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Quarantine and Biosecurity Review Secretariat  
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Dear Secretariat

The Cooperative Research Centre for National Plant Biosecurity Ltd (CRCNPB) was established in 2005 in recognition of the need to strengthen the plant biosecurity, and quarantine, scientific capacity of Australia. The CRCNPB plays a coordination and management role in enhancing the scientific effort to enable Australia's plant industries to pre-empt and, therefore, diminish the economic, social and environmental impact of exotic plant pests. The activities of CRCNPB cover the full biosecurity continuum, pre-border, border and post- border.

The mission of CRCNPB is *'to foster scientific collaboration and engage stakeholders to deliver plant biosecurity technologies that will reduce risk to, and ensure sustainability of, Australia's plant industries'*.

The research activities of CRCNPB are assisting and will continue to assist in addressing many of the issues identified in the Quarantine and Biosecurity Review, Issues Paper. The strategic focus of the CRCNPB activities was developed after an opportunity analysis of the critical gaps in Australia's plant biosecurity system. The analysis found there are critical areas of research required across the full continuum of plant biosecurity. In addition, improving Australia's future capacity to manage risk and response to threats will best be achieved by enhancing the quality and quantity of education and training available to government, industry, undergraduate and postgraduate students.

CRCNPB's strategic plan is arranged into seven programs that reflect this strategic analysis. The focus of each program combines the needs identified by plant industries with the scientific areas that the CRCNPB has the greatest capability, or potential to add value to Australia's biosecurity system. CRCNPB continues to analyse the critical gaps in Australia's plant biosecurity capacity to ensure that it is focused on the most appropriate priorities. An overview of each of the research programs is provided in Attachment 1.

The four general responses outlined in this CRCNPB submission to the Quarantine and Biosecurity Review are:

1. The need for detailed independent review of all current quarantine and biosecurity systems to enable identification of pathway risks and returns (risk profiling) and to evaluate current performance.
2. The collection of quality data at the various border points that can be used in an independent evaluation of the current quarantine and biosecurity system. This data will also help address the Australian International Plant Protection Convention (IPPC) obligations.
3. The need to identify the real beneficiaries of border controls and to ensure the system is not based solely on full cost recovery from the user

4. In order for Australia to provide a quarantine and biosecurity system that can maintain its Appropriate Level of Protection (ALOP) there is a need for continuing research to deliver;
  - a) appropriate risk analysis and evaluation,
  - b) more cost effective, accurate and timely diagnostics,
  - c) more cost effective and accurate surveillance, and
  - d) improved response.

This response to the review provided below addresses a number of the specific issues for consideration identified in Part C of the Issues Paper.

## **RISK ACROSS THE QUARANTINE AND BIOSECURITY CONTINUUM**

### ***Q. Are Australia's quarantine and biosecurity systems appropriate to maintain its ALOP (very low risk, but not zero)?***

To fully address this question, an increased capacity in risk profiling is required. Risk profiling can only be achieved if appropriate data is collected and made available to those with the capacity to analyse. It is likely that the significant effort being directed at ensuring that pathways such as passengers transiting airports are monitored in high proportions, should be directed at other less visible pathways, such as post entry quarantine (PEQ), that can pose much greater threats for the introduction of pests.

There are a number of areas in Australia's current quarantine and biosecurity system where improvement is required. A summary of these areas is provided below.

Currently PEQ is a high-risk pathway that provides the conduit for propagatable plant material into Australia. The current system relies heavily on private facilities and on visual inspection of material. It is felt by many researchers that this pathway provides a much greater risk of introducing plant pests into Australia than passengers entering the country. Following the detection of wheat streak mosaic virus in Australia (a PEQ breach) a large review was undertaken by Radcliffe et al. (2003) to investigate, among other things, the current PEQ system in Australia. A working group (Standards Working Group [SWG]) was established under the Primary Industries Standing Committee (PISC) structure to address the issues raised by this review and a formal document was prepared and tabled. To date the recommendations to address the issues raised in the SWG response have not been adopted.

The current PEQ policy is heavily focused on cost recovery from users with only a small allocation called 'anti-smuggling' provided to the two Australian Government operated facilities to offset some of the cost. PEQ is a service provided to plant industries to enable new germplasm to be imported into the country. As such the total cost is the responsibility of the importer. There would appear to be very little consideration of the service that PEQ provides to the plant industries as a whole or the general community. It could be argued that even though the importer is the primary beneficiary of the importation of new germplasm (IP rights etc.), the total cost of processing the material through PEQ is unfairly burdened on the importer. The industry as a whole will benefit from the release of the new germplasm and the Australian community benefits from the prevention of entry of new pests and the availability of new germplasm.

The relative risk between imported plant commodities for consumption and propagatable material through PEQ needs greater communication to plant industries and the general community. For plant industries to remain competitive in their global markets there is a need for a regular flow of new germplasm. For this reason industries can see PEQ as a hurdle that is too long or costly, but the benefit obtained by preventing the importation of exotic plant pests is not well considered. On the other hand imported plant commodities represent competition to Australian plant industries even though the risk of entry for an exotic plant pest may be significantly less. The perception of risk is somewhat clouded by other issues. The current system invests significant resources in developing

and managing import risk analyses, while plant industries invest heavily in challenging the outcomes of the risk analysis. The investment in PEQ research and development is minimal. CRCNPB has recently commissioned a project to investigate new, more cost effective and accurate diagnostic methodologies for PEQ.

For some plant species a system known as 'open quarantine' exists where material can be sown in field situations to enable fast tracking of new germplasm into Australia. In 2003, a review commenced into the open quarantine policy for wheat, however the review has never been completed – despite wheat being Australia's largest plant industry and the significant impact if incursions of certain exotic pests occurred. The current policy has enabled large volumes of new germplasm to enter Australia with minimal quarantine and for the grains industry this is inconsistent with the ALOP. The SWG stated that, based on the evidence, the current arrangements for open field quarantine did not provide significant protection against quarantine pests. Radcliffe et al. (2003) stated that open quarantine for cereals should not continue to occur.

Another area that highlights the need for greater capacity in risk profiling is containers. The volume of container trade in Australia is increasing rapidly particularly as a result of the expansions in mining which in turn, has increased the cost of bulk ship storage. Internal inspection of containers entering Australia is minimal with the importer taking responsibility for ensuring the container is clean and providing declarations. The risk of entry of exotic plant pests is high, as demonstrated by the detection of possibly exotic fungal spores in a dirty container after delivery to a large grain company in Australia and the detection of Khapra beetle in Western Australia in 2007. The source of containers (countries where the container has landed prior to Australia) and their recent history (goods transported) is not tracked and is not included in determining the need for close inspection or cleaning. This enables non-target commodities to be imported into Australia in dirty containers that may have contained quarantinable material in previous shipments. It is accepted that inspection of every container is not feasible, however, further analysis is required to identify means by which the origin of containers can be traced and the risk posed by entry of containers can be appropriately determined. CRCNPB is investigating the potential to use chemometrics as a proactive surveillance tool that can increase the level of internal surveillance of containers.

The quarantine and biosecurity system can only be evaluated if quality data is collected and made available for analysis. Very little data is collected to enable an evaluation of the current quarantine and biosecurity system in Australia. In the past, AQIS collected data on any pest identified in imported material and this was recorded in a database known as Pest and Disease Interceptions (PDI). From 1993-2003 approximately 140,000 entries were made to PDI. This data was collected until July 2003 and operational scientists employed by AQIS attempted to identify all detections to species level. This policy has now changed with very few detections being identified to species level, which is necessary if effective evaluation is to be undertaken. Trading partners such as the USA, Japan and NZ routinely identify all detections to species level and provide this data to the public domain. No such data is provided by Australia. Without data, current effectiveness of Australia's quarantine and biosecurity system can not be evaluated. Data is also critical for effective risk assessment and to enable future research to enhance current methodologies. The data will also enable assessment of the effectiveness of IRAs and enable alterations to management of risks where necessary.

A recent change in responsibility provides an example of the data that should be collected and provides a snapshot of the performance of the current system. For a six month period in 2006-2007 several states were responsible for managing breaches of pests associated with imported material. One state recorded nearly one breach per day for the total period of their responsibility. The detections included several serious wood boring insects that have the potential to severely impact on plant industries and the general community. The responsibility was resumed by AQIS after this period. No other data is available outside of this six month period. Collection and reporting of such data is crucial if evaluation and improvement of the current system is to occur.

Once the data is collected, information management systems are required along with the tools to enable effective evaluation. CRCNPB has commenced activities to provide information management systems and evaluation tools. The recently approved ABIN will also provide the framework for the storage of this data.

***Q. Is ALOP understood and applied in a consistent way? Is it achieved in a way that is not more trade restrictive than required?***

Discussions with various groups would indicate that ALOP is poorly understood by many researchers (both in government and industry), by industry and by the general community. Consideration is needed as to whether or not plant industries and the general community confuse ALOP with other commercial considerations.

The question of whether Appropriate Level of Protection (ALOP) is understood and applied consistently is perhaps best considered from a communication perspective. The process of assigning the acceptability (or otherwise) of risk presents a fundamental communicative challenge to any organisation. It will need to attempt to balance the disconnect between quantitative measures that are used to calculate this measure (which are based on scientific research and therefore reasonably objective) and the inherent subjectivity that is afforded by the use of the term 'appropriate'. A greater research effort is required in risk communication to identify the methods by which the meaning of ALOP can be conveyed to the average 'punter'.

Is ALOP not more trade restrictive than required? CRCNPB believes that external review is the key to ensuring integrity of such measures, and so long as sound peer-reviewed scientific research is the basis for calculations of ALOP, then it is acceptable under international phytosanitary agreements. The caveat to this is that the calculation of ALOP must also itself hold up to the scrutiny of peer-review, and for this there needs to be both formal and transparent peer-review processes and the capacity (in terms of skills, training and resources) for individuals to engage in that process.

***Q. Are risk analyses, import policy determinations and permit conditions sufficiently updated through monitoring of actual experience in the application of risk management measures? Do the appropriate feedback loops exist and are they effective??***

***Q. Is there adequate auditing and verification of pre-border, border and post-border measures to ensure that policy determinations and permit conditions, including arrangements for co-regulation with industry, are in fact meeting the appropriate standard?***

***Q. How should the quarantine and biosecurity continuum (pre-border, border and post-border) be monitored to ensure that the system functions (to prevent and respond to pest and disease incursions)?***

Without the collection of relevant data (species intercepted at the border) it is not possible to effectively audit and verify the effectiveness of current measures. Data on species identification from detections should not be viewed as classified information that cannot be provided to the wider community. This data would enable researchers to improve current risk assessment methodologies and to identify possible improvements to quarantine and biosecurity processes. From a community engagement point of view, release of this data helps educate individuals on the risk they pose and the role they need to play in the quarantine and biosecurity continuum.

In collaboration with the Australian Centre of Excellence for Risk Analysis (ACERA), CRCNPB has commenced a project to assess the effectiveness of Australia's quarantine system. The success of the project will be determined by the quantity and quality of data that can be obtained for the research. Research organisations such as the CRCNPB and ACERA should be viewed as ideal vehicles that can undertake rigorous independent evaluation of current activities through the application of science. This research coupled with internal audit should be implemented to ensure the necessary feed-back loops exist to improve the current quarantine and biosecurity system.

Australia has obligations under SPS to demonstrate that pests are being detected at the border so that current border controls can be justified. This can be achieved through identifying pests detected to species level, however, if no data is collected and made available it is questionable if current barriers could be justified. As stated above, the undertaking of independent scientific evaluation and internal audit should be viewed as mandatory to ensure Australia is meeting its current obligations and can improve its current activities. There is no identifiable reason to treat interception data as confidential. A more transparent open policy on data availability would achieve significant benefits for Australia's current system.

As previously stated, from 1993-2003 a database called Pest and Disease Interceptions (PDI) was maintained and over the ten year period approximately 140,000 intercepted pests were identified, a large proportion to species level. While PDI was not made public it did represent a significant data set that could be used to justify quarantine barriers. Since 2003 there is no data available as PDI was made inactive. Comparatively few identifications are now made to species level.

***Q. Are the arrangements for sharing pest and disease information between the Commonwealth, the states and territories and industries working adequately?***

It is critical for information management databases to be established for effective pest information sharing to occur. As already stated it is also important to ensure that quality data collection is occurring. There is considerable scope for new investment in the area to ensure greater collaboration and coordination, both nationally and globally. Initiatives such as ABIN and the US Global Pest and Disease Database do provide some capacity but further analysis is required.

***Q. Are the arrangements for incursions with a principally environmental impact appropriate?***

Arrangements could be improved substantially with better analysis and better data. Very little research has been undertaken to assess the likely impact on the environment of many of the threats facing Australia. There is also very little resourcing available for research into this area. Much greater research efforts are also required in investigating the interface between commercial plant production, amenity planting and natural ecosystems. This information gap may be impacting on the ability to develop effective incursion arrangements. The International Plant Protection Convention also requires that environmental impact is considered in IRA's so there is a strong need to ensure appropriate arrangements are in place.

AusBIOSEC are currently addressing the interaction between the agriculture and environment sectors which should assist in improving the current incursion management arrangements.

***Q. Are the current roles and responsibilities of the Commonwealth and the states and territories well understood and operating effectively?***

Australia's biosecurity system is complex. The management of plant biosecurity in Australia by regulators and industry involves many levels of legislation, implemented through numerous regulatory bodies with oversight from various state and federal agencies. A lack of resources means that regulators and industry for the most part function in isolation from research in the field until, as is often the case, their paths cross at the point of an emergency pest incursion or market access issue. At that point, there is no time for regulators to explain the intricacies of biosecurity laws, nor for researchers to develop a quick-fix solution to the problem.

Scientists, on the other hand, are often accused of looking at the world through 'technical coloured glasses'. Research into plant biosecurity is wide-ranging and aims to address long-term broad scientific, agricultural and economic problems across a number of disciplinary and research environments. Technology 'solutions' to plant biosecurity problems, once produced, do not always meet the 'real world' requirements of regulatory bodies and industry that enable them to be put into

practice. There is a strong need for much greater interaction between the regulatory, research and industry sectors in developing quarantine and biosecurity research activities.

There is a clear need for better understanding of the different needs and roles of regulators, industry and researchers. CRCNPB is aiming to address this regulatory/research/industry interaction through workshops and other communication activities. The CRCNPB and the Australian Biosecurity CRC actively facilitate engagement between the researchers and the end-users (research users) which ensures that research outcomes are delivered and adopted and translate into new and improved policy and practice.

**Q. Are the different elements of legislative systems (both different Commonwealth legislation, and the state and territory statutes) operating in an effective and complementary manner?**

In addressing this issue close consideration needs to be given to the operational activities that may need tweaking to ensure legislation is working effectively. Legislative fixes can be viewed as simply 'bandaid' fixes while it is the operational activities that define how effectively legislation is working. There is a need for sociology research in this area to ensure that the implementation of the legislation is effective in providing the best outcomes from an industry, government and community perspective.

**Q. Are resources available to Australia's quarantine and biosecurity authorities deployed across the continuum to the areas of highest risk/return?**

Has a thorough review been undertaken as to what are the areas of highest risk/return? Has the balance between plants and animals been appropriately assessed? AQIS currently invests a large resource into its airport activities which are very visible to the general public, but is the risk posed by passengers as great as that posed by commercial produce/commodities entering as cargo or post entry quarantine?

The plant sector now contributes more to the Australian economy than the animal sector although total government investment is skewed towards animals. The zoonotic link is an obvious reason to invest greater resources into the animal sector, however, there is no evidence that a review has been completed to ensure the appropriate balance has been achieved between the plant and animal sectors. As an example, a review completed by the Victorian Auditor General in 2004 found that the total quarantine/biosecurity investment in the state of Victoria for animals was five times higher than that for plants even though both contributed equally to the Victorian economy.

The Australian Government currently deploys significant funds to the operation and maintenance of the Australian Animal Health Laboratories in Geelong. The facility website states that '*The Australian Animal Health Laboratory (AAHL) plays a vital role in maintaining the health of Australia's livestock, aquaculture species and wildlife*'. While this large investment is made by the Australian government into AAHL there is no equivalent investment in infrastructure in the plant sector. The responsibility for these services rests with state agencies.

As referred to in an earlier question, the risks from imported cargo (containers) and PEQ do not seem to be adequately appreciated.

Greater research and resourcing is required to investigate how many of the threats can be managed off-shore prior to the shipment or movement of material and/or people.

**Q. Is the emphasis on screening international air passengers arrivals, air cargo, sea cargo, ships/passengers/baggage at seaports from overseas and international mail consistent with risks and returns?**

As discussed above it is not obvious that a review of the risks and returns has been undertaken.

The increasing volume of passengers at international airports (and the increased carrying capacity of individual planes) focuses on the outcomes of the time taken to process passengers rather than the key objective of screening for restricted quarantine material.

A thorough independent review of the risks and returns for each of the pathways is well overdue.

***Q. Is there sufficient development of, and reliance on, pre-border intelligence?***

Sharing of interception data between countries is a key form of pre-border intelligence which could be greatly improved through the collection and distribution of quality data. In addition, a greater understanding of pest behaviour pre-border can greatly assist Australia's capacity in risk assessment. As stated above moving the treatment of risk off-shore needs greater investigation. Sharing of data also builds confidence and trust between trading partners.

CRCNPB is currently undertaking an 'early warning' project to enable Australia to increase its ability to use pre-border intelligence. The project aims to quantitatively evaluate the risk of pest establishment. Presently, government agencies rely on a largely subjective process of consulting experts and industry stakeholders to determine which pest species could invade Australia. Artificial neural networks, and in particular self organising maps (SOMs), present the possibility to objectively and scientifically identify those pest species which could become established in Australia and to calculate relative risk values associated with each species. This project draws on the work of Dr Sue Worner (Lincoln University) by using SOMs to reduce multidimensional data to two dimensions, and generating risk lists of establishment which can be used by government agencies in all of their agriculture and environment based risk assessment processes.

The limitation to research such as that listed above is the knowledge base of biological information for pest species. Building the linkages between countries greatly assists in accessing this vital information.

The NAQS model of pre-border surveillance works effectively and consideration could be given to implementing it more widely.

***Q. Is there sufficient priority given to monitoring and surveillance post border? Who should provide these functions and resources?***

For the plant sector, the list of potential pests is in the thousands and currently there are very few or no effective means of detecting incursions, other than through accidental discovery and public reporting. Most of the current policies discourage the participation of the general community in post-border surveillance. Cost-recovery, particularly for identification of pests and for treatment of imported items has decreased the capacity for effective post-border surveillance. The earlier a pest is detected, the greater the chances it can be eradicated, the costs for eradication will be lower and if the pest is not eradicable, the options for containment are greater. The active participation of the general community in surveillance needs to be encouraged.

Surveillance was identified as an area that has critical gaps in the strategic analysis undertaken by the CRCNPB when it commenced. Only a limited amount of active surveillance is undertaken in Australia and the capacity and capability to undertake surveillance activities has decreased to low levels. Surveillance demonstrates that particular pests are 'known not' to occur rather than 'not known' to occur. Responsibility for post border surveillance rests largely with the state agencies responsible for quarantine and biosecurity. The Australian Government only has a limited role in post-border surveillance and this is largely through the national fruit fly trapping grid and the NAQS program. The Office of the Chief Plant Protection Officer (OCPPPO) coordinates a national surveillance reference group which has enabled structure to be built into current surveillance activities but the priority given is still low. The major effort in this area is passive rather than active surveillance.

Despite AQIS being responsible for the regulation of the border it is not responsible for any post-border surveillance. The reliance is on the general public and state agencies to report any breaches. To ensure effective evaluation and management of the border quarantine activities can be undertaken, it would be advisable to have AQIS responsible for a post-border surveillance activity that was focused around border points, ports and quarantine facilities. Greater efforts in post-border surveillance would provide the capacity to measure effectiveness and thus modify processes to address breach pathways. This issue was addressed in the Radcliffe review of 2003.

CRCNPB is undertaking a number of research activities that will provide tools to enhance the current post-border surveillance activities in Australia. The research is focused on identifying technologies and tools that will enable surveillance to be completed in a cost effective, accurate and timely manner. The new tools/technologies being investigated include; Personal Digital Assistant (PDA) surveillance; hyperspectral Pathogen Detection; female lures for fruit fly; smart insect traps; flying spore traps; surveillance simulation platform; and a review of a biosecurity quarantine model system.

***Q. Do the arrangements to recover costs of aspects of the quarantine and biosecurity system appropriately reflect the balance between public interests and private benefits? Are there alternatives which would provide improved incentives and resources to better reflect the balance of national interests?***

See comments on PEQ provided above.

***Q. Does cost-recovery have an impact on the ability of AQIS staff to deliver public good outcomes?***

It is the view of many groups that AQIS activities are now focused on time and cost recovery and less on the prevention of entry of quarantinable items. There does not seem to be any analysis of where the benefits, including public benefit, flow from the activities of AQIS.

To use the example of PEQ, many advanced diagnostic protocols exist that could enhance the screening of plant material as it completes its required term in PEQ. These protocols are not used as they often cost more than visual inspections, despite the level of accuracy being many factors greater. The concern is that the importer will not want to bear the cost of the extra testing. The public good outcome for Australia should dictate that this testing should be mandatorily undertaken to provide a greater level of confidence in the health status of any material leaving the facility. The benefits from PEQ not only flow to the importer but also to the wider industry and the general community.

Also see comments below that relate to PEQ private facilities and comments provided throughout text on border data collection.

AQIS has a workforce with the capability and competence to deliver a high quality quarantine system, however, policy and process development has eroded the ability of staff to achieve the required objectives. Through a thorough review of the current operations and a re-prioritising of activities and staff, an appropriate quarantine system could be achieved.

***Q. Does cost recovery limit monitoring of pests and diseases at the border, for example where the product is treated or destroyed to minimise the costs to the importer?***

The question should really consider what level of data collection is required for effective management of the quarantine and biosecurity system rather than cost recovery limitations. The benefits that can be achieved from this data collection can then be derived and identify who should pay for the provision of services.

Currently if an importer decides to have a product treated or destroyed following detection of a possible quarantinable pest there is no further diagnosis undertaken of the pest detected as the cost must be recovered from the importer, who is usually not interested in paying for this service.

Identification of the pest detected to species level and sometimes to sub species level provides the Australian quarantine and biosecurity system with valuable data that can be used to assist in risk assessment and aids in evaluation of the current system. Operational scientists within AQIS have in the past (pre 2003) dedicated significant time to identifying pests detected, however, very few definitive identifications are undertaken now due to the costs involved.

The operational scientists have provided significant benefit to the delivery of public good outcomes in the past and strong consideration should be given to re-utilising this important resource in collecting the required data. Quarantine and biosecurity must be underpinned by science and it is imperative that AQIS maintains a strong operational scientist group.

The CRCNPB has recently commenced a project in collaboration with New Zealand to provide tools that will enable greater capacity in the screening of PEQ material. Both AQIS and Biosecurity Australia have a role in the research. To manage biosecurity and trade risks associated with germplasm imports, AQIS operates a PEQ program which integrates with the Import Clearance Program. Under the program, breaches of PEQ systems have significant consequences for trade (market access), border security, the general industry and the community. PEQ diagnostics and border biosecurity in general present enormous challenges to Australia and New Zealand which include:

- That identification of many quarantine pests is often based on visual inspections that can be compromised by issues such as latent infection and expression of environmental stressors (e.g., water deficiency). In the instance of bulk grain imports, this is highlighted in the risk posed by seed borne viruses, particularly when present at low levels.
- Considerable uncertainty about the organisms associated with some categories of imported plants (e.g. ornamentals). For example, ornamental grasses are potential hosts of a number of pests of concern to the grains industry.
- Validated and cost-effective methods for the detection of a number of pests
- The use of pre-described tests for defined lists of pests which do not allow for the detection of unknown strains and/or genera of pests.

***Q. To what extent and under what conditions is it appropriate to use private facilities in the quarantine and biosecurity system? Are the current monitoring, auditing and supervision arrangements for public and private quarantine facilities effective?***

The Standards Working Group (SWG) that considered the implementation of the Radcliffe review (2003) stated that decisions concerning appropriate containment of all plant material and plant affecting organisms need to be based on an appropriate pest risk analysis. Without an appropriate pest risk analysis, organisms/commodities of greater biosecurity threat may be placed in a containment facility of a level not capable of containing potential pests, and hence pose an unacceptable quarantine risk. The SWG further added that the location of a facility is critical. Based on the four categories of quarantine pest proposed, it was stated that quarantine containment for pests, rated as low and above, should be avoided in agricultural production areas with crops or vegetation that could be primary hosts or alternate hosts for organisms that may be housed in the facility. For plant production in most cases this suggests that private facilities are not appropriate facilities for PEQ. In most cases the private facility is in close proximity to host material of concern and the separation may be as minimal as three metres or a sheet of glass.

Any facility holding plant material undergoing a period of PEQ should have a contingency plan that includes regular post-border surveillance and provides a high probability of eradication should a breach occur. Private facilities are in most circumstances associated with commercial operations or breeding programs providing direct pathways for any pest breach, should they occur, into established plant communities. Private facilities have been motivated by the need to expedite the business of germplasm introduction without due consideration of the additional risk imposed.

In order to ensure effective operation of any PEQ facility, it is imperative that any plant material entering the PEQ system is recorded and traced. This capacity will provide the ability to evaluate the effectiveness of the operation of the current system. The current system places the responsibility on the manager of the facility (which in most cases is not government) to maintain a register of all material entering and being released from quarantine. There needs to be a central database to allow trace back of material in the case of an incursion.

Research should be undertaken (assuming appropriate resources can be identified) to investigate what is the appropriate level of isolation for a PEQ facility. This will require research into the biology of pests, the modes of movement and establishment factors. There is also a need to investigate how all relevant data can be collected and accessed to ensure full traceability of any material entering the PEQ system.

The SWG recommended competency levels for individuals involved in the monitoring, auditing and supervision of such facilities. Radcliffe et al. (2003) stated that there should be a requirement to demonstrate competency to both manage and operate a PEQ facility. These SWG recommended competencies are not currently met nor has the system to demonstrate the competency been established.

***Q. Are the requisite skills and disciplines available to deliver optimal quarantine and biosecurity systems? If not, what are the highest priority areas? Is the education and training of personnel with these skills adequate? If not what are the highest priority areas?***

Currently Australia is facing a shortage of skills in many of the underpinning disciplines for quarantine and biosecurity. The current capability in many areas such as bacteriology, nematology, aphid and mite taxonomy, plant disease epidemiology and surveillance science is very limited.

While the CRCNPB is working to address these skill gaps by providing trained graduates and advanced training for individuals already working in the field, the issue of long term employment needs to be addressed. Without the defining of a clear career structure within the existing biosecurity organisations it will not be possible to significantly change the current limitation in skill sets. It is unlikely that Australia or any developed country will return to a position where it has a large resource of trained experts in specific disciplines. The development of new tools and technologies such as remote microscopes will enable the future experts to have a greater general knowledge. CRCNPB is investing in the development of a remote microscope network in parallel with an AQIS funded activity. The parallel activities have been coordinated to avoid duplication and it is hoped that a single network will be operational in the near future that utilises the total diagnostic capacity in Australia. Through the provision of a triage system the capacity to undertake diagnosis will be enhanced. Australia does not have the skills base to support two such networks and the combining of the two activities is necessary. If added confidentiality is required for AQIS labelled samples then this can easily be accommodated through an appropriate triage system.

***Q. Is infrastructure such as diagnostic laboratories and containment facilities adequate to meet quarantine and biosecurity needs? If not what are the highest priority areas?***

The current plant diagnostic laboratories operate in a largely independent manner with only informal linkages existing. All laboratories are present in state or territory agencies, some universities and CSIRO. AQIS maintains a few specific diagnostic laboratories which support AQIS activities. It is a priority that a strong national plant diagnostic network is established that includes the AQIS laboratories. With the appropriate constraints, all of these laboratories can handle and diagnose samples that may be deemed quarantinable. The development of a national diagnostic network will assist in ensuring the expertise base covering all disciplines is maintained across the country. Technologies such as the remote microscope network will help in enabling such a network to work effectively.

The debate on the adequacy of containment facilities has been ongoing for many years. As discussed previously the Australian Government funds a large animal quarantine/biosecurity containment facility in Geelong (AAHL) yet no funding is provided for plant facilities. Further discussion is required on whether or not the establishment of a national plant containment facility is required. The current laboratory structure in state agencies, with some enhancing modifications, are suitable for undertaking the diagnosis of most of the exotic plant pests that will enter Australia. However, while limited work may be possible in the CSIRO facility in Canberra, if research is to be conducted on an exotic plant pest there is no current facility in Australia that is suitable and would provide the required level of containment. Cost limitations in building and operating such facilities for research would suggest that consideration be given to undertaking such research off shore in countries where the pest is endemic and there is no need to contain. The CSIRO experience with the Shenton Park facility highlights the significant costs that can be incurred in building and maintaining a facility.

***Q. How should the effectiveness of research on quarantine and biosecurity issues be evaluated?***

As the key coordinating body for plant biosecurity related research in Australia the CRCNPB has developed a detailed process for developing, approving and evaluating research activities. CRCNPB has a strategic plan that has identified the research priorities for plant biosecurity. This strategic analysis was undertaken in consultation with the participants of CRCNPB who represent the key government agencies and industries involved in quarantine and biosecurity in Australia. All research activities undertaken by CRCNPB need to clearly identify the biosecurity problem being addressed.

CRCNPB is implementing a project gating system to consolidate our evaluation processes. The gating system will be managed through the CRC's information management system to provide a rational and transparent process which will evaluate and track the progress of projects through the research cycle. During the gating process, project proposals are initially evaluated by CRCNPB's Science Committee against a set of defined criteria which determine whether the project meets the CRC objectives and whether there are clear deliverables that will benefit an end user. If the objectives are met the project is recommended for approval by CRCNPB's independent Board. When Board approval has been granted, the project becomes active and continues through the gating process. Within this process, all projects are reviewed quarterly to determine whether the project has met the requirements to progress to the next phase of the research cycle. The main phases that form the gating system are: Project Proposal, Contract, Research, Development, Delivery, Adoption and Evaluation. By tracking projects using the gating system, the CRC can identify any projects at risk and gain an overview of the CRC's investments in the research portfolio.

CRCNPB's Science Committee and Research Leader both fulfil key roles to regularly evaluate the progress of projects. One evaluation strategy is for project teams to submit a quarterly report which is used to score the project's performance and provide feedback to project teams. This process also provides an opportunity to identify areas of concern and impact highlights and, where needed, an action plan established.

To ensure continual improvement, the CRC undertakes a process to evaluate its systems and internal processes. This also ensures we are performing at the desired operational and strategic level.

***Q. Is research appropriately funded, coordinated and prioritised?***

The CRCNPB was established in 2005 in recognition of the need to strengthen the plant biosecurity scientific and research capability of Australia. CRCNPB has 23 participants representing all relevant government agencies (excluding Tasmania), Plant Health Australia, CSIRO, universities and plant industries. Through the CRC the coordination and prioritisation of plant biosecurity research has improved, however, there are still some research providers/investors who operate separately to the CRC.

The largest contribution of research funding is provided by the Australian government through the CRC Program. Government agriculture agencies are largely providing in-kind support. Industry participants such as Horticulture Australia (HAL) and the Grains Research and Development Corporation (GRDC) provide significant research funding into plant biosecurity through the CRC. HAL works collaboratively with CRCNPB to ensure relevant plant biosecurity research is undertaken in the most resource effective manner. The GRDC is a large participant in CRCNPB and have identified CRCNPB as the ideal organisation to ensure research is undertaken that will deliver the best outcomes for Australia's grain industry in the area of plant biosecurity. The Crawford Fund and Rural Industries Research and Development Corporation provide investment to plant biosecurity research through the CRC. The three largest grain companies in Australia also invest significant funds in CRCNPB research as they have identified the importance for their business of plant biosecurity for both trade and market access.

Plant Health Australia (PHA) is a participant in the CRC. Plant Health Australia is a peak national coordinating body for plant health in Australia and its role in policy and processes runs parallel to the research activities of CRCNPB. The membership of PHA includes all relevant government agencies and the majority of plant industries in Australia.

There are still a number of plant based RDCs that are not participating in the CRCNPB and further coordination in this area will assist in minimising duplication. In addition, AQIS could play a larger role, by engaging its operational science group, in helping set research priorities through its active engagement with organisations such as the CRCNPB and PHA.

Through the CRC, large research collaborations have been developed with a number of international partners. The CRC has also been able to coordinate research collaborations with diverse disciplines who have the potential to provide new tools and technologies for plant biosecurity, for example NASA and NICTA.

CRCNPB has also partnered with the CRC for New and Emerging Infectious Diseases to ensure cross sector research is undertaken in an efficient manner with benefits provided to the human, animal and plant sectors.

The key driver for CRCNPB research is a need to develop a strong culture of demand pull rather than the previous technology push culture that has persisted in many areas of research. Industry investment in CRCNPB has been driven partly by a lack of conviction that the previous research activities (pre CRC) have delivered outcomes that had provided benefits to industry. This was mainly due to research being technology push rather than demand pull based. In CRCNPB, industry play a key role in ensuring demand pull drives the research activities.

AusBIOSEC is developing the overarching framework through which a partnership is being developed between government, industry and the community. AusBIOSEC will be responsible for identifying the gaps in current biosecurity arrangements and CRCNPB will contribute by providing the scientific research required to underpin specific plant objectives identified through AusBIOSEC provided appropriate data is available. AusBIOSEC will also assist to identify and review the priorities for quarantine and Biosecurity research in Australia.

***Q. Is the distribution of the research effort appropriate along the quarantine and biosecurity continuum?***

CRCNPB defines the continuum as preparedness and prevention (risk analysis), diagnostics, surveillance, impact management and post harvest integrity. Investment varies between programs depending on the relative priority assigned following the strategic analysis. The largest investment is in the surveillance area, followed by preparedness and prevention, impact management, post harvest integrity and diagnostics.

CRCNPB is continually reviewing and re-prioritising the distribution of research investment it currently manages. New sources of data, and greater availability of data, may change the distribution of research investment.

CRCNPB aims to develop generic research activities as much as possible to ensure outcomes are beneficial to as large a proportion of the plant industries as possible. There are a large number of plant species with an even greater number of pest species while the total investment for research is significantly smaller than animals or humans who deal with significantly smaller well known species combinations. For this reason not all research can afford to be targeted on individual combinations but rather a generic approach provides the best outcomes for Australia.

***Q. What methods could be used to set and review research priorities across the continuum?***

CRCNPB utilises end-user engagement as a key method of reviewing research priorities across the continuum. All research activities must have clear objectives that identify the deliverables that will be achieved and have an understanding of the pathway to adoption.

Robust methodologies for undertaking risk analysis are a key tool required to ensure effective review of research priorities. This is particularly important when decisions are made about research efforts in regard to one pest species over another. However, risk analysis needs to be complemented by good data, e.g. from risk profiles across the continuum.

CRCNPB is providing a vehicle by which national strategic reviews of current capacity and research activities are being undertaken. These reviews have not been completed in the past as individual research organisations have competed for available research resources. The reviews have enabled gaps to be identified and have decreased research duplication.

***Q. Who should establish and review research priorities?***

The plant biosecurity research priorities should be established by the end-users of the research deliverables. In many cases this is government agencies who have responsibility for quarantine and biosecurity in Australia. Plant industry bodies will also be the end-users of many of the technologies and tools developed through research, particularly in the areas of surveillance and risk analysis. The collaboration of end-users in organisations such as CRCs provide ideal opportunities for reviewing research priorities.

One of the dangers in identifying research priorities is to focus on operational activities and avoid strategic research which is often longer term and represents an investment with greater risk yet has the potential to provide greater returns. Ensuring an effective linkage between end-users and researchers is critical as the science and technology that can be brought to the table by researchers can provide real opportunities for redefining what may be possible.

***Q. In the context of competing research priorities, is sufficient emphasis given to research on risk analysis methods?***

CRCNPB is investing significant funds into the risk analysis area. This has been driven by the need to develop more robust methodology for risk analysis which is the base of decisions made in quarantine and plant biosecurity. The CRCNPB has partnered with ACERA in plant biosecurity risk analysis research.

The initiative to form ACERA (Australian Centre of Excellence in Risk Analysis) has also enabled a greater emphasis on risk analysis research.

The current structure for ACERA provides it with minimal independence with all research activities approved and coordinated through DAFF. This lack of independence has the potential to prevent new methodologies being researched that may significantly enhance the capacity of the current system.

Providing researchers with greater freedom to explore a research topic that addresses a specific need has far greater potential for delivering a new strategic approach to a problem than having a research activity that has been devised and is managed by the end-user. The non researcher may be more focused on making small changes and avoiding outcomes that may challenge the status quo.

A structure similar to the CRC (incorporated company with an independent skills based Board) would enable this work to be done more effectively. The CRC structure enables research that stands up to evaluation and assessment and benefits the full community. The governance rigour also lifts the credibility of any research undertaken. Independence also enables greater degrees of international linkage which are essential in fields of global importance.

CRCNPB is currently undertaking research to develop a methodology which enables industry stakeholders and policy-makers to account for biosecurity risk by combining both quantitative bioeconomic modelling techniques with interactive multi-criteria analysis. Human beings are notoriously poor at making decisions when faced with low probability-high consequence events, which makes the process of allocating resources to biosecurity planning extremely difficult. The first step in this process is to prioritise threats. By building on the quantitative impact simulation models the project plans make the greatest use of what data is available. However, in instances where biological data constraints are considerable (e.g. the environmental and social impacts of a particular species) these models must be supplemented by other information. To deal with these situations the project is using a deliberative multi-criteria evaluation technique to formalise the inclusion of qualitative and anecdotal evidence to supplement economic modelling. In doing so, the project aims to produce a more rigorous tool for prioritising biosecurity threats to plant industries that will guide decisions for spending research and development dollars and reduce the risk of biosecurity breaches.

***Q. How effectively is new information from research activity incorporated into Australia's risk management measures?***

Plant biosecurity research has lagged a significant distance behind policy and process development prior to the establishment of CRCNPB. CRCNPB through its Delivery and Adoption Program is developing processes to maximise the uptake of research outcomes.

***Q. Are there any critical information or knowledge gaps that can be remedied to support better research and policy outcomes?***

Without data collection that is open and transparent it is very difficult to identify gaps. As stated previously data is essential when setting priorities and managing a biosecurity system into the long-term.

***Q. Who should pay for quarantine and biosecurity research?***

Quarantine and biosecurity research should be funded by the end beneficiaries. A large number of the outcomes of quarantine and biosecurity research benefit the Australian community as a whole and as such funding should be provided by government. This has been recognised with the Australian and state and territory governments investing significant funds through the CRC Program.

Plant industries and individual entities within industries also benefit from the research and should contribute. In the case of CRCNPB, Horticulture Australia and the Grains Research and Development Corporation currently invest significant funds. An analysis may indicate that some industries are not currently investing comparable levels of funding into this area of research which has been identified as one of the five priority areas for rural research and development.

AQIS needs to play a greater role in collaboration and resourcing of quarantine research through research organisations such as CRCNPB. CRCNPB and other like organisations represent a significant resource to AQIS and should be utilised in addressing key issues requiring scientific

outcomes. As stated previously AQIS has trained staff with expertise in many of the science disciplines and their greater engagement should be encouraged.

***Q. Is monitoring of the quarantine and biosecurity continuum targeted at the right areas (e.g. primarily at the border)? Is there a process to ensure that the results of monitoring are being used effectively to improve the operation of the system?***

While monitoring at the border is the primary focus, there is a general lack of immediate post border surveillance to identify breaches in the system. Monitoring of this area would provide a much greater capacity to review and modify the current system as gaps are identified.

The responsibility of AQIS needs to be expanded to cover the immediate post border area and develop stronger linkages between AQIS and the relevant state/territory agency to ensure appropriate action can be taken in a timely manner. There needs to be a more open and transparent monitoring system to enable independent analysis of the current operations. It is instructive to note the example of the state reported nearly one breach a day over six months while no breaches have been reported while AQIS has been responsible.

***Q. Is the Quarantine and Exports Advisory Council an effective forum for advising the Minister and Director of Animal and Plant Quarantine of quarantine and biosecurity issues?***

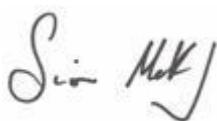
A revised QEAC that is independent and appropriately skills based would provide a more effective vehicle to monitor/evaluate and recommend improvements to the current operations of the quarantine and biosecurity system. The revised QEAC should have a modified mandate with greater public communication.

In conclusion, CRCNPB is the key coordinating body for plant biosecurity research in Australia. The CRC has brought together significant investment from the government and industry sectors and focused it on strategic research that will deliver new tools and technologies for Australia's plant quarantine and biosecurity system. The CRC is also investing heavily in developing the future human resource for Australia through its education and training program. CRCNPB has a comprehensive research portfolio that will significantly benefit Australia's quarantine and biosecurity system. It should, however, be noted that there is still the capacity for an even greater level of collaboration and participation by all parties involved or investing in plant biosecurity research.

Greater emphasis is required on undertaking analysis of the relative risks and returns from the various pathways in the quarantine/biosecurity continuum to ensure appropriate operational investment is achieved. To enable this analysis to be undertaken it is critical that appropriate, quality data is collected from the various border points and made available.

I would be happy to discuss the review and the benefits that will be delivered for Australia's agricultural plant industries through CRCNPB. For further information on the research projects currently being undertaken by CRCNPB, please contact me on 02 6201 2882.

Yours sincerely



Dr Simon McKirdy  
**Chief Executive Officer**

## ATTACHMENT 1: OVERVIEW OF CRCNPB RESEARCH PROGRAMS

### Program 1: Preparedness and Prevention Research

Program 1 seeks to deliver the knowledge required to underpin decisions on the risk of entry, establishment and spread for exotic plant pests. Improving Australia's capacity to identify threats, to prioritise them and to allocate resources to mitigate, will strengthen the level of preparedness and so contribute to Australia's ability to minimise the impact of exotic plant pests. Further, as quarantine (pest and import) risk analysis is a core plank upon which international trade is regulated, the stronger the science base underpinning Australia's trade decisions the stronger the defensible position Australia will be placed to defend them.

The goal of this program aims to *decrease the incidence and impact of harmful emergency (exotic) plant pest incursions through contributing to the development of risk analysis systems based on sound science to support decision making*. To achieve this, the program has a strategic vision to identify threats across the whole biosecurity continuum, from developing mechanisms to identify pre-emergent threats through to increasing our capacity to deal with known threats. The program recognises that to strengthen Australia's capability of analysing threats, we need to be able to critically review the current approaches used and identify whether they can be improved and where improvements will bring measurable dividends.

The program recognises that the process of threat identification and prioritisation is not static, but responds to changes in; patterns of trade; factors influencing probabilities of entry; establishment and spread; capacity to contain and eradicate incursions; and shifts in agricultural practices

A key threatening process to plant biosecurity is climate change. At present the influence of climate change on these factors is poorly defined. Further, we recognise that in climate change it is not only exotic threats that are of biosecurity concern, but also endemic threats where changes in distribution and abundance coupled with changes in land use can directly impact on the level of threat posed and the subsequent priority to industry and jurisdictions. The CRCNPB recognises that we have a role in developing the tools and methodologies to engage with policymakers and provide industries with capacity to make informed decisions in regards to their management of the potential impacts of climate change.

### Program 2: Diagnostics Research

The aim of the Diagnostics Program is to develop and foster world-class capability for early identification of emergency plant pest incursions in Australia by providing data, expertise and diagnostic technology that is accurate, accessible and cost effective.

Diagnostics capability is a core component of Australia's front-line biosecurity system. Those involved in prevention, surveillance, and impact management of exotic plant pests have a basic need for diagnostic information and access to expertise and technological capability to rapidly and accurately identify plant pests. At present, diagnostic information and the organisational structure to provide the delivery of diagnostic information are poorly developed and lack national focus. Moreover, we do not have reliable diagnostic tests for many of the currently listed as exotic plant pests and/or tests that are available do not meet the required criteria.

The Diagnostics Program will address these issues by developing;

- diagnostic tests for critical and important pests,
- new technology platforms for fast, accurate and cheap delivery of diagnostic tests, and
- systems for the delivery of up-to-date diagnostic information for pests.

Improvements in these three areas will deliver better diagnostic capability that will underpin other important components of our biosecurity system.

### **Program 3: Surveillance Research**

The aim of the Surveillance Program is to develop effective national plant biosecurity surveillance systems based on scientifically sound sampling tools, new technology and innovative survey methods. Short-term projects will deliver a national exotic plant pest surveillance strategy for grains and national guidelines for surveillance with hand-held equipment. Sensor technology to enhance surveillance trapping and field operator effectiveness are also being investigated. Medium-term projects will increase surveillance effectiveness, in particular, grain surveillance and fruit fly trapping for market access. A long-term goal of the surveillance program is to develop a real-time simulation tool for surveillance.

### **Program 4: Impact Management Research**

The aim of the Impact Management Program is to improve the management of exotic plant pest incursions in Australia. The program develops predictive simulation systems for better response strategies. It will increase Australia's capacity to control the threat of virulent pests. It will improve disinfestation technologies to maintain and build our import and export markets. It will develop and implement new control and containment strategies for pest incursion management that minimise the economic, social and environmental impact of plant pests.

### **Program 5: Post Harvest Integrity Research**

The focus of the Post-harvest Integrity Research Program is the development of practices and technologies that underpin the continued competitiveness of Australian products in local and international markets. Market access for Australian products depends on the continued supply of safe, high-quality, contaminant-free products to end-users. These products, however, are under serious threat from both endemic and exotic pests, pathogens and mycotoxins which can infest and infect harvested crops at many points in the supply chain. Our challenge in this Program is to deliver scientific outputs that will contribute significantly to the effective management of biosecurity threats in the post-harvest sector and support sustained market growth for Australian products.

The goal of Program 5 is to *Maximise the value, integrity and competitive advantage of Australia's post-harvest supply chain*. To achieve this, the program strategy is to develop a portfolio of projects that address both short and longer term priorities. This program was initiated by the grain industry through a Supplementary Bid to the CRC Plant Biosecurity. The most urgent issue for the grain industry is the development of strong resistance to phosphine fumigant in grain insect pests. Projects are being commissioned that will define best practice use of phosphine in grain storages to manage resistance effectively. With a view to sustainable management of these pests in the long term, other projects will identify the key biotic and abiotic factors that determine the distribution, abundance and movement of insect pests within the grain supply chain and determine selection to resistance to phosphine. Other projects will address issues including safe application of phosphine and the removal of potential threats to health and the environment. Future investment will be in the development of cost-effective technologies to replace phosphine.

Opportunities to provide benefit to other (non-grain) industries will also be explored.

### **Program 6: Education and Training**

The CRCNPB seeks to deliver the education and training required to enhance skills, develop industry awareness and ensure that Australia has the highest quality plant biosecurity research community. Improving Australia's current and future capacity to detect and diagnose exotic plant pests, manage risks and respond in an adequate and timely manner to threats will be best achieved by providing quality education and training to government, industry, undergraduate and postgraduate students. Further, as plant biosecurity incursions are often identified by the general public, a strong emphasis is also being placed on raising awareness in the community and in primary and secondary schools.

The goal of this activity is that the awareness, knowledge and skill of industry personnel, and supply of trained scientists involved in all stages of the plant biosecurity continuum will be enhanced through education and training. To achieve this, the program has several core strategic actions that will result in a large number of new graduates ready for employment within the industry. The program is supplying postgraduate students with scholarships to support their study, and will soon launch new postgraduate courses for those already working in the industry who wish to upgrade their formal qualifications without the longer term commitment to completing a PhD. The program recognises that to strengthen our capacity we need to train students in the areas of science underpinning plant biosecurity, and also train them in project leadership, IP management and general knowledge of the industry. As a result all our students and staff receive training within this area. We also realise that plant biosecurity is of international concern, and consequently we are working collaboratively with overseas institutions to train students of the highest calibre, and who meet an internationally-recognised standard of education in biosecurity.

The CRCNPB currently has 22 PhD candidates undertaking research covering the full plant Biosecurity continuum and covering biology, social science and economics.

CRC Plant Biosecurity's Research and Education Programs has been charged with the task of developing new biosecurity knowledge products that will lead to improved biosecurity outcomes for Australia's plant industries. Future outputs from work in these programs will include new risk modelling systems, surveillance standards, diagnostics resources, product integrity systems, and education and training tools. The CRC's Delivery and Adoption Program supports the Research and Education Programs by facilitating knowledge transfer of Centre outputs to industry and regulatory end-users – principally, agribusiness, producers and the Australian and State Governments.

#### **Program 7: Delivery and Adoption**

The goal of Program 7 is to achieve *realisation by stakeholders of the benefits of the CRC, as a result of adoption of improved knowledge-based systems by government, universities and plant industry organisations, and commercialisation of new technologies through the private sector*. To ensure maximum adoption of new plant biosecurity technologies and skills, the program's activities have a focus on project delivery planning and developing private and public partnerships for knowledge transfer of CRC's outputs. We recognise that a successful delivery strategy will depend on positive consultation with product end-users throughout the development life cycle, and facilitation of effective three-way researcher-industry-regulator engagement strategies are a core concern for this program.

The CRC's Delivery and Adoption Program is undertaking strategic research to improve our ability to deliver plant biosecurity tools, knowledge and technology to industry around issues like phosphine resistance, focusing on communication and practice change for improved biosecurity outcomes. From a simple public communication perspective, the concept of biosecurity is inherently complex, carrying with it a range of social, scientific, regulatory and commercial influences that mean that the term itself is not easy to communicate, nor indeed to achieve engagement at a level that might lead to improved risk management practices. Such complexity makes risk communication a key issue for agribusiness and regulatory agencies operating at the industry, regional, and individual levels, and the development of strategies to improve awareness, engagement and adoption of plant biosecurity knowledge are critical to this effort.