (if available)
- Contingency Plans (if available)
- Delimiting surveys
- Available scientific information concerning the plant pest, including pest risk assessments, and the potential impact of the pest on domestic production, the environment and exports (both domestic and international).

Contingency Plans

Some differing views on the usefulness of Contingency Plans have been received during the review. The existing plans demonstrate a high level of diversity in their structure and content, with some plans being extremely detailed, whilst others are more guidance documents. Over 100 Contingency Plans have been developed for exotic pests, primarily by industry through PHA for pests contained in Industry Biosecurity Plans, and this process is ongoing. In some cases there may be a number of plans developed by different groups for the same pest eg. Huanglongbing.

Feedback from industry consulted during this review on the value of Contingency Plans has been generally positive. Moreover, PHA was not aware of any major issues with the existing Contingency Plans, but recognised that improvements can always be made to any system. Nevertheless, there have been discussions at Plant Health Committee on their usefulness in an incursion response and the effort required to complete plans and maintain their currency for pests listed in Industry Biosecurity Plans, given that these pests may never be detected in Australia.

Most Contingency Plans are prepared by industry with assistance from PHA. PHA has prepared a document entitled “Technical Guidelines for the Development of Pest Specific Response Plans” to provide guidance on the development of Contingency Plans.

The preparation of Contingency Plans in collaboration with PHA appears to be working well, although the content of some plans could be improved. Key elements of a Contingency Plan relevant to a response include:

- information on the biology of the pest, including distribution,
- host range,
- potential pathways for establishment and spread,
- method of dispersal,
- impact,
- movement controls,
- surveillance and diagnostic methodology and
- control methods.

In some cases, Contingency Plans have included additional detail, for example details on the EPPRD and incident management structure, which may not be needed.

Surveillance and diagnostics methodologies are available from the development of national diagnostics protocols, and can be referenced in Contingency Plans.

Identifying methods of control, suitable quarantine measures and potential pathways can inform decisions regarding the availability of chemicals for treatment, appropriate quarantine zones and whether produce can be moved from the quarantine zones, and if so, under what conditions.

The current process produces Contingency Plans that are industry specific, although it is recognised that the same pest(s) may affect more than one industry, and the natural environment. Even though pests may affect more than one industry, the key elements of a Contingency Plan should be relevant to all affected industries. For example, the biology of the pest will be the same, as will the host range, the method of spread and control methods. There may be differences in areas such as symptom expression and the extent of the damage, however most of the key issues relevant to managing a response should be covered.

Contingency Plans are a very useful instrument in pre-determining a number of issues relevant to a response, such as the biology of the pest, potential containment practices and quarantine zones, whether product can be moved safely from the affected area, and a number of other factors. However Contingency Plans need to be up to date so that they can provide a useful resource in the event of an exotic pest incursion.

It has been suggested that Contingency Plans could be streamlined by adopting a modular approach and creating Contingency Plans for groups of pests with similar characteristics. This is an area that should be explored further, as the resources to prepare pest specific Contingency Plans for the large number of pests which might enter Australia are enormous.

When a pest incursion is detected, the combat jurisdiction(s) is responsible for managing the response. For Contingency Plans to be of maximum benefit, they should be nationally endorsed. It is therefore important that jurisdictions and other relevant industry parties have an opportunity to review and endorse Contingency Plans.

The number of Contingency Plans being generated is significant and a process of Plant Health Committee review and endorsement for those currently existing could be quite onerous. It would be preferable to concentrate on those Contingency Plans prepared for national priority plant pests.

It is an option to have pest specific Contingency Plans developed and endorsed for the national exotic priority pests. Where plans are already in existence, it may be necessary to review their content to ensure that they cover all of the relevant areas appropriately.

The remaining pests could have more generic, modular Contingency Plans developed. This approach would reduce the effort needed to develop pest specific Contingency Plans for high priority pests in Industry Biosecurity Plans.

There is continuing work being undertaken on managing incursions of pests that predominantly affect the environment. Whilst there are a large number of Contingency Plans for agricultural pests, there are few Contingency Plans prepared for pests that predominantly affect the environment and/or social amenity. More focus on producing Contingency Plans for these pests should be considered. As it is anticipated that a number of pests that predominantly affect the environment would be identified as national priority pests, some pest specific Contingency Plans could be developed in consultation with environmental groups. The approach of preparing more generic, modular plans would also be useful to consider.

Finding

Pest (or taxonomic group) specific Contingency Plans could be developed for the national priority pests covering all host crops across multiple industries and/or the environment (if not already available) and these could be nationally endorsed by relevant Parties, including Plant Health Committee. It is also an option to consider developing more generic Contingency Plans, for other pests.

Development of departmental personnel

In the event of an exotic plant pest outbreak being detected, the primary responsibility for managing the incident lies with the jurisdiction(s) where the outbreak is located, and jurisdictions have developed suitable capability to manage their responsibilities in most instances. Nevertheless, situations arise when resources in combat jurisdictions are stretched and assistance from other jurisdictions and the department is needed.

Under the SBQI, departmental officers have been deployed in the combat jurisdiction to assist in a number of emergency responses. Whilst deployment of officers has occurred in the past, there has been a significant increase in demand under the SBQI.

SBQIallows the rapid deployment of additional personnel to combat jurisdictions in the early stages of a response, to assist the combat jurisdiction to deal quickly with essential elements of an incident. This initiative is valuable for the combat jurisdiction as it provides additional resources and for the department, as it provides practical experience in responding to an incident for the officers who are deployed.

Training of departmental officers in the various roles that they may be asked to undertake is being considered by the department, however it is important to define what roles are appropriate for departmental officers. The needs of the combat jurisdiction in any one emergency response may differ between incidents and between jurisdictions. For example, feedback from some jurisdictions indicate that the best role for the department is in preparing documentation such as response plans and in providing leadership in brokering agreement between the jurisdictions, rather than providing personnel to assist in field activities. Another jurisdiction reported that it is already well equipped to deal with most emergencies, has on-line training available and an emergency response training unit. Under the SBQI the department will only deploy resources following a request from a state or territory; as such the assistance may vary depending on the jurisdiction and the situation.

There are activities in the Local Control Centre and State Coordination Centre where departmental officers can perform significant roles, such as providing technical expertise and in preparing documentation and planning. Roles in the field such as conducting delimiting surveillance or regulatory work are less clear, as there can be work health and safety and legal issues associated with this type of work.

The appropriate roles, therefore, for departmental officers who are deployed in emergency responses need to be determined in consultation with the jurisdictions, as well as such issues as the length of deployment. Once these

roles have been agreed, a training program can be identified. Training could consist of on-line training, face to face training and Local Control /State Coordination Centre simulations, in order to give people better understanding of the various interactions between roles in an incident response. As the jurisdictions already have training programs available for their staff, it may be appropriate to utilise these existing programs for the training of departmental officers.

It has been estimated that people who have not had direct experience in managing a pest incursion may take up to a fortnight to become familiar with their particular job and how it interacts with other key roles. Many participants are only available for a short period of time, sometimes less than 2 weeks. This can cause delays in responding quickly and accurately to an emergency pest incursion. In the recent CGMMV response in the Northern Territory, some officers were only available for a few days, causing some issues with continuity. Minimum deployment time commitments need to be considered to ensure officers have sufficient time to effectively contribute to the incident response.

Finding

Consider developing a policy that defines the roles of departmental officers deployed in the jurisdictions in an emergency response, in consultation with state and territory governments, to assist in deployment and support development of a tailored training program, drawing on the training material existing nationally and in the state and territory governments.

A register of suitably qualified and trained personnel should be maintained for the above identified roles, including suitable contractors. Minimum deployment times should be considered.

Responses on land under Commonwealth control

The Australian Government has responsibility for managing responses on Commonwealth land, including:

- the external territories (including Christmas, Ashmore, Cartier, Coral Sea, Cocos (Keeling), Heard and McDonald Islands and the Australian Antarctic Territory) and some national parks;
- the Jervis Bay Territory; and
- land that is owned or leased by the Commonwealth (including airports).

Additionally, the department works with operators of Quarantine Approved Premises and ports to manage responses.

External Territories, Jervis Bay Territory and National Parks

The Australian Government, through the Department of Infrastructure and Regional Development administers the Ashmore and Cartier Islands, Christmas Island, the Cocos (Keeling) Islands, the Coral Sea Islands, and the Jervis Bay Territory. This department also manages the Government's interests in the Australian Capital Territory, the Northern Territory and Norfolk Island.

The Australian Government Department of the Environment administers Heard and McDonald Islands and the Australian Antarctic Territory and six national parks; Norfolk Island, Pulu Keeling, Christmas Island, Uluru-Kata Tjuta, Kakadu, Booderee, with several jointly managed with their traditional owners.

Whilst the arrangements for managing pest incursions in the states/territories are well set out, the arrangements for managing pest incursions in Commonwealth External Territories and National Parks is not clear. It is also not clear which Australian Government agency should be responsible for managing pest incursions in these Commonwealth locations. As the Department of Infrastructure and Regional Development and the Department of the Environment have administrative responsibilities for these Commonwealth areas, it would be would be

logical for these departments, with advice from the department, to take the lead in managing any pest incursions in these locations.

The technical and operational expertise for managing plant pest incursions generally resides in the states/territories with the Australian Government, through the department, taking a national coordinating role. It would be sensible to utilise the existing expertise in the state/territory when pest incursions are located in Commonwealth locations, however such arrangements would need to be negotiated and formalised, through a MoU or equivalent. The department could take a leading role in these roles and responsibilities, as it has extensive experience in coordinating pest incursion responses.

Other Areas

The processes in place for responding to pest detections on Quarantine Approved Premises (QAPs) which are premises registered by the department in accordance with the *Quarantine Act 1908*, and first ports such as airports and wharves appear to be working satisfactorily.

Where an exotic pest is detected, the owners of a QAP have a responsibility to contact the department, who assesses the risk. The OSS program undertakes the identification of the pest, while decisions on how the detection is to be managed are made by central office policy areas. The department has the authority to issue directions to the owner of the affected premises for the control of the pest.

Where an exotic pest is detected outside of the boundaries of a QAP, the department does not have authority to direct the QAP premises owner to control the pest. In these cases, the responsibility for management of the pest rests with the state or territory, and can be handled through the national emergency response arrangements.

Although the roles and responsibilities for managing exotic pests in these areas appear to be well understood, they are not well documented. It would be useful to prepare documentation which clearly sets out the roles and responsibilities for the affected parties and procedures and policies to fulfil its normal commitment under the EPPRD, NEBRA for land under its remit (e.g. ports, airports).

Regarding Defence land, there is a MoU between the department and the Department of Defence that describes the roles and responsibilities for the application of biosecurity requirements for Defence property and personnel entering Australia. The MoU specifically mentions managing detections of disease vectors, but does not include other exotic pests.

The department and the Department of Defence plan to review the MoU following the implementation of the new *Biosecurity Act 2015*. It would be beneficial to document the roles and responsibilities for responding to exotic pests other than disease vectors in this review.

Finding

Roles, responsibilities and resourcing of responses to pest incidents on land under Commonwealth control should be agreed with the relevant Australian Government agencies and/or between relevant program areas within the department, and suitable arrangements for responding to pest incursions should be agreed and formalised.

Pests with an impact on the environment and/or social amenity

Pests that predominantly impact on the environment and/or social amenity are managed in accordance with the NEBRA where there are no pre-existing arrangements in place (i.e. the EPPRD or EADRA). This may include weeds, which are excluded from both the EADRA and the EPPRD, and which predominantly impact on the environment.

The Exotic Weed Incursions Agreement Taskforce has been established as a short-term taskforce under the National Biosecurity Committee. The objective of the Taskforce is provide advice to the National Biosecurity Committee on a potential deed-like response agreement and funding mechanism for responding to exotic production weed incursions not covered by current emergency response agreements. The Taskforce will consider whether or not the arrangement can be included in existing emergency response agreements, in particular the EPPRD.

ABARES is also assessing likely production weed candidates that could be considered under a new agreement.

The arrangements for considering a response to an incursion of pests of environmental significance appear to be in hand. At present there are, however, limited Contingency Plans prepared specifically for pests that impact on the environment and/or social amenity, although there may be some overlap with Contingency Plans prepared for agricultural pests.

Finding

The preparation of Contingency Plans for significant pests that impact on the environment and/or social amenity would be of great benefit and should be pursued. This issue has been further discussed in the section of the report dealing with Contingency Plans.

Senate Inquiry

On 26 June 2014, the Senate referred the following matter and report to the Senate Standing Committees on Environment and Communications.

"The adequacy of arrangements to prevent the entry and establishment of invasive species likely to harm Australia's natural environment."

The References Committee tabled its report on 13 May 2015, and made a number of recommendations, including recommendations to:

- improve environmental biosecurity outcomes under NAQS
- develop a national priority list of pests and diseases not yet established in Australia of environmental biosecurity concern
- improve cargo surveillance measures for the detection of invasive species, and of tramp ants in particular
- revise NEBRA to remove the requirement for unanimous agreement and to include the precautionary principle and transition to management.

The Senate also recommended that the Inspector-General of Biosecurity conduct a review of how effectively high-risk environmental biosecurity concerns are addressed, with a particular focus on identifying gaps in pathway and risk analyses and on improving information gathering and sharing between states/territories.

The Senate enquiry highlighted the need for the development of a national priority list of exotic pests of environmental concern, which can be included in the pest prioritisation work currently underway in the department. Independently, the department has also identified the need to improve border surveillance for all exotic pests and is planning to expand its border surveillance resourcing.

At the time of writing the government had not issued a response to the report.

Pest Detections in Northern Australia

Through the White Papers on Agricultural Competitiveness and Developing Northern Australia, the government announced that additional resources will be applied in northern Australia to ensure regional biosecurity risks are appropriately managed. This commitment recognises that northern Australia's proximity to other countries means that pest incursions can occur through natural processes as well as trade and the movement of people.

The department's NAQS program undertakes extensive surveillance activities in northern Australia, including Torres Strait, in order to identify pest threats which may have moved from our near neighbours or from other areas into Australia. Exotic pest detections are reported to the relevant state/territory and internally within the department. The responsibility for formal notification of an exotic plant pest in accordance with the EPPRD or NEBRA lies with the relevant state/territory, and must be reported within 24 hours of the jurisdiction becoming aware of the incident. Once reported, the normal response arrangements for dealing with a pest incursion should apply.

Some difficulties in responding to a pest incursion in northern Australia have been reported, including the sensitivities associated with responding to a pest incursion in indigenous areas, the logistics of mounting a response in remote areas and the associated high costs involved.

For example, *Liriomyza sativae* was initially detected in Torres Strait in 2008, and the incident was considered by the CCEPP several times, before deciding in 2014 that it was not technically feasible to eradicate in Torres Strait. Subsequently, *L. sativae* was detected on the mainland, and while a formal decision on eradicability has not been made, a workshop has convened to consider options for managing this pest into the future.

Although this pest was detected in 2008, the processes used to reach a decision on responding to this pest appear to be following the established procedures. Nevertheless, the time taken to reach a conclusion regarding appropriate action for this pest appears to be excessive.

Pests detected in the far north of Australia pose a number of difficulties when considering eradication, however, as recognised in the Developing Northern Australia White Paper, their presence provides a source of pests that can migrate to other parts of Australia. Where it is considered not feasible to eradicate detected pests in these areas, the potential for movement of these pests to other parts of Australia where they might affect agricultural crops and the environment needs to be considered.

The White Paper on Developing Northern Australia recognises the significant contribution that NAQS plays in safeguarding Australia from exotic pest incursions. The government is committed to building on the success of NAQS to reduce the risk of new pest incursions establishing in the north, with the potential to move into other vulnerable parts of Australia. The government has announced funding of $12.4m to expand surveillance and compliance activities for Indigenous Ranger groups.

Finding

The use of NAQS personnel in monitoring the spread of pests is a valuable resource, and the use of NAQS in conjunction with the relevant state/territory to conduct suppression of targeted pests as an initial response should be considered.

Enhanced surveillance activity in northern Australia through the White Paper will provide improved detection rates, however key decisions regarding eradication, suppression and management of detected pests will still need to be made and adequately resourced.

CONCLUSION

Australia has a world class biosecurity system, including arrangements for preparing for and managing plant pest incursions. Australia's approach recognises that a partnership between the Australian and state and territory governments and industry is necessary to achieve good biosecurity outcomes.

This report identifies some areas where improvements to the present system could be made, which are grouped under the general headings of Prevention, Early Detection and Response. The department has already commenced a number of projects which should address many of these identified areas for improvement. For other identified areas for improvement, some options to address the need are presented.

Early detection of exotic pests is very important in being able to respond effectively to pest incursions, and robust surveillance and diagnostic capability plays a key role in this area.

On-farm surveillance by industry is becoming better established with many industry programs available to growers, mainly in the grains area. Some industries have partnered with relevant state/territory government in undertaking surveillance, which is a good model, given that the states and territories and industry are both conducting surveillance, and industry can benefit from the level of expertise available in government.

Much of the present industry surveillance is targeted at meeting export requirements, both inter-state and international. More focus on surveillance for exotic pests which do not have a particular export requirement but are nevertheless important because of their potential impact should be encouraged. The gathering of surveillance data from all sources so that it is available nationally is also needed, and some systems are under development to achieve this end.

The government has released two White Papers this year, both of which commit more funding to surveillance, both for protection of Australia from exotic pests and to support our agricultural exports. This level of financial support should ensure that surveillance and related diagnostic capability are significantly improved.

ATTACHMENT A: CONSULTATION

- Australian Government Department of Agriculture and Water Resources
  - NAQS
  - Plant Import Operations Branch
  - Operational Science Support
  - Plant Health Policy Branch
  - Biosecurity Policy and Implementation Division (Preparedness program)
  - Animal Biosecurity
  - Plant Biosecurity
  - Biosecurity Emergency Management Working Group
  - Compliance Division
- NSW Department of Primary Industries
- Queensland Department of Agriculture and Fisheries
- Department of Agriculture and Food, WA
- Department of Primary Industries, Parks, Water and Environment, TAS
- Plant Health Australia
- Horticulture Innovation Australia
- Nursery and Garden Industry Association
- AUSVEG
- Grains Industry Market Access Forum
- Citrus Australia
- Australian Oilseeds Federation
- Invasive Species Council
- Australian Melon Association

ATTACHMENT B: SOME SOURCES OF TECHNICAL INFORMATION THE DEPARTMENT USES.

Online resources

(with hyperlinked thumbnails and related links – Ctrl + click to follow)

Standards, RPPOs and NPPOs

World Trade Organization Sanitary and Phytosanitary Agreement (SPS Agreement)
Description: Official site for the World Trade Organization.

International Plant Protection Convention - IPPC
Description: The IPPC is an international treaty to secure action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control. It is governed by the Commission on Phytosanitary Measures (CPM) which adopts International Standards for Phytosanitary Measures (ISPMs).
Related link: All adopted ISPMs

Asia and Pacific Plant Protection Commission (APPPC)
Description: The APPPC is the RPPO for the Asia and Pacific region. A Regional Plant Protection Organization (RPPO) is an inter-governmental organization functioning as a coordinating body for National Plant Protection Organizations (NPPO) on a regional level. Not all contracting parties to the IPPC are members of RPPOs, nor are all members of RPPOs contracting parties.
Related links: Regional Standards for Phytosanitary Measures (RSPM)

Pacific Plant Protection Organization (PPPO)
Description: All Members of the Pacific Community are Members of the Pacific Plant Protection Organisation. The Pacific Community consists of twenty seven (27) members including twenty two (22) Pacific Island Countries and Territories (PICTS) and 5 founding members. Founding members include Australia.

SPC-Plant Protection Service (PPS)
Description: The Secretariat of the Pacific Community-Plant Protection Service (PPS). PPS collaborates with countries and territories in the Pacific region to reduce the impact of pests, diseases and weeds in agriculture, forestry and the environment and focuses on Prevention, Preparedness and Pest management.

Department of Agriculture Fisheries and Forestry
DAFF roles include managing national biosecurity controls to minimise the risk of exotic pests and diseases entering the country. The department also provides import and export inspection and certification to facilitate exports.
Related links: DAFF Biosecurity ; Import risk analyses and policy and scientific reviews

Ministry for Primary Industries New Zealand
Description: MPI is charged with leadership of the New Zealand's biosecurity system.
Related links: Import standards ; Risk analyses

USDA (APHIS)
Description: U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS).
Related links: PPQ manuals ; News room ; US regulation online (incl. risk analyses) ; National agriculture library digital collection

North American Plant Protection Organization (NAPPO)
Description: The NAPPO is the RPPO for North America.
Related link: NAPPO standards ; NAPPO alerts

European and Mediterranean Plant Protection Organization (EPPO)
Description: The EPPO is the regional plant protection organization (RPPO) for Europe.
Related link: EPPO plant quarantine (with A1 and A2 lists) ; EPPO plant protection thesaurus

Search (general)

Google
Description: General searching tool.
Related link: Google scholar

	The Pacific Islands Pest List Database **Description**: The Pacific Islands Pest List Database (PLD) stores records of pests that are currently known to affect agriculture, forestry and the environment in Pacific Island countries and territories (PICTs).
	HighWire (Stanford University) **Description**: HighWire Press partners with independent scholarly publishers, societies, associations, and university presses to facilitate the digital dissemination of 1403 journals, reference works, books, and proceedings.
	USDA National Agricultural Library **Description**: The National Agricultural Library is one of four national libraries of the US. It houses one of the world's largest and most accessible agricultural information collections and serves as a national network of state land-grant and U.S. Department of Agriculture field libraries.
	ID Source **Description**: ID Source is a collection of over 1,500 identification-themed websites that cover plant pests, diseases, and weeds, a set of links to these "ID Aids" and a powerful search tool.
	Plant Management Network **Description**: The Plant Management Network offers a searchable database comprised of thousands of web-based resource pages from the network's partner universities, companies, and associations. **Related link**: Cross journal search
	Global Biodiversity Information Facility (GBIF) **Description**: GBIF was established by governments in 2001 to encourage free and open access to biodiversity data, via the Internet.
	The Directory of Open Access Journals **Description**: The Directory of Open Access Journals covers free, full text, quality controlled scientific and scholarly journals from a broad range of subject areas.
	E-journals **Description**: E-journals provide links to journals, including those concerning plant biology.
	Pests and Diseases Image Library (PaDIL) **Description**: The PaDIL database contains notes and high quality images showing primarily exotic targeted organisms of plant health concern to Australia.
	Crop Protection Compendium (CABI) **Description**: Includes information on pests, diseases and weeds and their natural enemies, the crops that are their hosts, and the countries in which they occur.
	Invasive Species Compendium (CABI) **Description**: The invasive species compendium provides information on invasive species. It contains datasheets on over 1500 species, and basic data on countries, habitat and pathways. It also has a bibliographic database of over 60,000 records and a library of full text articles.
	Plantwise (CABI) **Description**: Plantwise provides global pest data. It includes information on pest distribution, pest management, and country specific pest records.
	PestNet **Description**: PestNet is an email network that helps people worldwide access rapid advice and information on crop protection, including the identification and management of plant pests. It started as a service for the Pacific, rapidly expanded to South East Asia, set up a separate service for the Caribbean, and now welcomes anyone interested in crop protection anywhere in the world. It's free to members.
Taxonomy / Nomenclature	
	International Association for Plant Taxonomy (IAPT) **Description**: IAPT is dedicated to biodiversity and the extent, recognition, organisation, evolution, and naming of plants and fungi, both living and fossil. **Related link**: ICBN - International code of botanical nomenclature

	Plant Taxonomy (GRIN) db **Description**: GRIN taxonomic data provide the structure and nomenclature for accessions of the National Plant Germplasm System (NPGS) of the USDA's Agricultural Research Service (ARS). Families and genera of vascular plants and over 40,000 species from throughout the world are represented, especially economic plants and their relatives. Information on scientific and common names, classification, distribution, references, and economic impacts are provided. **Related link**: Search
	International Plant Names Index (IPNI) db **Description**: The International Plant Names Index (IPNI) is a database of the names and associated basic bibliographical details of seed plants, ferns and fern allies. Its goal is to eliminate the need for repeated reference to primary sources for basic bibliographic information about plant names. The data are freely available and are gradually being standardized and checked.
	International Commission on Zoological Nomenclature (ICZN) **Description: ICZN was founded in 1895. Its task is to create, publish and, periodically, to revise the International Code of Zoological Nomenclature. The Commission also considers and rules on specific cases of nomenclatural uncertainty. These rulings are published as 'Opinions' in the Bulletin of Zoological Nomenclature.** **Related link**: International code of zoological nomenclature ; Bulletin of zoological nomenclature
	International Committee on Taxonomy of Viruses (ICTV) **Description: Categorizing known viruses into a single classification scheme that reflects their evolutionary relationships, i.e. their individual phylogenies. The ICTV provides the standard and definitive reference for virus taxonomy.** **Related link**: Virus taxonomy - 2012
	**Prokaryotic Names with Standing in Nomenclature (LPNS)** **Description: There is no official classification of prokaryotes, but the names given to prokaryotes are regulated. The International Code of Nomenclature of Bacteria (Bacteriological Code) contains considerations, principles, rules and recommendations which govern the way in which prokaryotes are named.** **Related link**: Taxonomic Outline of Bacteria and Archaea
	MycoBank (fungi) db **Description**: Database in which all newly described fungi and new names of fungi can be deposited and stored along with key nomenclatural and descriptive material. Each name is given a unique reference number, and several leading mycological journals (e.g. Fungal Diversity, Mycological Research, Mycotaxon, Studies in Mycology), have made the prior deposition of new names in MycoBank a requirement for publication.

Invertebrates	
	Australian National Insect Collection Database (ANIC) Description: The ANIC database currently contains more than 380 000 specimens from over 40 000 sites across Australia and nearby regions. The available data is a reflection of various projects that required specimen data entry, therefore some groups are well represented and others not at all - although there may be specimens in the physical collection.
	Fauna of New Zealand **Description**: Fauna of New Zealand is a series on the terrestrial invertebrates of NZ. Each of which contain a checklist of the taxa, and introduction to the group, descriptions of the taxa, and illustrations. **Related link**: Fauna of New Zealand online (pdfs)
	Natural History Museum (UK) **Description**: The museum facilitates a range of research projects, including botany, zoology and entomology related projects. **Related link**: Research projects
	Featured Creatures (USA) **Description**: The site provides general information on insects, nematodes, arachnids and other organisms that are of interest to Florida.
	Knowledge Master (USA) **Description**: This site provides general information on Hawaiian pests, hosts, distribution, damage, biology, and management.
	Acari
	**Spider Mites (Tetranychidae - Global)** **Description**: This site has information about on spider mites (Acari: Tetranychidae). This family of mites comprises 1,250 phytophagous species.
	**Invasive Mite Identification: Tools for quarantine and plant protection** **Description**: This site has information (keys and other tools) on spider mites.
	**Acarologia** **Description**: Acarologia is a peer-reviewed open access journal devoted to the biology of the Acari.
	Coleoptera
	**Wood Boring Beetles of the World** **Description**: Wood Boring Beetles of the World is Phase I of a multi-phase initiative to provide an accurate identification resource for wood boring beetles.

	Diptera
	**Pacific Fruit fly web** **Description**: The Pacific regional fruit fly project promotes the technical capacity of the Pacific Island countries and territories PICTs to manage fruit flies
	**Diptera Site (Global)** **Description**: The Diptera site has general information about the world's flies.
	**Diptera (Australasia / Oceania)** **Description**: Originally published 1989 by Bishop Museum Press and E.J. Brill, this catalogue of 1,155 pp. recorded approximately 16,000 species of flies occurring in Australia, New Zealand, New Guinea, and the Pacific. Since then, there have been a number of publications that have made it necessary to publish an updated version of the catalogue.
	**National History Museum Agromyzidae db (Global)** **Description**: This project provides information on and tools for the identification of miner flies of economic importance (Diptera: Agromyzidae). **Related link**: Species ; Hosts
	Hemiptera
	**Coccoidea - Scalenet db (Global)** **Description**: This site provides comprehensive information on the scale insects of the world, including information on their classification, nomenclatural history, distribution, hosts, and literature. **Related link**: Search index
	**USDA Coccoidea - Scale Lucid Key** **Description**: This site is a Lucid key used to identify scale insects of quarantine concern to the USA. It provides information on scale families, mealybugs, soft and other scales.
	**National History Museum Diaspididae db (Global)** **Description**: The site provides an identification guide and information source on economically important diaspidids (armoured scales) of the world. **Related link**: Species ; Hosts
	Hymenoptera
	**CSIRO Ant db (Australia)** **Description**: The database provides an overview of Australian ant fauna. It includes information on all genera and many of the species known to occur on mainland Australia, Tasmania and nearby islands.
	**Landcare Research Ant db (NZ/Global)** **Description**: The ant distribution database contains records of the distribution and collection records for all ant species in New Zealand (native and exotic).
	**USDA Ant db - USDA FORMIS (Global)** **Description**: FORMIS is a composite of several ant literature databases. It contains citations for a large fraction of the world's ant literature (about 38,000 references). FORMIS contains ant taxonomic literature (through to 1996).
	Lepidoptera
	**National History Museum Butterflies / moths db (Global)** **Description**: This site provides a comprehensive interactive catalogue of all the published genus-group names of Lepidoptera from Linnaeus, 1758, up to the present. Full-colour images of representatives of most included families are provided. **Related link**: Search
	**National History Museum Lepidopteran Host Plants db (Global)** **Description**: This site has information on the world's butterfly and moth (Lepidoptera) caterpillar hosts. It offers a synoptic data set drawn from about 180,000 records comprising taxonomically 'cleaned' host plant data for about 22,000 Lepidoptera species drawn from about 1600 published and manuscript sources.

	Related link: Search
	National History Museum Global Lepidoptera Names Index db **Description**: The global Lepidoptera names index provides a useful resource for finding the correct name of Lepidopteran species.
	National History Museum Tortricidae Leafrollers (Eurasian) db **Description**: This site provides illustrated descriptions of 189 Eurasian tortricid pest species, brief descriptions of the immature stages, information on their life-histories, host plants, distribution, parasitoids and attractantia, and diagnostic characters for 62 related non-pest species. It also contains an interactive, illustrated key to both males and females of the 190 most frequently encountered species. **Related link**: Species ; Host
	Tortricids of Agricultural Importance (US website) **Description**: The family Tortricidae contains approximately 9,800 species, many of which are considered serious pests. Here you will find comprehensive resources used for identifying adults and larvae of tortricids that threaten agriculture in the US.
	Thysanoptera
	CSIRO Thysanoptera Checklist (Global) **Description**: This world list includes about 7400 species-group and 1200 genus-group names, together with their authors and dates of publication; among these are many names placed into synonymy. Included with each generic name is the type-species, and for each species the original genus is given as well as the original country from which it was collected. **Related link**: Search
	CSIRO World Thysanoptera **Description**: This website contains a number of useful resources on the order Thysanoptera, thrips. This includes information on classification, identification, distrubution lists, glossary and references.
	Nematoda
	Nematology Research (Japan) **Description**: Nematology Research, formerly the Japanese Journal of Nematology. It contains full papers, reviews and short communications on all aspects pf nematology. **Related link**: Back contents
	Nebraska University (USA/Global) **Description**: This is a general site containing information on nematology.
	Nemaplex **Description**: Nemaplex is a virtual encyclopaedia on soil and plant nematodes. Nemaplex was developed and is maintained by the Department of Nematology, University of California Davis, California.
Pathology	
	Australasian Plant Pathology **Description**: The Australasian Plant Pathology Society is dedicated to the advancement and dissemination of knowledge of plant pathology and its practice.
	American Phytopathological Society **Description**: The American Phytopathological Society is an international scientific organization devoted to the study of plant diseases and their control. APS advances modern concepts in plant health management in agricultural, urban and forest settings.
	British Mycological Society **Description**: The British Mycological Society was founded in 1896 and has some 1400 members from many countries around the world, reflecting its international status. Its sole objective is to promote mycology in all its aspects.

	Canadian Phytopathological Society **Description**: The American Phytopathological Society is an international scientific organization devoted to the study of plant diseases and their control. APS advances modern concepts in plant health management in agricultural, urban and forest settings.
	Journal of Bacteriology **Description**: The journal provides fundamental knowledge of bacteria and other microorganisms.
	Index Fungorum db **Description**: World database of fungal names that contains names of fungi (including yeasts, lichens, chromistan fungi, protozoan fungi and fossil forms) at species level and below. Index Fungorum aims to provide a complete list of fungal names.
	USDA Systematic Mycology and Microbiology Laboratory db **Description**: Systematic Mycology and Microbiology Laboratory studies the systematics of fungi important as biological control agents and plant pathogens. **Related link**: Search
	Studies in Mycology **Description**: The CBS taxonomy series "Studies in Mycology" is an international journal which publishes systematic monographs of filamentous fungi and yeasts, and at occasions the proceedings of special meetings related to all fields of mycology, biotechnology, ecology, molecular biology, pathology and systematics. **Related link**: Search
	Mycologia **Description**: Mycologia publishes papers on all aspects of the fungi, including lichens. Subjects appropriate to the journal are physiology and biochemistry, ecology, pathology, development and morphology, systematics, cell biology and ultrastructure, genetics, molecular biology, evolution, applied aspects, and new techniques. **Related link**: Search
	Phytophthora db **Description**: This database provides a catalogue of genotypic and phenotypic information on known isolates of *Phytophthora* spp as a baseline for identification, classification, and risk assessment of new isolates.
	National Centre for Biotechnology Information National Centre for Biotechnology Information **Description**: This site is the US national resource database for molecular biology information. Access to many public databases and other references.
	Journal of General Virology **Description**: The JGV has a diverse scope. This includes topics on all aspects of animal, plant, insect, bacterial and fungal viruses, transmissible spongiform encephalopathies, molecular biology and immunology, virus–host interactions and antiviral compounds.
	Botanical
	Australian National Botanic Gardens **Description**: The ANBG provides details of Australian plants, botany and horticulture. **Related link**: Centre for Australian biodiversity research
	Kew Botanic Gardens (UK) **Description**: The Royal Botanic Gardens, Kew collections forms an encyclopaedia of knowledge about the plant kingdom. **Related link**: Library ; Seed database ; Research
	USDA Plants db **Description**: The PLANTS database provides standardized information about the vascular plants, mosses, liverworts, hornworts, and lichens of the U.S. and its territories. **Related link**: Advanced search