Plant Health AUSTRALIA

# National Pineapple Industry Biosecurity Plan

*Version 1*

*July 2008*

Plant Health Australia is a peak national coordinating body for plant health in Australia. We commission projects and work with members to coordinate the development of national policy and capability to enhance the ability of Australian agriculture to respond effectively to plant pests, weeds and diseases.

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# ACKNOWLEDGEMENTS

The *National Pineapple Biosecurity Plan* was coordinated by Plant Health Australia (PHA) and developed through a partnership approach using government and industry resources and expertise.

The following organisations, agencies were involved in the development and finalisation of the plan.

| | |
|---|---|
| Growcom | growcom together we grow |
| Horticulture Australia Ltd (HAL) | HAL Know-how for Horticulture™ |
| Queensland Department of Primary Industries and Fisheries | Department of Primary Industries and Fisheries Queensland Government |
| Australian Quarantine and Inspection Service | Australian Government Australian Quarantine and Inspection Service |
| Biosecurity Australia | Australian Government Biosecurity Australia |
| Office of the Chief Plant Protection Officer | Australian Government Department of Agriculture, Fisheries and Forestry |

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PI06003: This project was facilitated by HAL in partnership with the pineapple industry. It was funded by voluntary contributions from Growcom and Plant Health Australia. The Australian Government provides matched funding for all HAL's R&D activities.

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# BIOSECURITY PLAN FOR THE PINEAPPLE INDUSTRY

# INTRODUCTION



For more information on Plant Health Australia

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# Acronyms

| | |
|---|---|
| AQIS | Australian Quarantine and Inspection Service |
| EPPRD | Emergency Plant Pest Response Deed |
| GIMP | Generic Incursion Management Plan |
| IBG | Industry Biosecurity Group |
| IBMP | Industry Best Management Practice |
| IBP | Industry Biosecurity Plan |
| OCCPO | Office of Chief Plant Protection Officer |
| PGAG | Pineapple Growers Advancement Group |
| PHA | Plant Health Australia |
| PLANTPLAN | The generic emergency response document which outlines operational procedures for plant pest incursions |
| QA | Quality Assurance |
| QDPI&F | Queensland Department of Primary Industries and Fisheries |

**Note:** The definition of a pest as adopted by the International Plant Protection Convention (any species, strain or biotype of plant, animal, or pathogenic agent, injurious to plants or plant products) is used throughout this plan.

# Plant Health Australia

Plant Health Australia (PHA) is a public company, with members including the Australian Government, all state and territory governments, and a range of plant industry organisations. The company was formed to address high priority plant health issues, and to work with all its members to develop an internationally outstanding plant health management system that enhances Australia's plant health status and the sustainability and profitability of plant industries.

# Need for biosecurity plans

Australia's geographic isolation and lack of shared land borders **Error! Bookmark not defined.**have, in the past, provided a degree of natural protection from exotic threats. Australia's state and federal quarantine systems are also critical in helping to prevent the introduction of harmful exotic threats to plant industries. Despite these measures, the rapid increase in overseas tourism, imports and exports, mail and changing transport procedures (e.g. refrigeration and containerisation of produce), as well as the potential for pests to enter via natural routes, mean that relying on border quarantine measures is not enough.

Biosecurity planning provides a mechanism for the pineapple industry, government and other relevant stakeholders to actively identify pest threats, analyse the risks they pose, and put in place procedures to reduce the chance of pests reaching our borders, and minimise the threat if a pest incursion occurs.

Ensuring the pineapple industry has the capacity to minimise the risk of pest entry and establishment, and to respond effectively to any pest threats, is a vital step for the future sustainability and viability of the industry. Through this pre-emptive planning process, the industry will be better placed to maintain domestic and international trade, negotiate access to new overseas or domestic markets, and reduce the social and economic costs of pest incursions to both growers and the wider community.

# Background on the pineapple industry

**Background to the Pineapple Industry**

The Australian Pineapple industry is, by national standards, a relatively small agricultural industry, with approximately 170 businesses in Queensland producing pineapples for the fresh market and processing. Production is predominantly concentrated in south east Queensland. In total, there are a total of 4500 hectares under pineapple production

The key production areas in Queensland include North Queensland, Yeppoon/Cawarral, Bundaberg, Maryborough/Hervey Bay, Mary Valley/Nambour, Glasshouse Mountains/Beerwah, Wamuran and Elimbah. It is estimated that 60 percent of pineapples produced for the fresh fruit market and for processing are grown in the Cooloola-Sunshine Coast region. Pineapple production has decreased in recent years from a peak of 5870 hectares in 1993/94 (ABS 1993/94) to the current levels of 4500 hectares. Pineapple production has increasingly moved to comparatively larger scale operations.

Pineapples are grown year round in Queensland with an average turn-around of 18 months from planting to plant crop harvest and 16 months from plant crop harvest to the ratoon crop harvest. Approximately 1000 hectares are planted annually.

In Australia, the fresh fruit market is split between Smooth Cayenne, Queen (rough leaf) and the new hybrid varieties. The hybrid varieties are noted for their higher brix (concentration of sucrose) levels and sugar /acid ratio and are therefore marketed as sweeter premium pineapples. Currently the fruit supplied to the fresh market is approximately 60% Smooth Cayenne / rough leaf and 40% hybrids, with a trend to higher levels of hybrid production into the future.

The total production of pineapple in Australia in 2006/2007 was 115,000 tonnes with 85,000 tonnes for canning and juicing and 30,000 tonnes of fresh market produce, valued at $40 million. In recent years there has been a trend towards a greater proportion of fruit grown for the fresh market. The most recent contraction has taken place in the processing sector.

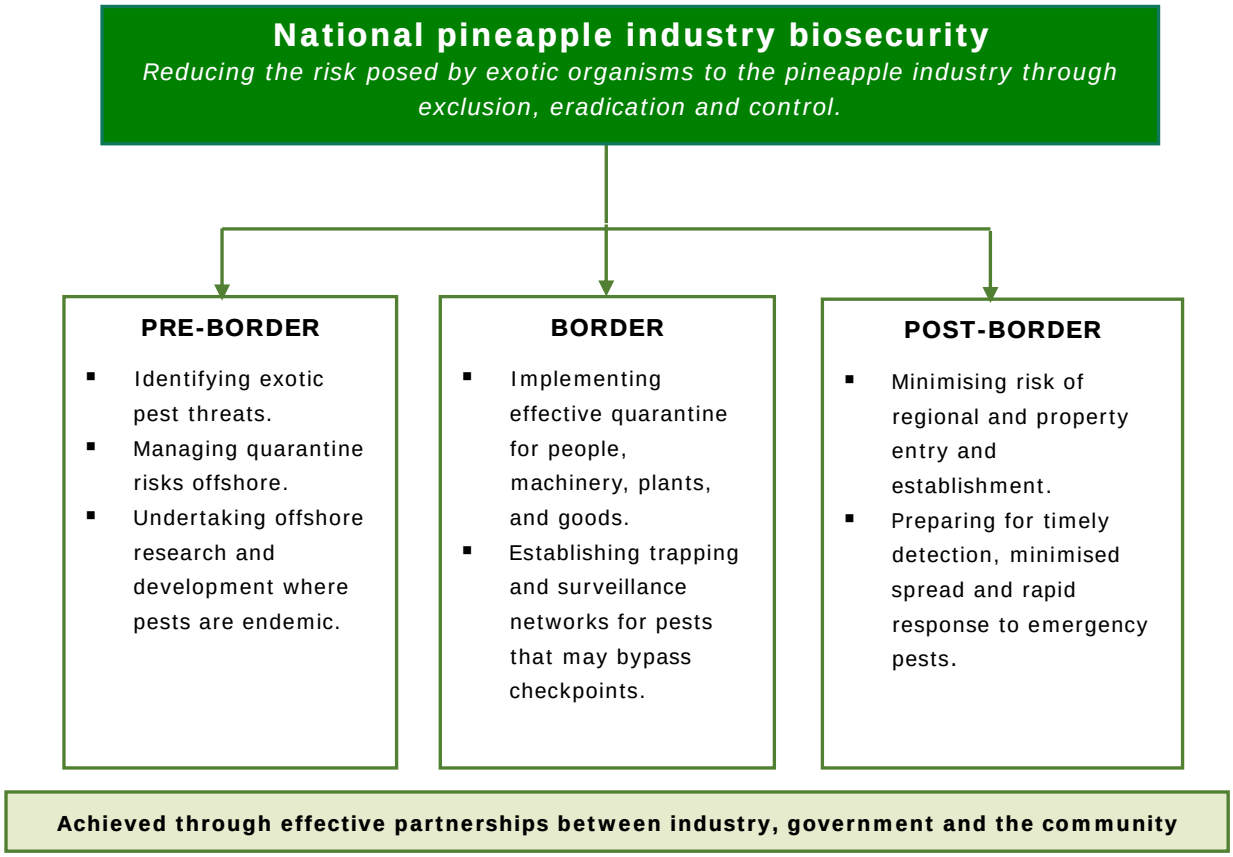
The majority of Australian produced fresh and processed pineapples are consumed within Australia. Exports of fresh pineapples account for only 6% of total production and a small quantity of Australian processed pineapple is exported to retail markets in New Zealand. There is limited potential for expansion of export markets due to competition from lower cost production in Asian countries; however there has been some interest in reviving the New Zealand market and the pest free status of Australia's produce may play an important role in increasing market share.

In recent years Australia has accepted fully processed and fresh pineapples, predominantly from South East Asia. This product is imported by a number of multinational companies. Pineapple tops have been imported from South East Asia to establish operations in Australia by one of the multinational companies, who have also acquired farms in North Queensland. All entry of pineapple material must adhere to quarantine requirements developed by Biosecurity Australia and implemented by AQIS.

# What is biosecurity planning?

Industry biosecurity is the minimisation of risks posed by exotic organisms through actions such as exclusion, eradication, and control. Effective industry biosecurity relies on all stakeholders, including government agencies, industry, and the public (Figure 1). A number of authors have identified the components of a plant industry biosecurity continuum, and Lloyd (1996) summarised them in the Generic Incursion Management Plan (GIMP) for the plant industries (Figure 2).

**Figure 1:** *Industry biosecurity: a shared responsibility*

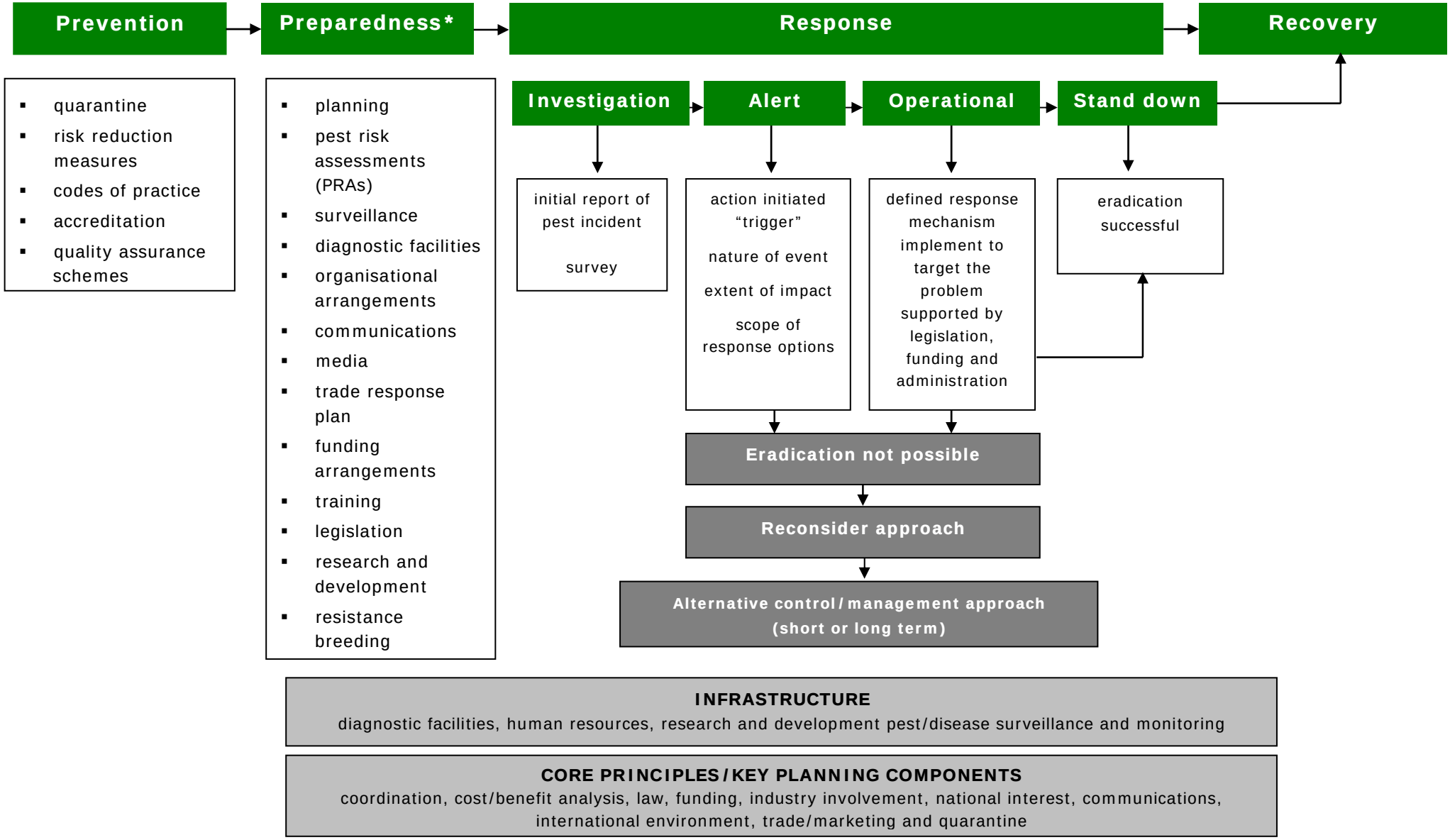



With the assistance of Growcom and the Pineapple Growers Advancement Group (PGAG), an Industry Biosecurity Group (IBG), coordinated by PHA, was formed to work on the development of a industry biosecurity plan for the pineapple industry. The IBG includes representatives from Growcom, the Pineapple Growers Advancement Group, as well as consultants, representatives from Queensland agriculture agencies, the Australian Government, and PHA.

**Table 1:** *Members of the IBG that have contributed to the development of the Biosecurity Plan*

| Name | Organisation |
|---|---|
| Mr Chris Fullerton | PGAG |
| Mr Les Williams | PGAG |
| Mr Chris Doyle | PGAG |
| Mr Nathan Stevens | PGAG |
| Mr Tony Accorsini | PGAG |
| Mr Peter Maywald | PGAG |
| Mr Rudi Wassman | Golden Circle (retired) |
| Ms Roberta Rossely | OCCPO |
| Mr Ken Pegg | QDPI&F |
| Mr Chris Freebairn | QDPI&F |
| Ms Jay Anderson | QDPI&F |
| Ms Sarah Corcoran | QDPI&F |
| Ms Marcelle O'Brien | QDPI&F |
| Mr Simon Newett | QDPI&F |
| Dr Garth Sanewski | QDPI&F |
| Mr Tim Wolens | Golden Circle |
| Ms Julie Moore | Growcom |
| Mr Doug Christensen | FAVCO |
| Mr Geoff Waite | Consultant |
| Dr Sharyn Taylor | PHA |
| Ms Debra Eaton | PHA |
| Ms Lucinda McIntyre | PHA |

**Figure 2:** *Generic Incursion Management Plan (GIMP) for the plant industries*

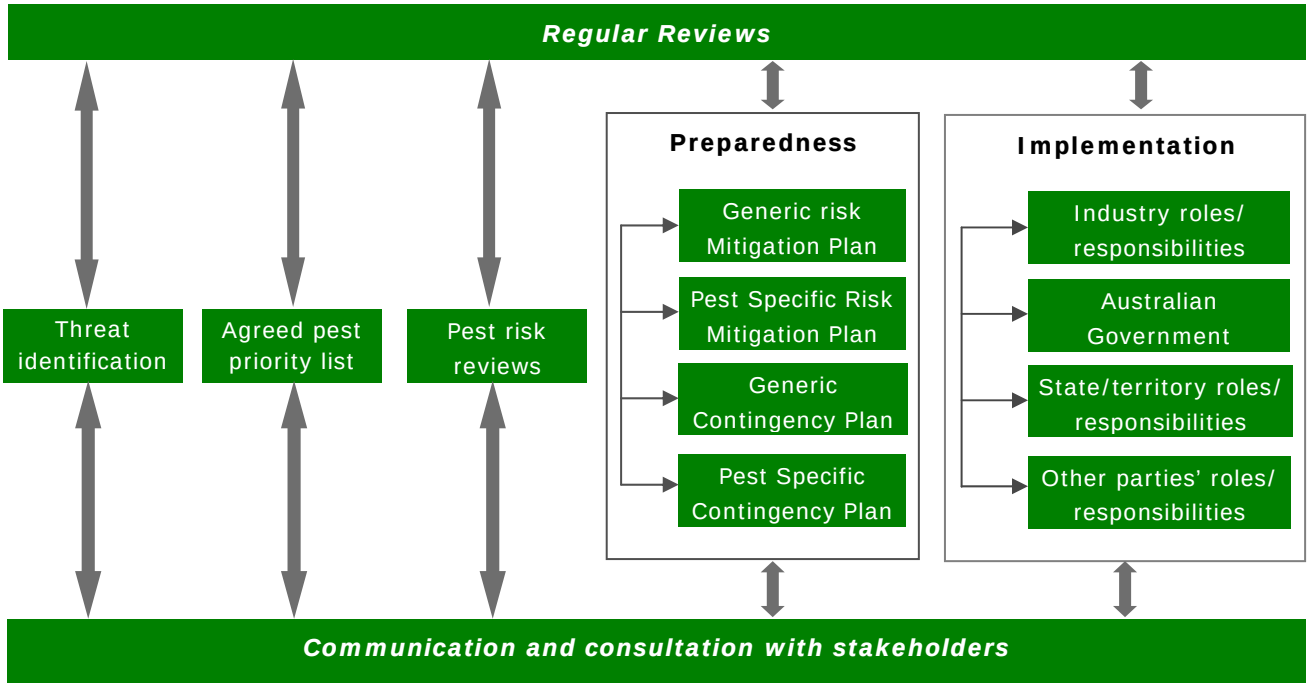



* stages of 'all hazards' approach adopted by Emergency Management Australia

Key steps in the development of the *Industry Biosecurity Plan for the Pineapple Industry* are shown in Figure 3, and included:

- identifying and documenting key threats to the pineapple industry
- developing an agreed emergency plant pest priority list
- undertaking and documenting appropriate pest risk reviews
- developing an industry risk mitigation plan
- developing a generic incursion response plan
- developing pest-specific contingency plans for high priority pests
- agreeing on, and documenting the roles and responsibilities of stakeholder groups
- developing appropriate communication and consultation strategies
- developing a review strategy.

**Figure 3:** *Steps involved in the development of a Industry Biosecurity Plan*




# Document overview

The biosecurity package developed for the Australian pineapple industry focuses on a number of key areas.

## Threat identification, pest risk reviews and incursion management funding arrangements

Guidelines are provided for the identification and categorisation of biosecurity threats through a process of qualitative risk assessment. The primary goal is to coordinate identification of exotic pest threats that could impact on productivity, sustainability, and marketability and to assess their potential impacts. This plan strengthens risk assessment work already being done both interstate and overseas. Pest Risk Reviews have been included for individual pests where available. Key plant biosecurity threats are detailed in

Threat Summary Tables, along with the emergency plant pest priority list (the top ranked threats to the pineapple industry).
An Emergency Plant Pest Response Deed (EPPRD) has been negotiated between the government and industry members of PHA. As at October 2007, all state and territory governments, the Australian Government and fourteen plant industries had formally ratified the EPPRD. The EPPRD provides a formal mechanism for industry and governments to raise funds for the eradication of emergency pest incursions in a timely and efficient manner. The EPPRD is a binding legal document and includes the following key outcomes which have been endorsed by PHA members:

- cost minimisation for all parties
- early detection and response
- ensuring rapid responses to emergency plant pests – excluding weeds in the first instance
- ensuring decisions to eradicate are based on appropriate criteria (must be technically feasible and cost beneficial)
- an agreed list of potential emergency plant pests
- a commitment of all signatories to biosecurity and risk mitigation;
- cost sharing/payment of eligible costs
- a cap on contributions (based on local value of production)
- an effective industry/government decision-making process
- a limit in scope (to only cover emergency pest threats relevant to PHA member industries).

## Risk mitigation plan

This section provides a summary of activities to mitigate the impact of pest threats on the Australian pineapple industry, along with a set of guidelines for managing risk at all operational levels. Many pre-emptive practices can be adopted by plant industries and government agencies to reduce risks. These include:

- surveillance, awareness and training activities
- exclusion activities (e.g. restricting movement of planting material and machinery)
- selection of appropriate planting materials and cultivars
- destruction of crop residues
- control of vectors
- control of alternative hosts and weeds
- tillage practices
- post-harvest handling and produce transport procedures
- use of warning and information signs
- use of dedicated equipment when working in high risk areas
- restricting the use of high risk vehicles during high risk times
- reporting suspect pests to appropriate authorities
- including farm biosecurity in Industry Best Management Practice (IBMP) and Quality Assurance (QA) schemes.

## Contingency plans and response management arrangements

PHA has developed PLANTPLAN, a generic emergency response plan for the Australian plant industries. This plan details the operational procedures required and the organisations responsible in the event of an incursion of a high priority plant pest.

## Awareness material

Information on where to find further information on key identified threats to the Australian pineapple industry is provided within this Biosecurity Plan. Information on high priority plant pests will help increase industry awareness and promote rapid detection and eradication.

# Review processes

With the support of PHA, the IBG is responsible for reviewing this plan on a tri-annual basis. The review process will be used to determine:

- strategies to maximise the adoption of recommended practices
- where further improvements can be made
- revisions/updates to the plan
- where resources should be allocated to improve the plan.

# References

Australian Bureau of Statistics, *Agricultural Commodities Australia*, Cat. no. 7121.0, ABS, Canberra, ACT.

Lloyd, H. L. (1996). *Incursion management in Australian plant industries:* a report by the Plant Industries Sub-Committee of the SCARM Task Force on Incursion Management. Department of Primary Industries and Energy, Canberra, ACT.

Plant Health Australia. (2008) *PLANTPLAN: Australian Emergency Plant Pest Response Plan*. Version 1. Plant Health Australia, Canberra, ACT.

Plant Health AUSTRALIA

# BIOSECURITY PLAN FOR THE PINEAPPLE INDUSTRY

# THREAT IDENTIFICATION, PEST RISK REVIEWS AND INCURSION MANAGEMENT FUNDING ARRANGEMENTS



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# APPENDICES

# Acronyms

| | |
|---|---|
| AS/NZS | Australian Standard/New Zealand Standard |
| AQIS | Australian Quarantine and Inspection Service |
| DAFWA | Department of Agriculture and Food, Western Australia |
| DTQ | Disease Threat Questionnaire |
| EPPRD | Emergency Plant Pest Response Deed |
| IRA | Import Risk Assessment |
| PHA | Plant Health Australia |
| PTQ | Pest Threat Questionnaire |
| TST | Threat Summary Table |

**Note:** The definition of a pest as adopted by the International Plant Protection Convention (any species, strain or biotype of plant, animal, or pathogenic agent, injurious to plants or plant products) is used throughout this plan.

# Introduction

This section is designed to help identify high risk pest threats to the pineapple industry, and to present a framework for assessing the potential economic, social, and environmental impacts associated with each threat. A consistent approach to threat identification and risk assessment will provide a strong base for future risk management activities by facilitating a more coordinated and efficient approach.

Emergency plant pests are defined as those that meet one or more of the following criteria:

a) It is a known exotic plant pest, the economic consequences of an incident of which would be economically or otherwise harmful for Australia, and for which it is considered to be in the regional or national interest to be free of the plant pest.

b) It is a variant form of an established plant pest which can be distinguished by appropriate investigative and diagnostic methods, and which if established in Australia, would have a regional or national impact.

c) It is a serious plant pest of unknown or uncertain origin which may, on the evidence available at the time, be an entirely new plant pest, and which if established in Australia would have an adverse economic impact regionally and or nationally.

d) It is a plant pest of potential economic importance to the area endangered thereby and not yet present there or widely distributed and being officially controlled, but is occurring in such a fulminant outbreak form, that an emergency response is required to ensure that there is not either a large scale epidemic of regional or national significance or serious loss of market access.

By identifying key threats a pre-emptive approach may be taken to risk management. Under this approach mechanisms can be put into place to increase the effectiveness of our response if pest incursions occur.

One such mechanism is the Emergency Plant Pest Response Deed (EPPRD) that has been negotiated between PHA's government and industry members. Once finalised, the EPPRD ensures reliable and agreed funding arrangements are in place in advance of emergency plant pest incursions, and assist in the response to emergency plant pest incursions, particularly those identified as key threats.

Identification of high risk pests will also assist in the implementation of effective grower and community awareness campaigns, targeted biosecurity education and training programs for growers and diagnosticians, and development of pest-specific incursion response plans.

## Threat identification

Information on biosecurity threats to the pineapple industry described in this document came from a combination of:

- An Import Risk Assessment (IRA) for pineapples
- past records
- existing industry protection plans
- relevant experience
- industry practice and experience
- relevant published literature

- local industry and overseas research
- economic models
- specialist and expert judgment.

At this time, only invertebrate pests (insects/mites) and pathogens (disease causing organisms) have been identified, although the issue of weeds may be revisited through reviews of this plan.

## Ranking pest threats

Key questions required for ranking the importance of pests include the following:

- What are the probabilities of entry, establishment, and spread, for each pest?
- What are the likely impacts of the pest on cost of production, overall productivity, and market access?
- How difficult is each organism to identify and control and/or eradicate?

The Threat Summary Tables (TSTs) presented at Appendix 1 list potential exotic pest threats to the pineapple industry and provide summarised information on entry, establishment and spread potential, consequences of establishment, and eradication potential (where available).

The most serious threats from the TSTs were identified through a process of qualitative risk assessment and are listed in Table 1. All threats listed in Table 1 are exotic pests not currently found in Australia. At the time of preparation of this Biosecurity Plan, there were no pests of the pineapple industry under active control.

## Pest and Disease Threat Questionnaire scores

The Pest Threat Questionnaire (PTQ) system was developed by the Department of Agriculture and Food, Western Australia (DAFWA) to rank the relative importance of quarantine threats for that state.

In conjunction with the DAFWA, PHA has developed a web based PTQ and Disease Threat Questionnaire (DTQ) system for ranking the relative importance of threats at a national level.

The PTQ can be found at www.planthealthaustralia.com.au/PTQ
The DTQ can be found at www.planthealthaustralia.com.au/DTQ

Generation of a PTQ or DTQ score involves a number of experts answering multiple choice questions on particular pests. The DTQ or PTQ score is calculated based on combined questionnaire responses (which carry different numerical weightings). Through this process, high priority pests are identified and targeted for further in-depth risk assessment and the development of specific risk management strategies (as required).

# Emergency plant pest priority list

**Table 1:** *Emergency plant pest priority list*

This table provides the top ranked pest threats to the pineapple industry (see end of Table 2 for legend). Pests are listed alphabetically by scientific name. Additional pest-specific information is provided in the Threat Summary Tables at Appendix 1. Assessments may change given more detailed research, and the priority list will be reviewed at least annually.

| Common name | Scientific name | Primary host | Plant part affected | Entry potential | Establishment potential | Spread potential | Economic impact | Risk |
|---|---|---|---|---|---|---|---|---|
| False codling moth; bollworm | *Cryptophlebia leucotreta or Argyroploce leucotreta; Cryptophlebia roerigi; Thaumatotibia roerigii; Olethreutes leucotreta* | | Fruit, leaves and seeds. | High | High | High | High | Medium |
| Grey pineapple mealybug; annona mealybug | *Dysmicoccus neobrevipes* | | Fruit and leaves | Medium | High | High | High | Medium |
| Bacterial fruit collapse | *Erwinia chrysanthemi* (distinct pathovar) | | Whole plant | High | High | High | High | High |
| Fusariosis | *Fusarium guttiforme* | | *Whole plant. Causal agent of gummosis* | *High* | *High* | *High* | *High* | *High* |
| Pineapple fruit borer | *Strymon megarus* or *Thecla basilides* | | Fruit and leaves Associated with spread of fusariosis. | Low | Medium | Medium | Medium | Low |

**Note:** See end of following table for legend

| Entry Potential | |
|---|---|
| Negligible | probability of entry is extremely low given the combination of factors including the distribution of the pest source, management practices applied, low probability of pest survival in transit. |
| Low | probability of entry is low, but clearly possible given the expected combination of factors described above. |
| Medium | pest entry is likely given the combination of factors described above. |
| High | pest entry is very likely or certain given the combination of factors described above. |
| Unknown | pest entry potential is unknown or very little of value is known. |

| Establishment Potential | |
|---|---|
| Negligible | the pest has no potential to survive and become established. |
| Low | the pest has the potential to survive and become established in approximately one third or less of the range of hosts. Could have a low probability of contact with susceptible hosts. |
| Medium | the pest has the potential to survive and become established in between approximately one-third and two thirds of the range of hosts. |
| High | the pest has potential to survive and become established throughout most or all of the range of hosts. Distribution is not limited by environmental conditions that prevail in Australia. Based upon its current world distribution, and known conditions of survival, it is likely to survive in Australia wherever major hosts are grown. |
| Unknown | the establishment potential of the pest is unknown or very little of value is known. |

| Spread Potential | |
|---|---|
| Negligible | the pest has no potential for natural spread. |
| Low | the pest has potential for natural spread locally. |
| Medium | the pest has potential for natural spread throughout a physiographic region. |
| High | the pest has potential for natural spread to all production areas. |
| Unknown | spread potential is unknown or very little of value is known. |

| Economic Impact | |
|---|---|
| Negligible | there is no impact on yield, host longevity, production costs or storage. |
| Low | there is minor impact on standing crop and little effect on stored product. |
| Medium | there is moderate impact on crops, but host mortality is rare, storage losses may occur. |
| High | there is severe impact on standing crop, with significant host mortality and/or storage losses. |
| Extreme | there is extreme impact on standing crop, with extreme host mortality and/or storage losses. |
| Unknown | the economic potential of the pest is unknown or very little of value is known. |

# Pest Risk Reviews

The objective of risk analysis is to clearly identify and classify biosecurity risks and to provide data to assist in the evaluation and treatment of these risks. Risk analysis involves consideration of the sources of risk, their consequences, and the likelihood that those consequences may occur. Factors that affect the consequences and likelihood may be identified and addressed via risk mitigation strategies.

Risk analysis may be undertaken to various degrees of refinement, depending on the risk information and data available. Analysis may be qualitative, semi-quantitative, quantitative, or a combination of these. The complexity and cost of analyses increase with the production of more quantitative data. It is often more practical to first obtain a general indication of the level of risk through qualitative risk analysis, and if necessary, undertake more specific quantitative analysis later (AS/NZS-4360, 1999).

When a risk analysis is performed, it is important to document the type of analysis used, the level of confidence in the analysis, and any areas where assumptions have been made or where information is limited or unavailable. The steps listed below, which follow Biosecurity Australia's *Draft Guidelines for Import Risk Analysis* (2001), provide an outline of the qualitative pest risk assessment process. Refer to Biosecurity Australia (2001) for further detail if required.

The determination of entry potential in this document takes into account all possible pathways including legal and illegal importation of budwood or fruit and the possibility of introduction through natural means such as wind. This scope is wider than the scope used by Biosecurity Australia in their Import Risk Assessments. The two approaches use similar underlying methodology, however due to the differences in the scope of consideration, risk outcomes may be different.

At the time of preparing this Industry Biosecurity Plan for the Pineapple Industry, Pest Risk Reviews for key threats to the pineapple industry had not been produced.

## Step 1 - Clearly identify the pest

It is important to clearly define the identity of the pest for which the risk assessment is being performed, so that it is not confused with other pests. The generally accepted unit for defining the pest is its scientific name. A broader grouping than species may be used in some circumstances, for example when carrying out a risk assessment for a group of closely related species. Alternatively, in some cases the unit for defining a pest may be more narrowly defined, for example a sub-type within a species (e.g. subspecies, race, pathovar). In such cases there must be evidence that factors, such as differences in host range, pathogenicity or vector relationship, that make that sub-type distinct from others in terms of biosecurity significance (Biosecurity Australia, 2001).

## Step 2 – Assess the likelihood of entry, establishment and spread

It is likely that a combination of qualitative and quantitative data will be used to assess the likelihood or potential of an exotic incursion and its establishment. The likelihoods of entry, establishment and spread should be rated separately, noting any limitations or comments that may help in further refinement of the rating given. Table 2 defines the different risk level ratings that may be allocated (Biosecurity Australia, 2001).

After each risk area has been rated individually, a combined risk rating should be determined using the qualitative risk analysis matrix presented in Table 3. Again any important assumptions or limitations should be noted (Biosecurity Australia, 2001).

**Table 2:** *Factors used to rate the likelihood or potential of a pest incursion*

| Likelihood or potential | Qualitative ratings | Statistical probability of occurrence |
|---|---|---|
| Entry potential, establishment potential and spread potential | High | Range = 0.7 to 1 |
| | Medium | Range = 0.3 to 0.7 |
| | Low | Range = 0.05 to 0.3 |
| | Very low | Range = 0.001 to 0.05 |
| | Extremely low | Range = 10-6 to 0.001 |
| | Negligible | Range = 0 to 10-6 |
| | Unknown | n/a |

From Biosecurity Australia (2001)

**Table 3** *Combining qualitative risk ratings*

| | Likelihood | | | | | |
|---|---|---|---|---|---|---|
| **Likelihood** | **Negligible (N)** | **Extremely low (EL)** | **Very low (VL)** | **Low (L)** | **Moderate (M)** | **High (H)** |
| **High** | **N** | **EL** | **VL** | **L** | **M** | **H** |
| **Moderate** | **N** | **EL** | **VL** | **L** | **L** | **M** |
| **Low** | **N** | **EL** | **VL** | **VL** | **L** | **L** |
| **Very low** | **N** | **EL** | **EL** | **VL** | **VL** | **VL** |
| **Extremely low** | **N** | **N** | **EL** | **EL** | **EL** | **EL** |
| **Negligible** | **N** | **N** | **N** | **N** | **N** | **N** |

From Biosecurity Australia (2001)

## Step 3 – Assess the likely consequences

The most obvious consequence of a pest introduction is the economic impact it may have on an industry and local communities. Environmental and social impact ratings are also important to consider, as they help to determine the level of responsibility and the cost-sharing arrangements that may be involved in managing the risk. Whilst economic impacts may sometimes be expressed numerically, qualitative impact ratings can be used in place of numerical data if necessary.

Table 4 defines the categories for rating economic, environmental, and social impacts (Biosecurity Australia, 2001).

**Table 4** *Factors used to rate the consequences of a pest incursion*

| Impact rating | Definition |
|---|---|
| Unlikely to be discernible | Not usually distinguishable from normal variation in the criterion. |
| Minor | Not expected to threaten economic viability, but would cause a minor increase in mortality/morbidity or a minor decrease in production. For non-commercial factors, impact not expected to threaten the intrinsic 'value' of the criterion, but the value would be considered as 'disturbed'. These effects would generally be reversible. |
| Significant | Would threaten economic viability through a moderate increase in mortality/morbidity or moderate decrease in production. For non-commercial factors, the intrinsic 'value' of the criterion would be significantly diminished or threatened. Effects may not be reversible. |
| Highly significant | Would threaten economic viability through a large increase in mortality/morbidity, or a large decrease in production. For non-commercial factors, the intrinsic 'value' of the criterion would be considered as severely or irreversibly damaged. |

From Biosecurity Australia (2001)

Economic, environmental, and social impacts should be assessed individually, and should be calculated for each of four geographic and/or geopolitical scales: local areas (i.e. rural communities, towns, or local government areas); districts (i.e. recognised sections of states, such as 'North West Slopes and Plains' and 'Far North Queensland'); regions (i.e. collections of districts – generally states), and; Australia as a whole (Biosecurity Australia, 2001).

These values are then translated to an 'impact score' (range A-F) according to the guidelines in Table 5.

**Table 5:** *Assessing consequences for pest incursions at local, district, regional, and national levels*

| Scale | Consequence ratings | | | | | |
|---|---|---|---|---|---|---|
| **National** | Unlikely to be discernible | Unlikely to be discernible | Unlikely to be discernible | Minor | Significant | Highly significant |
| **Regional** | Unlikely to be discernible | Unlikely to be discernible | Minor | Significant | Highly significant | Highly significant |
| **District** | Unlikely to be discernible | Minor | Significant | Highly significant | Highly significant | Highly significant |
| **Local** | Minor | Significant | Highly significant | Highly significant | Highly significant | Highly significant |
| **Impact score** | **A** | **B** | **C** | **D** | **E** | **F** |

From Biosecurity Australia (2001)

### Combine individual consequence ratings to produce an overall consequence rating for a specific pest

Where numerical data are used in risk assessment, the overall consequences for a particular pest can be calculated by simply summing the values. However if, as is more often the case, a qualitative evaluation has been used to rate economic, social or environmental impacts, it is not possible to simply sum the outcomes to determine the overall impact of a pest across these categories. The following rules have been developed by (Biosecurity Australia, 2001) to perform

a similar function and should instead be used to obtain an approximate impact evaluation. These rules are mutually exclusive and should be addressed in order, until one is found to apply.

1. Where the consequence of a pest for any direct or indirect criterion is rated as 'F', the overall consequences are considered to be 'extreme'.
2. Where the consequences of a pest are rated as 'E' for more than one criterion, the overall consequences are considered to be 'extreme'.
3. Where one consequence is rated 'E' and all others are rated 'D', the overall consequences are considered to be 'high'.
4. Where one consequence is rated 'E' and all others are not unanimously rated 'D', the overall consequences are considered to be 'high'.
5. Where all consequences are rated 'D', the overall consequences are considered to be 'high'.
6. When the consequences of at least one criterion are rated 'D', the overall consequences are considered to be 'moderate'.
7. Where all consequences are rated 'C', the overall consequences are considered to be 'moderate'.
8. Where the consequences of a pest are rated as 'C' for one or more criteria, the overall consequences are considered to be 'low'.
9. Where the consequences for all criteria are rated as 'B', the overall consequences are considered to be 'low'.
10. Where the consequences for one or more criteria are considered 'B', the overall consequences are considered to be 'very low'.
11. Where the consequences for all criteria are rated 'A', the overall consequences are considered to be 'negligible'.

## Step 4 – Derive an overall risk estimate by combining the likelihood and consequence ratings

Once the probabilities of entry, establishment and spread have been calculated for the pest, and an assessment of the likely consequences has been made, this information can be combined to achieve a risk estimate. This may be done mathematically for numerical data, however a set of 'decision rules' are required in order to combine qualitative rankings (Biosecurity Australia, 2001). Table 6 summarises decision rules for combining the qualitative likelihood and consequence ratings described in this document.

**Table 6:** *Risk estimation matrix*

| Likelihoods of entry, establishment and spread | Consequences of entry, establishment and spread | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Negligible impact** | **Very low impact** | **Low impact** | **Moderate impact** | **High impact** | **Extreme impact** |
| **High likelihood** | **Negligible risk** | **Very low risk** | **Low risk** | **Moderate risk** | **High risk** | **Extreme risk** |
| **Moderate likelihood** | **Negligible risk** | **Very low risk** | **Low risk** | **Moderate risk** | **High risk** | **Extreme risk** |
| **Low likelihood** | **Negligible risk** | **Negligible risk** | **Very low risk** | **Low risk** | **Moderate risk** | **High risk** |
| **Very low likelihood** | **Negligible risk** | **Negligible risk** | **Negligible risk** | **Very low risk** | **Low risk** | **Moderate risk** |
| **Extremely low likelihood** | **Negligible risk** | **Negligible risk** | **Negligible risk** | **Negligible risk** | **Very low risk** | **Low risk** |
| **Negligible likelihood** | **Negligible risk** | **Negligible risk** | **Negligible risk** | **Negligible risk** | **Negligible risk** | **Very low risk** |

From Biosecurity Australia (2001)

### Definition of risk categories with respect to risk management

- **Extreme risk** – specific action is required immediately to reduce risk.
- **High risk** – specific action is required. Generic risk mitigation plans should be adopted as soon as possible in the interim to increase the level of protection.
- **Moderate risk** – the current level of risk protection is insufficient. Appropriate risk reduction measures need to be identified and applied.
- **Low risk** – the current level of risk protection is insufficient. Appropriate risk reduction measures need to be identified and applied.
- **Very low risk** – an acceptable level of risk protection is in place. Additional risk management measures are not required.
- **Negligible risk** – an acceptable level of risk protection is in place for this threat. Risk management measures should be reviewed to ensure that they are justifiable.

## Step 5 – Review the risks

Risks will change over time and may become more or less important based on changing technology, practices, legislation and policy. A process to identify new threats and to reassess the risk of existing threats facing the industry will be undertaken regularly as part of the review process of this plan. This will help ensure all threats have been identified and appropriately prioritised, with suitable risk mitigation strategies in place. It is recommended that these reviews be undertaken at least annually.

# Formal categorisation of pests for inclusion in the industry/government Emergency Plant Pest Response Deed

The following section outlines the Emergency Plant Pest Response Deed between government and industry members of PHA, and as such is subject to change until the deed has been formally ratified. The Deed aims to minimise the impact of emergency plant pests by establishing an industry/government agreement to cover eradication of emergency pests, reducing delays in securing funding, providing industry with greater involvement in eradication efforts, and removing disincentives to report emergency pests.

Only the response to emergency pests will be covered by the Deed. Industry and government will share the total cost of an approved emergency plant pest response based on pre-agreed funding categories. These categories determine the contributions that each party will pay, based on the relative public and private benefits to be obtained from eradication. Four funding categories are included in the Deed.

**Table 7:** *Cost sharing categories*

| Category | Description | Funding share |
|---|---|---|
| Category 1: Very high public benefits | Pest which if not eradicated would:<br>▪ cause major environmental damage to natural ecosystems; and/or<br>▪ potentially affect human health or cause a major nuisance to humans; and/or<br>▪ cause significant damage to amenity flora; and<br>▪ have relatively little impact on commercial crops.<br>This category also covers situations where the pest has a very wide range of hosts including native flora and there is considerable uncertainty as to the relative impacts on the different crops. In short, it is almost impossible to properly determine which industries benefit from eradication and to what extent, and in any case, the incursion primarily affects native flora and/or amenity plants, and/or is a major nuisance if not a health risk to humans. | 100 per cent public funding |
| Category 2: High public benefits | Pest which if not eradicated would:<br>▪ cause significant public losses either directly through serious loss of amenity, and/or environmental values and/or effects on households, or indirectly through very severe economic impacts on regions and the national economy, through large trade losses with flow on effects through the economy; and<br>▪ also impose major costs on the industries concerned so that these industries would significantly benefit from eradication. | 80 per cent public funding, 20 per cent private funding |

| Category | Description | Funding share |
|---|---|---|
| Category 3:<br><br>Moderate public benefits | Pest which if not eradicated would:<br><br>▪ primarily harm the industries concerned but there would also be some significant public costs as well (that is, moderate public benefits from eradication). In this case the pest could adversely affect public amenities, households or the environment, and/or could have significant, though moderate trade implications and/or national and regional economic implications. | 50 per cent public, 50 per cent private funding |
| Category 4: Mostly if not wholly private benefits | Pest which if not eradicated would:<br><br>▪ have little or no public cost implications and little or no impacts on natural ecosystems. The affected commercial industries would be adversely affected primarily through additional costs of production, through extra control costs or nuisance costs; and<br><br>▪ generally there would be no significant trade issues that would affect national and regional economies. | 80 per cent private funding, 20 per cent public funding |

## Pest categorisation

Exotic organisms listed in the emergency plant pest priority list may be put forward for categorisation and inclusion in the schedules to the Deed. Other organisms identified in TSTs or identified via other means as being priority pests, may also be categorised if required.

Organisms that enter Australia, but which have not been formally categorised will be treated as belonging to Category 3 until formally categorised.

A Categorisation Group determines the category that applies to high priority pests. Only emergency plant pests that have a high impact or establishment potential are considered for categorisation. Taking into account relevant scientific and other knowledge and experience the Categorisation Group will consider requests for pest categorisation, undertake reviews of pest categorisation, or remove pests from priority lists.

When more than one industry is affected by an emergency plant pest, the Categorisation Group will also determine, and where requested review, the funding weight for determining industry cost shares. Funding weights provide a means for calculating each industry's contributions if a pest affects multiple industry parties.

At the time of preparing this Biosecurity Plan, the only high priority pest for the pineapple industry that had received formal pest categorisation was the False Codling Moth *(Cryptophlebia leucotreta).* This pest has been rated as Category 2.

Figure 1 outlines the decision-making process for pest categorisation.

## Composition of the categorisation group

Membership of the Categorisation Group will comprise (at a minimum):

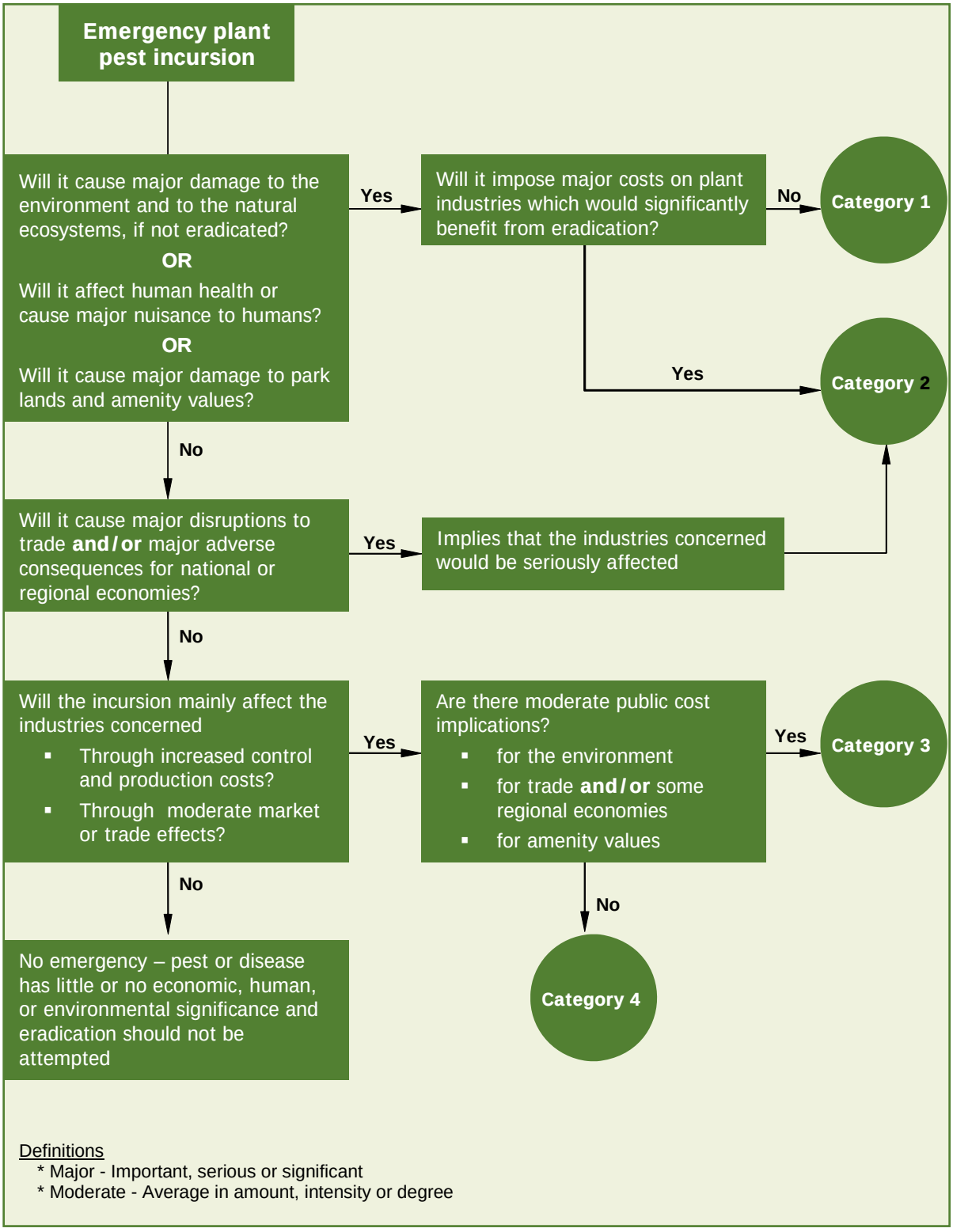
- an independent chair from PHA
- a standing representative of industry parties
- three technical experts [people with specific expertise in the areas of plant pathology or entomology], one nominated by the Australian Government, one nominated by the states/territories and one nominated by plant industry(s)
- a person with relevant economic expertise including social, trade and regional impact assessment
- a nominee from each plant industry or industries affected by the emergency plant pest being categorised.

The Categorisation Group may also seek advice from:

- a person with human health expertise, if a public health risk may exist
- a conservation representative or
- other relevant members determined by the independent chair.

Advisers who have specific expertise may accompany members, but will not be part of the decision-making process

**Figure 1:** *Pest categorisation decision tree*



# References

AS/NZS-4360. (1999). Risk Management Standards Association of Australia, Strathfield, NSW.

Biosecurity Australia. (2001) *Guidelines for Import Risk Analysis: Draft September 2001*. Department of Agriculture, Fisheries and Forestry – Australia, Barton, ACT.

# Appendix 1: Threat Summary Tables

## Insects

Information provided below is a basic overview and may change given further research or if new information comes to hand.

| Scientific name | Common Name | Plant part affected | Distribution | Entry potential | Establishment potential | Spread potential | Economic impact | Risk Estimate |
|---|---|---|---|---|---|---|---|---|
| **Arthropoda** | | | | | | | | |
| *Adoretus tessulatus* | Pineapple white grub | This species feeds on the roots (Petty, 1976). | South Africa (Petty, 1977) | Low | Low | Low | Low | Negligible |
| *Anomocaulus fulvovestitus* | Pineapple borer | Feeds on leaf bases and stems (Swain, 1971; Watt, 1986). | Fiji (Endrödi, 1985; MAF NZ, 1999a; Swain, 1971; Watt, 1986) | Low | Low | | | Negligible |
| *Baris sp.* | Weevil | This weevil feeds on the fruit, causing gummosis (Martínez, 1976). | Venezuela (Martínez, 1976) | Low | Low | Low | Low | Negligible |
| *Barybus sp.* | Weevil | This weevil feeds on the fruit (Bachli & Redmond, 1997). | El Salvador (Bachli & Redmond, 1997) | Low | Low | Low | Low | Negligible |
| *Batrachedra mathesoni* | Moth | This species feeds on the fruit at flowering stage, causes gummosis (Nakasone & Paull, 1998; Perez, 1957, 1959). | Caribbean Region (Nakasone & Paull, 1998; Rohrbach, 1983) | Low | Low | Low | Low | Negligible |
| *Castnia penelope* or *Castnia icarus* | Moth | Larvae feed on leaves and stems. | Brazil (Schotman, 1989) | Low | Low | Medium | Medium | Very Low |
| *Chelacheles sp.* | Mite | This species is a predatory mite (Volgin, 1989). | Brazil (Sanches & Flechtmann, 1982) | Low | | | | Negligible |

| Scientific name | Common Name | Plant part affected | Distribution | Entry potential | Establishment potential | Spread potential | Economic impact | Risk Estimate |
|---|---|---|---|---|---|---|---|---|
| *Cholus spinipes* or *Cholus wattsi* | Weevil | This weevil feeds on the fruit, stalk and leaves (Marshall, 1922). | Grenada (Marshall, 1922; O'Brien, 1994; Schotman, 1989) | Low | Low | Low | Medium | Negligible |
| *Cholus vaurieae* | Weevil | This weevil feeds on the fruit, stalk and leaves (O'Brien, 1994). | Venezuela (O'Brien 1994; Salas & O'Brien, 1997) | Low | Low | Medium | Medium | Very Low |
| *Cholus zonatus* or *Polyderces zonatus* | Weevil | This weevil feeds on fruit (Schotman, 1989). | Martinique, Saint Lucia (Schotman 1989) | Low | Low | Low | Low | Negligible |
| *Colaspis sp.* | Beetle | This species potentially feeds on fruit and leaves (Bachli & Redmond, 1997). | El Salvador (Bachli & Redmond, 1997) | Low | Low | Low | Low | Negligible |
| *Cotinis mutablis* or *Cotinus mutabilis* | Fig beetle | Adults feed on fruit and larvae damage roots (Camino-Lavin *et al*., 1996; Moron & Deloya, 1991). | El Salvador (McGuire & Crandall, 1967); Mexico (Deuve, 1992); United States (Thomas, 1981) | Low | Medium | High | High | Low |
| *Cryptophlebia leucotreta* or *Argyroploce leucotreta; Cryptophlebia roerigi*; *Thaumatotibia roerigii*; *Olethreutes leucotreta* | False codling moth; bollworm | The false codling moth feeds on fruit (Pinhey, 1975).Leaves and seeds. | Angola, Benin, Burkina Faso, Burundi, Cameroon, Chad, Congo Democratic Republic, Côte d'Ivoire, Ethiopia, Gambia, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritius, Mozambique, Niger, Nigeria, Rwanda, Réunion, Saint Helena, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe (CIE, 1976); Israel (Wysoki, 1986) | Medium | High | High | High | Medium |
| *Diaspis boisduvalii* | Boisduval scale | | Bermuda, Mexico, Antigua and Barbuda, Barbados, Dominica, Guadeloupe, Jamaica, Martinique, Puerto Rico, Saint Kitts and Nevis, French Guiana, Guyana. (CAB International, 2007) | Low | | | Low | Negligible |
| *Dolichotetranychus vandergooti* [Acarina: Tenuipalpidae] | Perianth mite | The perianth mite feeds on leaves (Yunus & Ho, 1980). | India (Sathiamma, 1985); Malaysia (Yunus & Ho, 1980) | Low | | | | Negligible |

| Scientific name | Common Name | Plant part affected | Distribution | Entry potential | Establishment potential | Spread potential | Economic impact | Risk Estimate |
|---|---|---|---|---|---|---|---|---|
| *Dysmicoccus grassii* or *Pseudococcus grassi*; *Dysmicoccus alazon* | Mealybug | Mealybugs feed on plant sap (leaves) and excrete a sugary liquid called honeydew. Fruit and leaves may be affected due to sooty mould fungus growing on the honeydew (Smith *et al*., 1997). | Bahamas, Belize, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Honduras, Mexico, Panama, Peru, Puerto Rico, Spain (Canary Islands), Trinidad (Ben-Dov, 1994) | Low | Low | Low | Low | Negligible * |
| *Dysmicoccus neobrevipes* | Grey pineapple mealybug; annona mealybug | The grey pineapple mealybug feeds on upper stem, inflorescence and fruit. (Beardsley, 1993; Ito, 1938). | American Samoa, Cook Islands, Costa Rica, Dominican Republic, Ecuador, El Salvador, Fiji, Guam, Guatemala, Haiti, Honduras, Jamaica, Kiribati (Gilbert Islands), Marshall Islands, Mexico, Northern Mariana Islands (Rota Island), Panama, Peru, Philippines, Puerto Rico, Suriname, Trinidad, Vietnam, Virgin Islands, Western Samoa (Ben-Dov, 1994); Italy (Tranfaglia, 1983); Malaysia (Lim, 1973); Thailand (Waterhouse, 1993); United States (Florida (Anon., 1979a), Hawaii (Beardsley *et al.*, 1982; Ben-Dov, 1994)) | Medium | High | High | High | Medium |
| *Euetheola bidentata* or *Dyscinetus bidentatus* | Bidentate scarab; rough-headed corn stalk borer | The bidentate scarab potentially feeds on leaves and stem. | Central America, French Guiana, Guyana, Mexico, Suriname; Trinidad and Tobago, United States, Venezuela (Schotman, 1989); Guatemala (Zoebelein, 1975) | Low | Unknown | Unknown | | Negligible |
| *Genopaschia promotis* | Moth | Only one reference in CAB International (2000) (i.e. Schotman, 1989) and this insect does not actually appear in the reference. | Dominica (Schotman, 1989) | Low | | | | Negligible |
| *Glycyphana sinuata* | Beetle | Reported as being associated with flowers and fruit (Yunus & Ho, 1980). | Malaysia (Yunus & Ho, 1980) | Low | Low | Low | Low | Negligible |
| *Gymnonerius fuscus* | Stilt fly | Reported as being associated with flowers and fruit (Yunus & Ho, | Malaysia (Yunus & Ho, 1980) | Negligible | Negligible | Low | Low | Negligible |

| Scientific name | Common Name | Plant part affected | Distribution | Entry potential | Establishment potential | Spread potential | Economic impact | Risk Estimate |
|---|---|---|---|---|---|---|---|---|
| | | 1980). | | | | | | |
| *Haptoncus luteolus* or *Epuraea luteola* | Pineapple sap beetle; souring beetle; dried fruit beetle | This beetle feeds on spoiled or damaged fruit. One record only (Yunus & Ho, 1980). | China (Li, 1981); India (Rathore & Sengar, 1972); Iraq (El-Haidari *et al*., 1981); Israel (Kehat *et al*., 1976); Italy (Ciampolini & Maiulini, 1991); Malaysia (Yunus & Ho, 1980); Saudi Arabia (Hammad *et al*., 1981); United States (Vincent & Lindgren, 1972) | Low | Low | Low | Negligible | Negligible |
| *Haptoncus mellitula* or *Haptoncus mundus* | Pineapple sap beetle; souring beetle; dried fruit beetle | This beetle feeds on spoiled or damaged fruit (BPI, 2000). | Philippines (BPI, 2000); United States (Hawaii) (Sharp, 1878) | Low | Low | Low | Negligible | Negligible |
| *Haptoncus ocularis* or *Epuraea ocularis* | Pineapple sap beetle; souring beetle; dried fruit beetle | This beetle feeds on spoiled or damaged fruit. One record only (Yunus & Ho, 1980). | Malaysia (Yunus & Ho, 1980); Spain (Canary Islands) (Jelinek, 1997); United States (Hawaii) (Rohrbach & Schmitt, 1994) | Low | Low | Low | Negligible | Negligible |
| *Hoplopothrips ananasi* or *Hoplothrips anasi* | Ananas thrips | The ananas thrips potentially feeds on flowers, fruit and leaves (Costa-Lima, 1935). | Brazil (Costa-Lima, 1935; Mound & Marullo, 1996); Ecuador (MAF NZ, 1999b); South America (Schotman, 1989) | Low | Low | Low | Negligible | Negligible |
| *Lagria villosa* | Beetle | Adults normally feed on pollen of flowers, but will also feed on similar materials, such as soybean dust. This beetle has been implicated as a carrier of *Fusarium moniliforme* to pineapple flowers (Costa & Lordello, 1988; Edwards, 1977). | Africa, Brazil (Clark, 1978; Costa & Lordello, 1988; Edwards, 1977) | Low | | | | Negligible |
| *Lybindus dichrous* | Bug | | Brazil (Costa & Lordello, 1988) | Low | Low | Low | Negligible | Negligible |

| Scientific name | Common Name | Plant part affected | Distribution | Entry potential | Establishment potential | Spread potential | Economic impact | Risk Estimate |
|---|---|---|---|---|---|---|---|---|
| *Melanaspis bromeliae* | Armoured scale | This scale feeds on fruit and leaves and produces yellow spots on leaves (BPI, 2000; Deitz & Davidson, 1986). | Micronesia, Federated States of (Caroline Islands), Northern Mariana Islands (Mariana Islands) (Nafus *et al.*, 1999); Philippines (BPI, 2000) | Low | Low | Medium | Low | Low |
| *Melanoloma canopilosum* | Pineapple fruit fly | The pineapple fruit fly feeds on fruit (Bello-Amez *et al*., 1997a). | Peru (Bello-Amez *et al.*, 1997a) | Low | Low | Medium | Low | Very Low |
| *Melanoloma viatrix* | Fly | This fly feeds on fruit (Arevalo-Penaranda & Osorio-Ospina, 1995). | Colombia (Arevalo-Penaranda & Osorio-Ospina, 1995) | Medium | Low | Medium | Low | Very Low |
| *Metamasius callizona or Metamasius callizoma* | Weevil | Not on pathway as this weevil attacks leaves and stems of host plants (Frank & Thomas, 2000). | Ecuador (MAF NZ, 1999b); Mexico, Guatemala, Panama, United States (Florida) (Frank & Thomas, 1994) | Low | | | | Negligible |
| *Metamasius dimidiatipensis* or *Metamasius dimidiatapennis* | Weevil | This weevil feeds on leaves and stems (Salas *et al.*, 1996; Schotman, 1989). | Trinidad and Tobago (Schotman, 1989); Venezuela (Salas *et al.*, 1996) | Low | | | | Negligible |
| *Metamasius ritchiei* | West Indian cane weevil | The West Indian cane weevil feeds on fruit (Marshall, 1916; Schotman, 1989). | Jamaica (Marshall, 1916; Schotman, 1989) | Low | Low | Low | Low | Negligible |
| *Metapocyrtus sp.* | Weevil borer; pineapple weevil | This weevil potentially feeds on leaves and stems. | Philippines (Stephens, 1984) | Medium | | | | Very Low |
| *Opogona sacchari* or *Opogona subcervinella*; *Hieroxestis ligniferella*; *Hieroxestis sanctaehelenae; Tinea subcervinella*; *Alucita sacchari*; *Hieroxestis plumipes*; *Hieroxestis* | Sugarcane moth; banana moth | Eggs are laid in crevices in plant tissues. Infests stems or sometimes leaves and petioles of ornamental plants, and the fruiting head (developing fruiting body) of bananas (CABI/EPPO, 1997). | Africa, Central America, Europe, North America, Barbados, Bermuda, Brazil, Caribbean, China, Honduras, Peru, United States (CAB International, 2000) | Medium | Medium | Medium | Low | Low |

| Scientific name | Common Name | Plant part affected | Distribution | Entry potential | Establishment potential | Spread potential | Economic impact | Risk Estimate |
|---|---|---|---|---|---|---|---|---|
| *subcervinella*; *Opogona sanctaebelenae* | | | | | | | | |
| *Orthezia praelonga* | Croton bug; horned lamellated scale | This species attacks leaves, twigs, fruits, and causes defoliation of a large number of plant species (Martins *et al*., 1989). | Antigua & Barbuda, Barbados, Curaçao, Grenada, Guyana, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Vincent, Suriname, Trinidad and Tobago (Schotman, 1989); Brazil (Cruz & Oliveira, 1979); Peru (Beingolea, 1971) | Low | Low | Low | Low | Negligible |
| *Oryctes rhinoceros* | Rhinoceros beetle | Adults feed on leaves (Bedford, 1980). | American Samoa, Burma, China (Hong Kong, Taiwan), Cocos (Keeling) Islands (Cocos Island), Fiji, India, Indonesia, Malaysia, Maldives (Maldive Islands), Mauritius, Pakistan, Palau, Papua New Guinea, Philippines, Réunion, Sri Lanka, Thailand, Tonga, Vietnam, Western Samoa (Bedford, 1980) Keppel Island | Low | | | | Negligible |
| *Paracoccus marginatus* | Papaya mealybug | Recorded feeding on above-ground parts of its hosts, particularly on leaves and fruit (general comment not specific to pineapples). May also affect other above-ground parts including flowers, shoots, stems, trunks and branches (CAB International, 2000; Miller *et al*., 2001). | Antigua and Barbuda (Pollard, 1999); Belize (Williams & Granara de Willink, 1992); British Virgin Islands (Pollard, 1999); Costa Rica (Williams & Granara de Willink, 1992); Cuba (Watson & Chandler, 2000); Dominican Republic (Pollard, 1999); French Guiana (Matile-Ferrero *et al*., 2001); Guadeloupe (Matile-Ferrero & Etienne, 1998) (Saint Martin (Pollard, 1999)); Guatemala (Williams & Granara de Willink, 1992); Haiti (Pollard, 1999); Mexico (Williams & Granara de Willink, 1992); Netherlands Antilles (Pollard, 1999); Puerto Rico (Pollard, 1999); Saint Kitts and Nevis (Pollard, 1999); United Kingdom (Cayman Islands) (Watson & Chandler, 2000); United States (Pollard, 1999); United States Virgin Islands (Pollard, 1999) | Medium | Low | Low | Low | Very Low |
| *Phenacoccus hargreavesi* or *Pseudococcus hargreavesi*; *Pseudococcus bukobensis*; | Mealybug | Mealybugs feed on plant sap (leaves) and excrete a sugary liquid called honeydew. Fruit and leaves may be affected due to sooty | Angola, Cameroon, Ghana, Côte d'Ivoire, Nigeria, Sudan, Tanzania, Uganda (Ben-Dov, 1994) | Medium | Low | Low | Low | Very Low |

| Scientific name | Common Name | Plant part affected | Distribution | Entry potential | Establishment potential | Spread potential | Economic impact | Risk Estimate |
|---|---|---|---|---|---|---|---|---|
| *Phenacoccus hargreavesi* | | mould fungus growing on the honeydew (Smith *et al*., 1997). | | | | | | |
| *Phenacoccus madeirensis* | Cassava mealybug | The cassava mealybug feeds on leaves and stems (CAB International, 2000). | Angola, Antigua, Bahamas, Barbados, Bermuda, Bolivia, Brazil, Cameroon, Cape Verde, Colombia, Costa Rica, Côte d'Ivoire, Cuba, Dominica, Dominican Republic, Ecuador, Gambia, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Italy, Jamaica, Liberia, Mexico, Montserrat, Mozambique, Nigeria, Panama, Paraguay, Peru, Portugal (Madeira), Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Senegal, Sierra Leone, Trinidad and Tobago, United Kingdom (Cayman Islands), United States, Venezuela, Virgin Islands, Zimbabwe (Ben-Dov, 1994) | Medium | Low | Low | Medium | Low |
| *Phenacoccus solani* | Solanum mealybug | The solanum mealybug potentially feeds on florets. | Brazil, Curacao, Ecuador, Guatemala, Kiribati (Gilbert Islands), Marshall Islands, Mexico, Peru, Puerto Rico, South Africa, Trinidad, United States (Hawaii), Venezuela, Zimbabwe (Ben-Dov, 1994); South Africa (Willers, 1992b) | Low | Low | Low | Low | Negligible |
| *Phyllocoptruta sakimurae* | Blister mite | Yes – The blister mite occurs in grooves in the skin of pineapple fruit. Feeding damage causes blisters/galls on the leaves (Amrine & Stasny, 1994; BPI, 2000; Keifer, 1966). | Philippines (BPI, 2000); United States (Hawaii) (Amrine & Stasny, 1994) | Low | Medium | Low | Low | Very Low |
| *Planococcoides njalensis* or *Pseudococcus njalensis*; *Pseudococcus exitiabilis* | West African cocoa mealybug | Mealybugs feed on plant sap (leaves) and excrete a sugary liquid called honeydew. Fruit and leaves may be affected due to sooty mould fungus growing on the honeydew (Smith *et al*., 1997). | Benin, Cameroon, Ghana, Guinea, Côte d'Ivoire, Liberia, Nigeria, Principe, São Tome, Sierra Leone, Togo, Zaire (Ben-Dov, 1994) | Low | Medium | Medium | Low | Very Low |

| Scientific name | Common Name | Plant part affected | Distribution | Entry potential | Establishment potential | Spread potential | Economic impact | Risk Estimate |
|---|---|---|---|---|---|---|---|---|
| *Pseudococcus jackbeardsleyi* | Jack Beardsley mealybug | No data available specifically for *P. jackbeardsleyi*. Mealybugs usually occur in protected areas on the host such as on the undersides of leaves, in the axils of leaves, and in cracks and crevices on the trunk (CAB International, 2000). They are usually most visible when females form white waxy ovisacs surrounding the body (CAB International, 2000). | Aruba, Bahamas, Barbados, Belize, Brazil, Canada, China (Taiwan), Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Grenada, Guatemala, Haiti, Honduras, Martinique, Mexico, Micronesia, Federated States of (Caroline Islands), Panama, Puerto Rico, Saint Martin, Singapore, Trinidad and Tobago, Turks and Caicos Islands, United States Virgin Islands, Venezuela (Gimpel & Miller, 1996); Bolivia, Guyana, Nicaragua (Williams & Granara de Willink, 1992); Brunei Darussalam, Indonesia, Malaysia, Papua New Guinea, Philippines, Thailand, Tuvalu (Williams, 1988); Jamaica (Beardsley, 1986); Kiribati (Williams & Watson, 1988b); United States (Gimpel & Miller, 1996; Nakahara, 1981) | Medium | Medium | Low | Low | Low |
| *Pyroderces rileyi* | Worm, pink | Fruit/pods | Thailand, Egypt, United States, Hawaii, Columbia (CAB International, 2007) | Low | | | | Negligible |
| *Schizotetranychus asparagi* | Pineapple mite | Leaves | Hawaii, USA, Germany, Portugal, The Netherlands and Puerto Rico | Low | Low | Low | Medium | Very Low |
| *Stephanoderes* sp. | Fruit borer | This beetle feeds on fruit (Yunus & Ho, 1980). | Malaysia (Yunus & Ho, 1980) | Low | Low | Low | Low | Negligible |
| *Strymon megarus* or *Thecla basilides* | Pineapple caterpillar; fruit boring caterpillar | The pineapple caterpillar feeds on fruit and leaves. Injuries to inflorescence and fruit provides site for infection for *Fusarium guttiforme* (Bello-Amez *et al.*, 1997b; Nakasone & Paull, 1998; Rhainds *et al.*, | Caribbean, Central America, Mexico, South America (Nakasone & Paull, 1998); Brazil (Sanches *et al.*, 1985); Costa Rica (Rhainds *et al.*, 1996); Trinidad (Marie, 1995) | Low | Medium | Medium | Medium | Low |

| Scientific name | Common Name | Plant part affected | Distribution | Entry potential | Establishment potential | Spread potential | Economic impact | Risk Estimate |
|---|---|---|---|---|---|---|---|---|
| | | 1996; Sanches *et al.*, 1985).<br>Spreads fusariosis. | | | | | | |
| *Thlastocoris laetus* | Bug | This bug feeds on the fruit (Couturier *et al.*, 1993). | Brazil; Peru, Venezuela (Brailovsky, 1990) | Low | Low | Low | Low | Negligible |
| **Nematoda** | | | | | | | | |
| *Helicotylenchus* spp. | Spiral nematode | This species is not on the pathway; feeds on the roots. | India (Nath *et al.*, 1997) | Low, due to minimal risk of soil as vector | | | | Negligible |
| *Meloidogyne acronea* or *Hypsoperine acronea; Hypsoperine (Hypsoperine) acronea* | African cotton root nematode | This species is not on the pathway; feeds on the roots. | Bolivia (Cabanillas, 1985); Malawi (restricted distribution) (Bridge *et al.*, 1976); South Africa (restricted distribution) (Coetzee, 1956) | Low, due to minimal risk of soil as vector | | | | Negligible |

**Note:** See end of following table for legend

# Pathogens

Information provided below is a basic overview and may change given further research or if new information comes to hand.

| Scientific name | Common name | Life form | Plant part affected | Distribution | Entry potential | Establishment potential | Spread potential | Economic impact | Risk |
|---|---|---|---|---|---|---|---|---|---|
| **Fungi** | | | | | | | | | |
| *Fusarium guttiforme* | Fusarium stem rot | | Whole plant. Causal agent of gummosis | Brazil (Laville, 1980); Paraguay, Uruguay and Bolivia (de Matos *et al.*, 1992; Ventura *et al*., 1993) | High | High | High | High | High |
| *Pythium hydnosporum* or *Artotrogus hydnosporum Pythium artotrogus* | | | This fungus is associated with roots (Plaats-Niterink, 1981). | United States (Hawaii) (Anon., 1960; Raabe *et al*., 1981; Sideris, 1932) | Low | | | | Negligible |
| *Pythium indigoferae* | | | This fungus is associated with roots (Raabe *et al*., 1981). | United States (Hawaii) (Anon., 1960; Raabe *et al*., 1981) | Low | | | | Negligible |
| *Pythium megalacanthum* | | | This fungus is associated with roots. | United States (Hawaii) (Anon., 1960; Raabe *et al*., 1981) | Low | | | | Negligible |
| **Bacteria** | | | | | | | | | |
| *Acetobacter oxydans* | Marbling | | | United States (Hawaii) (Rohrbach, 1989; Rohrbach & Pfeiffer, 1975) | Low | | | | Negligible |
| *Erwinia chrysanthemi* | Bacterial fruit collapse and heart rot | | Fruit | Brazil, Colombia, Costa Rica, Cuba, Guatemala, Hawaii, Honduras, Jamaica, Malaysia, Panama, Papua New Guinea, Philippines (Bradbury, 1986); India (CAB Abstracts) | High | High | High | High | High |

## Entry Potential

| | |
|---|---|
| ***Negligible*** | probability of entry is extremely low given the combination of factors including the distribution of the pest source, management practices applied, low probability of pest survival in transit. |
| ***Low*** | probability of entry is low, but clearly possible given the expected combination of factors described above. |
| ***Medium*** | pest entry is likely given the combination of factors described above. |
| ***High*** | pest entry is very likely or certain given the combination of factors described above. |
| ***Unknown*** | pest entry potential is unknown or very little of value is known. |

## Establishment Potential

| | |
|---|---|
| ***Negligible*** | the pest has no potential to survive and become established. |
| ***Low*** | the pest has the potential to survive and become established in approximately one third or less of the range of hosts. Could have a low probability of contact with susceptible hosts. |
| ***Medium*** | the pest has the potential to survive and become established in between approximately one-third and two thirds of the range of hosts. |
| ***High*** | the pest has potential to survive and become established throughout most or all of the range of hosts. Distribution is not limited by environmental conditions that prevail in Australia. Based upon its current world distribution, and known conditions of survival, it is likely to survive in Australia wherever major hosts are grown. |
| ***Unknown*** | the establishment potential of the pest is unknown or very little of value is known. |

## Spread Potential

| | |
|---|---|
| ***Negligible*** | the pest has no potential for natural spread. |
| ***Low*** | the pest has potential for natural spread locally. |
| ***Medium*** | the pest has potential for natural spread throughout a physiographic region. |
| ***High*** | the pest has potential for natural spread to all production areas. |
| ***Unknown*** | spread potential is unknown or very little of value is known. |

## Economic Impact

| | |
|---|---|
| ***Negligible*** | there is no impact on yield, host longevity, production costs or storage. |
| ***Low*** | there is minor impact on standing crop and little effect on stored product. |
| ***Medium*** | there is moderate impact on crops, but host mortality is rare, storage losses may occur. |
| ***High*** | there is severe impact on standing crop, with significant host mortality and/or storage losses. |
| ***Extreme*** | there is extreme impact on standing crop, with extreme host mortality and/or storage losses. |
| ***Unknown*** | the economic potential of the pest is unknown or very little of value is known. |

Plant Health AUSTRALIA

# BIOSECURITY PLAN FOR THE PINEAPPLE INDUSTRY

# RISK MITIGATION PLAN

Plant Health Australia is a peak national coordinating body for plant health in Australia. We commission projects and work with members to coordinate the development of national policy and capability to enhance the ability of Australian agriculture to respond effectively to plant pests, weeds and diseases.

**For more information on Plant Health Australia**

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An electronic copy of this plan is available from the web site listed above.



PI06003: This project was facilitated by HAL in partnership with the pineapple industry. It was funded by voluntary contributions from Growcom and Plant Health Australia. The Australian Government provides matched funding for all HAL's R&D activities.

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## TABLES

# Acronyms

| | |
|---|---|
| APVMA | Australian Pesticides and Veterinary Medicines Authority |
| AQIS | Australian Quarantine and Inspection Service |
| BA | Biosecurity Australia |
| DAFF | Department of Agriculture, Fisheries and Forestry |
| DQMAWG | Domestic Quarantine and Market Access Working Group |
| HACCP | Hazard Analysis and Critical Control Point (Food Safety Certification) |
| IBMP | Industry Best Management Practice |
| IPM | Integrated Pest Management |
| IPPC | International Plant Protection Convention |
| IRA | Import Risk Analysis |
| NAQS | Northern Australian Quarantine Strategy |
| OCPPO | Office of the Chief Plant Protection Officer |
| PHA | Plant Health Australia |
| QA | Quality Assurance |
| SPS | Sanitary and Phytosanitary |
| SQF | Safe Quality Food |
| WTO | World Trade Organization |
| WQA | Woolworths Quality Assurance |

**Note:** The definition of a pest as adopted by the International Plant Protection Convention (any species, strain or biotype of plant, animal, or pathogenic agent, injurious to plants or plant products) is used throughout this plan.

# Introduction

There are a number of strategies that can be adopted to help protect and minimise the risks of exotic and emergency pests under International Plant Protection Convention (IPPC) standards (https://www.ippc.int/IPP/En/default.jsp), Commonwealth and State Legislation.

Many pre-emptive practices can be adopted to reduce the risk of exotic pest movement for the pineapple industry. Such risk mitigation practices are the responsibility of governments, industry and the community.

A number of key risk mitigation areas are outlined in this section, along with summaries of the roles and responsibilities of the Australian Government, state/territory governments, and pineapple industry members. This section is to be used as a guide outlining possible activities that may be adopted by Industry and growers to minimise and manage biosecurity risks. Each grower will need to evaluate the efficacy of each activity for their situation.

Risk mitigation activities include:

- surveillance, awareness and training activities on biosecurity best practice, identification of key pest threats and reporting of suspected pest incursion
- exclusion activities (e.g. restricting movement of planting material and machinery)
- selection and preparation of appropriate planting materials
- destruction of crop residues
- control of vectors
- control of alternative hosts and weeds
- tillage practices
- produce transport procedures
- use of warning and information signs
- use of dedicated equipment when working in high risk areas
- restricting the use of high risk vehicles during high risk times
- reporting suspect pests to appropriate authorities
- including farm biosecurity in Industry Best Management Practice (IBMP) and Quality Assurance (QA) schemes
- research and development.

# Barrier quarantine

Barrier quarantine should be implemented at all levels of the pineapple industry including at the national, state, regional, and farm levels.

## National level – importation restrictions

| | | |
|---|---|---|
| **Responsibility** | ▪ | Australian Government |

The Department of Agriculture, Fisheries and Forestry (DAFF) is the Australian Government Department responsible for maintaining and improving international trade and market access opportunities for agriculture, fisheries, forestry, and food industries (with FSANZS). DAFF achieves this through establishment of scientifically based quarantine policies, provision of effective technical advice and export certification services, negotiations with key trading partners, participation in multilateral forums and international sanitary and phytosanitary (SPS) agreements. The SPS agreements are delivered through the International Plant Protection Convention (IPPC) standard setting organisations, and collaboration with portfolio industries and exporters. DAFF also undertakes research to improve policies and procedures for protecting Australia's animal and plant health and natural environment, and provides technical assistance to further Australia's export market access program. Further information can be found at http://www.daff.gov.au

Biosecurity Australia (BA) is a part of DAFF and plays a key role in import regulation providing advice to other sections of DAFF developing regulation policy. The BA address is http://www.daffa.gov.au/ba. BA undertakes Import Risk Analyses (IRAs) in accordance with the IPPC, and provides advice to AQIS for the development and implementation of policy and conditions for imports and exports of plants and plant products. BA consults with industry and the community, and the process of undertaking IRAs can be found at http://www.daffa.gov.au/ba/ira/process-handbook. BA also facilitates research as required to undertake IRAs. In addition, BA assists Australia's technical market access program by negotiating quarantine conditions to meet other countries' import requirements for Australian animals and plants.

The Australian Quarantine and Inspection Service (AQIS) under the *Quarantine Act 1908* has responsibility for quarantine implementation at the national borders.

For all import conditions for pineapples (*Ananas spp.*) see:
http://www.aqis.gov.au/icon32/asp/ex_QueryResults.asp?Commodity=Pineapples&Area=All+Countries&EndUse=All+End+Uses&QueryType=Search

More information on AQIS and import/export quarantine requirements is available on the internet at www.aqis.gov.au

Any machinery or equipment being imported into Australia must also meet quarantine requirements. If there is any uncertainty, contact AQIS on (02) 6272 3933 or 1800 020 504.

If in doubt about whether something being brought back from overseas may pose a biosecurity risk, declare it to AQIS.

# State level – movement restrictions

| | | |
|---|---|---|
| **Responsibility** | ▪ | state and territory governments |

Each state has quarantine legislation in place to control the importation of plant material and to manage agreed pests if an incursion occurs. Before moving pineapples or nursery or garden plants interstate a permit must be obtained from the appropriate authority (see Table 1). Advice can be obtained by contacting your local state or territory agriculture agency directly, or by telephoning the Quarantine Domestic Hotline on 1800 084 881.

Further regulations have been put in place in response to specific pest threats and these are regularly reviewed and updated by the Domestic Quarantine and Market Access Working Group (DQMAWG).

**Table 1:** *Controls on interstate and interregional movement of farm or garden plants*

| State | Legislation | Administering authority |
|---|---|---|
| ACT | *Plant Diseases Act 2002* | Environment ACT |
| NSW | *Plant Diseases Act 1924* | New South Wales Department of Primary Industries |
| NT | *Plant Diseases Control Act 2000* | Department of Primary Industry, Fisheries and Mines |
| Qld | *Plant Protection Act 1989* | Department of Primary Industries and Fisheries, Queensland (DPI&F) |
| SA | *Fruit and Plant Protection Act 1992*<br>*Plant Health Bill 2007 (Draft only)* | Department of Primary Industries and Resources South Australia (PIRSA) |
| Tas | *Plant Quarantine Act 1997* | Department of Primary Industries, Water and Environment - Tasmania (DPIWE) |
| Vic | *Plant Health and Plant Products Act 1995*<br>*Plant Health and Plant Products Regulations 2006* | Department of Primary Industries, Victoria (DPI) |
| WA | *Biosecurity and Agriculture Management Act 2007* | Department of Agriculture and Food - Western Australia (DAFWA) |

**Table 2:** *State quarantine manuals for interstate and interregional movement of plant material*

| State | Administering authority | Links to quarantine manual* |
|---|---|---|
| ACT | Environment ACT | See NSW conditions |
| NSW | New South Wales Department of Primary Industries | http://www.agric.nsw.gov.au/reader/pe-plantquarantine |
| NT | Department of Primary Industry, Fisheries and Mines | http://www.nt.gov.au/dpifm/Primary_Industry/index.cfm?header=NT%20Entry%20Requirements |
| Qld | Department of Primary Industries and Fisheries, Queensland | http://www.dpi.qld.gov.au/health/4058.html |
| SA | Primary Industries and Resources South Australia | http://www.pir.sa.gov.au/planthealth/importers |
| Tas | Department of Primary Industries, Water and Environment - Tasmania | www.dpiw.tas.gov.au/inter.nsf/WebPages/SSKA-6V2UJF |
| Vic | Victorian Department of Primary Industries | Go to Plant Standards Branch at http://www.dpi.vic.gov.au/dpi/nrenfa.nsf/ Or go to: http://www.dpi.vic.gov.au/dpi/nrenfa.nsf/linkview/9907fd43d194794dca25718e001fe34c0f2b087fc279c31fca257274001c054d |
| WA | Department of Agriculture - Western Australia | http://agspsrv95.agric.wa.gov.au/quarantine/default.asp |

* If the link does not work, the relevant documents can be found on each departments' home page through links to the quarantine sections.

**Table 3** *State/territory restrictions on movement of machinery and equipment*

| State | Legislation | Administering authority | Control procedures |
|---|---|---|---|
| ACT | Plant Diseases Act 2002 | Environment ACT | |
| NSW | Plant Diseases Act 1924 | New South Wales Department of Primary Industries | Restrictions apply to movement of machinery that may have come into contact with potato cyst nematodes, or grapevine phylloxera. |
| NT | Plant Diseases Control Act | Department of Primary Industry, Fisheries and Mines | |

| State | Legislation | Administering authority | Control procedures |
|---|---|---|---|
| Qld | Plant Protection Act 1989 | Department of Primary Industries and Fisheries, Queensland | Entry conditions mainly apply to risk items (including soil and appliances) associated with bananas, host plants of sugarcane smut, grapes, ornamentals and plants from the family Solanaceae. Refer http://www2.dpi.qld.gov.au/health/4058.html for full conditions. |
| SA | Fruit and Plant Protection Act 1992 | Primary Industries and Resources South Australia | Restrictions apply relating to freedom from soil and plant material for used agricultural machinery. |
| Tas | Plant Quarantine Act 1997 | Department of Primary Industries, Water and Environment - Tasmania | The requirements for importing farm machinery and vehicles are covered by the *Plant Quarantine Act 1997* and the *Weed Management Act 2000*. The requirements are outlined in the Plant Quarantine Manual (Section 4.2). Machinery and equipment must be free from soil, plant trash, plants, declared weed seeds and other declared diseases or organisms. Specific conditions also apply to machinery and vehicles that have been used in certain areas (eg properties within 50 kilometres of an occurrence of chickpea blight). |
| Vic | Plant Health and Plant Products Act 1995 | Victorian Department of Primary Industries | Restrictions apply to movement of machinery that may have come into contact with potato cyst nematodes, or grapevine phylloxera. |
| WA | Plant Diseases Act 1914 and Regulations, 1989 | Department of Agriculture - Western Australia | Machinery and equipment entering the state is subject to inspection on arrival and must be free from soil and plant material. |

## Regional level – movement restrictions

| | |
|---|---|
| **Responsibility** | ▪ state and territory governments |

Quarantine legislation currently in place provides a basis for regulating the movement of nursery or garden plants between regions within states. Before moving nursery or garden plants intrastate a permit may be required from the appropriate authority (see Table 1). Advice can be obtained by contacting your local state or territory agriculture agency directly, or by telephoning the Quarantine Domestic Hotline on 1800 084 881.

### New South Wales

Information on pre-importation inspection, certification and treatment requirements may be obtained from the NSW DPI Regulatory Services office by phone (02) 9764 3311 or fax (02) 9746 3409.

### South Australia

Information on pre-importation inspection, certification and treatments and /or certification requirements for movement of pineapples in South Australia may be obtained from PIRSA Plant Health Operations by phone 1300 666 010 or fax (08) 8344 6033.

### Tasmania

For more information about the requirements for importing pineapples, including fruit and plant material, into Tasmania contact Quarantine Tasmania by phone (03 6233 3352) or E-mail Quarantine.Enquiries@dpiw.tas.gov.au.

### Victoria

Information on pre-importation inspection, certification and treatment requirements may be obtained from the DPI Victoria Plant Standards / or Biosecurity Victoria Regulatory Services office by phone (03) 9210 9222 (Knoxfield switch).

In general, conditions of entry apply to fruit and plants to prevent the introduction of Mediterranean and Queensland fruit fly, Spiralling Whitefly, Ash Whitefly, Green Snail, Argentine Ant, Electric Ant, Potato Cyst Nematode and Fire Ant.

### Western Australia

For further information on pineapple movement requirements within Western Australia, including disinfestation treatments, contact the Western Australian Quarantine Inspection Service (08) 9334 1800 or fax (08) 9334 1880.

### Queensland

A summary of the legislation governing movement within Queensland of plants, plant products and other related items can be found at http://www2.dpi.qld.gov.au/health/14775.html

**Table 2** *Notifiable plant pests for each state/territory*

| State | Notifiable pests |
|---|---|
| ACT | |
| NSW | |
| NT | |
| Qld | |
| SA | |
| Tas | |
| Vic | |
| WA | |

## Farm level – exclusion activities

| | |
|---|---|
| **Responsibility** | ▪ state/territory governments<br>▪ Industry/growers |

The greatest risk of spreading pests between properties is when soil, propagation material, people, machinery and equipment move from farm to farm and from region to region. It is the responsibility of the owner/manager of each property to ensure these risks are minimised.

It is in the interests of the industry to encourage and monitor the management of risk at the farm level, as this will increase the probability of early detection and reduce the probability of an incursion or outbreak. Early detection may reduce the likelihood of a costly incident response, thereby reducing costs to government, industry and the community.

## Surveillance, awareness and training

Surveys enhance prospects for early detection, minimise costs of eradication and are necessary to meet the treaty obligations of the World Trade Organization's (WTO) SPS Agreement with respect to the area freedom status of the Australian mainland.

The SPS agreement gives WTO members the right to impose SPS measures to protect human, animal and plant life and health provided such measures do not serve as technical barriers to trade. In simple terms, for countries such as Australia that have signed the SPS Agreement, imports of food, including fresh fruit and vegetables, can only be prohibited on proper, science based quarantine grounds. The agreement also stipulates that appropriate surveillance and monitoring are necessary to support claims of area freedom. This is termed “evidence of absence” data and is used to provide support that we have actively looked for pests and not found them.

There are currently no international standards for structured pest surveys. Their planning and implementation depends on the risk involved, the resources available, and the requirements of trading partners (particularly when Australia wishes to access overseas markets). The intensity and timing of surveys also depend on the spread characteristics of the pest and the costs of eradication.

Early detection of an exotic plant pest can significantly increase the likelihood of a successful eradication campaign, and reduce the associated costs. Effective surveillance plays a critical role in working toward this goal. Surveillance can be either targeted toward specific pests, or general in nature. General non targeted surveillance is based on recognising normal versus suspect plant material. Targeted surveillance is important for establishing whether particular pests are present in each state, and if so, where these occur.

Industry personnel can provide very effective general surveillance as part of their normal management procedures, provided individuals are aware of what to look for and understand the reporting procedures required. Producers, non commercial growers, staff, and consultants can provide valuable information as they are regularly in the field, and hence can observe any unusual pest activity or symptoms on plants.

Suitable awareness programs are required to support and encourage surveillance activities. These awareness programs can range from general information on posters and fact sheets for growers and their staff, through to field day activities and professional courses. Awareness programs should also outline procedures (i.e. who to contact, where and how) so that industry personnel are able to have unusual plant symptoms or pests identified quickly. Promoting community awareness and reporting should be encouraged. Industry personnel need to be kept informed of areas within the local area where pest incursions exist so that they can take precautionary measures when working in or receiving produce from those areas.

## National surveillance programs

| | |
|---|---|
| **Responsibility** | ▪ Australian Government<br>▪ industry (national associations) |

AQIS maintains barrier quarantine services at all international ports and in the Torres Strait region. AQIS also surveys the northern coast of Australia, offshore islands and neighbouring countries for exotic pests that may have reached the country through other channels (e.g. illegal vessel landings in remote areas, bird migrations, wind currents), as part of the Northern Australian Quarantine Strategy (NAQS). Pineapple crops and produce are inspected as part of this program and Grey pineapple mealybug and Rhinoceros beetle are included in targeted surveillance activities NAQS undertakes.

## State surveillance programs

| | |
|---|---|
| **Responsibility** | ▪ state and territory governments<br>▪ Industry/growers |

As the bulk of pineapple production occurs in Queensland, information is provided for this state only.

No formal surveillance programs operate for pineapples, however, informal (passive) surveillance activities are conducted by State government and research groups in Queensland.

Relevant state/territory agriculture departments are responsible for:

- planning and auditing surveillance systems
- coordinating surveillance activities with those of industry and interstate groups
- provision of diagnostic services
- providing field diagnosticians for special field surveillance
- surveillance of non commercial sites
- liaising with industry members
- developing communication, training and extension strategies with industry
- carrying out training
- reporting to all interested parties (e.g. AQIS, national bodies, trading partners and industry).

## Farm surveillance activities

| | |
|---|---|
| **Responsibility** | ▪ industry/growers |

Mechanisms for coordinating farm surveillance activities include workshop groups, study groups and cooperatives.

Industry representative groups may contribute toward the provision of effective surveillance through a range of activities. Examples include:

- carrying out surveillance on commercial properties
- liaising with agriculture departments
- improving capacity to recognise pests and diseases and raising awareness of the importance of biosecurity
- reporting suspect pests and identifying mechanisms for the collection of surveillance data including “evidence of absence” data for key threats
- provision of farm surveillance records
- coordination of grower surveillance
- funding commercial surveillance activities
- working with agriculture departments to develop awareness, training and extension programs

- carrying out training
- developing farm Biosecurity Plans to provide guidelines on Biosecurity best management practices.

Agribusinesses participate in surveillance by increasing general pest awareness and providing diagnostic services. Specific actions that contribute to surveillance include:

- distribution of extension materials
- attending and/or assistance with training
- receiving suspect samples and managing their transport to a diagnostic labratory
- supplying surveillance equipment (e.g. traps and diagnostic kits)
- providing diagnostic services to growers.

Grower roles and responsibilities include:

- implementation of surveillance on properties (where possible)
- implementation of Farm Biosecurity Plans
- reporting suspect pests
- provision of records of farm surveillance
- attending training providing awareness and training to staff
- meeting state/territory agriculture department and industry surveillance requirements
- ensuring identification material and sampling kits are available for staff
- being aware of and identifying biosecurity risks to their farm.

# Farm Biosecurity Plans

It is the responsibility of the pineapple industry to develop and promote biosecurity best practice guidelines and to participate in risk mitigation activities. The development of Farm Biosecurity Plans specific to the Pineapple Industry is an important step in raising awareness and achieving these outcomes.

The following sections provide basic information to be considered within the Farm Biosecurity Plans.

## Selection and preparation of appropriate planting materials

***Obtaining pest and pathogen free planting material for crop production***

| | |
|---|---|
| **Responsibility** | ▪ national border control (Australian Government)<br>▪ intra- and interstate border controls (state and territory governments)<br>▪ industry/growers |

Infected planting material can be the main source of spread for some serious pests, including weeds. Material from infected plants may appear healthy, so the outward appearance of planting material cannot be regarded as a reliable indicator of disease

status. Soil carried on plants or poorly checked planting material can harbour pathogens or pests, such as fungal spores, nematodes or weeds.

Currently no regulations are in place for the movement or sale of pineapple planting material and this has resulted in the spread of weeds and red mite, within production areas. Movement of exotic pests could occur easily in this manner and Farm Biosecurity Plans will assist in providing guidelines for identifying pests and monitoring new plantings.

## Control of vector and hitchhiker mechanisms

| | | |
|---|---|---|
| **Responsibility** | ▪ | industry – drawing on advice from government and non government research agencies |

Many viruses and some bacteria require a vector to provide a means of dispersal. Vectors are commonly invertebrates such as insects and mites. Nematodes, fungi, birds, people and machinery can also serve as vectors of plant pathogens. The activity and mobility of the vector determines the rate and distance of dispersal.

Inspection and cleaning of vehicles, machinery and equipment helps to prevent pest spread, as does cleaning of footwear and clothes and restricting unnecessary movement of vehicles and equipment around the farm. Consideration should also be given to the control of known vectors of plant pathogens when new disease outbreaks are likely.

## Control of alternative hosts

| | | |
|---|---|---|
| **Responsibility** | ▪ | industry – drawing on advice from government and non government research agencies |

Some weed species can act as alternative hosts of crop pests or can cause significant management issues in their own right. Where this is so, weed control practices can significantly contribute to limiting the survival of pests, reducing the potential for outbreaks and reducing the costs associated with control of the pest. Details of any alternative hosts will be included in pest specific contingency plans and awareness materials for high priority plant pineapple pests. Contingency plans and awareness materials are listed in later sections of this Biosecurity Plan.

## Wash down facilities for equipment and machinery

| | | |
|---|---|---|
| **Responsibility** | ▪ | industry – drawing on advice from government and non government research agencies |

Vehicles that are used to harvest or to transport pineapples, particularly if moving between farms, should be cleaned to remove soil and plants. This will help to minimise the risk of pest spread. For this purpose, all farms should have access to a wash down facility with a concrete, tarmac or gravel pad.

It is preferable that wash down facilities are located on the property or close to the property. Water draining from the wash down facility should not be directed back into fields or any farm water supply.

## Record keeping and QA industry

| | | |
|---|---|---|
| **Responsibility** | ▪ | industry – drawing on advice from government and non government research agencies |

Growers should maintain effective pest and disease monitoring and management programs. This includes keeping record of pest/disease outbreaks of established and exotic pests and the control measures used. Receivers should be informed of the source of the produce, and whether the material has come from an area experiencing a pest or disease outbreak.

An identification and tracing system, such as those used within HACCP systems will assist in tracing produce consignments to their source if they are found to be contaminated with an exotic pest. Within HACCP consignments are marked with the name of the grower, and a batch identification mark (date or other code). Growers maintain a record of the source and destination of each batch, and identify separate growing areas on a property map. These tracking and tracing systems could eventually form part of the development of biosecurity protocols, assisting with the monitoring of pineapple crops for significant signs of exotic pests.

For QA principles associated with Biosecurity, see page 20.

## Use of warning and information signs

| | | |
|---|---|---|
| **Responsibility** | ▪ | industry |

Placing warning and information signs on the entrances and gates of properties can help inform visitors of the biosecurity practices in place, and reminds industry personnel that farm biosecurity is a priority. Signs should also include up-to-date contact details for people to gain further information, as visitors to the area may not be aware of relevant biosecurity protocols.

All people entering the property should have a clear view of any information signs. Signs should contain clear and simple messages (e.g. “Do not enter the farm without prior approval”, “Use wash down facilities for cleaning vehicles and machinery”). Examples of Biosecurity signage can be obtained from State departments of Primary Industries or from Plant Health Australia.

## Use of dedicated equipment when working in high risk areas

| | | |
|---|---|---|
| **Responsibility** | ▪ | industry |
| | ▪ | state and territory governments |

It is a best practice procedure to assign equipment (including clothing, tools and footwear) to be used in pest infected/infested areas only. This means that the equipment used in infected/infested nurseries or areas is not reused in clean areas and *vice versa*.

## Restricting the movement of vehicles, equipment and people

A high risk of spreading pests comes from movements of people, machinery and equipment between regions and nurseries. This risk can be reduced by ensuring plant material and soil that may harbour pests is not moved to other properties or regions. Clothing and hair should also be washed after returning from overseas

Issues, although not included in the Farm Biosecurity Plans, that should also be considered are:

## Use of chemical control measures

| | | |
|---|---|---|
| **Responsibility** | ▪ | industry – drawing on advice from government and non government research agencies |

Agriculture departments and the pineapple industry should identify and list suitable chemical control measures for high priority exotic pests, and put into place procedures for the emergency registration of necessary chemicals that may be unavailable.

The Australian Pesticides and Veterinary Medicines Authority (APVMA) is the national authority responsible for registration and deregistration of chemicals and can be contacted by phone on (02) 6272 5852. The APVMA Permit Section deals specifically with emergency registrations for chemicals. Further information can be obtained from the APVMA web site at www.apvma.gov.au

## Destruction of crop residues

| | | |
|---|---|---|
| **Responsibility** | ▪ | industry – drawing on advice from government and non government research agencies |

Protocols for the destruction or treatment of affected crop material should be developed for high risk pests and pathogens.

As many crop pests and pathogens are able to survive on crop residues and by-products these should be treated responsibly. Burying, burning or removing crop residues, and cleaning equipment and machinery are effective cultural practices that may be adopted . When developing protocols some issues that will determine the effectiveness of crop residue treatment will include:

- the extent of the cropping area
- the survival mechanism, dispersal ability, and host range of the pathogen
- environmental constraints.

# Farm Biosecurity Plan – General Principles

| | | |
|---|---|---|
| **Responsibility** | ▪ | industry/growers |

It is in the interests of industry to encourage and monitor the management of biosecurity risks at the farm level, as this will reduce the probability of an incursion or outbreak and increase the probability of early detection. This should in turn reduce the likelihood of a costly incident response, thereby reducing the costs to the industry, governments and the wider community.

Suggested practices for minimising pest spread at the farm level include:

- ensuring that all workers are aware of, and adhere to, existing risk mitigation measures in place on the property
- ensuring that all visitors to the farm report directly to the office on arrival and receive instructions on hygiene protocols
- checking that machinery, vehicles, and equipment (e.g. trailers, crates, bins) entering or leaving properties are free of soil and crop debris.
- visually inspecting machinery and equipment before it comes onto the property and denying access to any equipment that does not meet biosecurity standards
- restricting movements of vehicles and people (if possible) during high risk periods. This may include avoiding moving vehicles and machinery, particularly when roads are wet and muddy
- ensuring all visitors and employees are aware of the importance of keeping footwear and clothing free from loose dirt and vegetable matter before entering or leaving the property
- providing wash down facilities for both machinery and people (e.g. high pressure hose with a concrete or tarmac pad, scrubbing brushes and footbaths)
- providing a designated parking area and transporting visitors, contractors, employees and government officials using vehicles based permanently on the property
- minimising unnecessary entry of vehicles from outside the farm and movements of vehicles around the farm (especially when the soil is wet)
- reporting all suspected exotic pests to your relevant agriculture department.

# Including farm biosecurity in IBMP and QA schemes

| | | |
|---|---|---|
| **Responsibility** | ▪ | industry |

For farm level protection from pests, the following farm biosecurity (farm hygiene) measures are recommended:

- using pest- and disease-free propagating material and planting resistant cultivars where applicable;
- inspecting all incoming vehicles and equipment for signs of contaminated soil or plant material and enforcing biosecurity standards
- using high pressure wash down facilities associated with a concrete, tarmac or gravel pad for cleaning vehicles and equipment, with disposal of effluent away from plants and irrigation sources

- undertaking a biosecurity/quarantine education and training program for employees and related personnel
- having a planned, effective monitoring and pest management program
- erecting informative signs at the entrance of the property which outline the basic biosecurity requirements for all visitors
- reporting all suspect diseased plants and pests to the local state/territory agriculture department, for identification
- minimising vehicle movement around the farm (particularly when muddy)
- training staff in effective use of relevant chemicals
- disposing of unwanted plants and reporting neglected crops and volunteer plants to the local state/territory agriculture department
- managing visitor movement around the farm by using vehicles which remain on the property, and supplying footwear or footbaths
- minimising or keeping public sales and tourist activities separate from the farm area.

Including these measures in IBMP and QA schemes will strengthen the ability to rapidly detect, control and eradicate exotic pest outbreaks in the pineapple industry before extensive damage occurs.

***Table 3*** *Industry best management practice and quality assurance schemes.*

| Scheme | |
|---|---|
| **Freshcare Code of Practice** | Freshcare is the industry-owned, national, on-farm food safety program for the fresh produce industry. Freshcare links food safety on farm to the quality and food safety programs of the other members of the fresh produce supply chain. Suitable for Coles and Woolworths sales.<br><br>www.freshcare.com.au |
| **Codex HACCP** | HACCP certification provides a recognised endorsement of food safety excellence.<br><br>http://www.codexalimentarius.net/download/standards/23/cxp_001e.pdf |

| Scheme | |
|---|---|
| **SQF2000 for packers and processors & SQF 1000 for producers** | The Safe Quality Food (SQF) Codes provide primary producers (SQF 1000) and food manufacturers, retailers, agents and exporters (SQF 2000) with a food safety and quality management certification program that is tailored to their requirements and enables suppliers to meet regulatory, food safety and commercial quality criteria. The SQF Codes are owned and managed by the Food Marketing Institute of the USA<br><br>http://www.sqfi.com/<br><br>http://www.sqfi.com/documentation/SQF1000_Code.pdf<br><br>http://www.sqfi.com/documentation/SQF2000_Code.pdf |
| **Woolworths Quality Assurance Standard (WQA)** | WQA is focussed on both quality and safety of all products supplied.<br>All Trade Partners that are suppliers of Fresh Food or Private Label products to Woolworths are required to attain certification to the Woolworths Quality Assurance (WQA) Standard, in addition to existing regulatory or voluntary audits that may be currently in place.<br><br>http://www.woolworths.com.au/Vendors/qa/default.asp |
| **EUREPGAP** | EUREPGAP® includes a number of protocols for horticultural and agricultural production. EUREP stands for the Euro-Retailer Produce Working Group and GAP for Good Agricultural Practice. EUREP's mission statement is to encourage the adoption of commercially viable farm assurance schemes which promote the minimisation of agrichemical inputs within Europe and worldwide, among many other issues.<br><br>http://www.eurepgap.org/fruit/Languages/English/index_html |

# Reporting suspect pests

***Figure 1*** *Postcard from Plant Health Australia's Plant Health Awareness Campaign*


Nothing will protect your crops more than a **good hard look.**

Pineapple growers are the key to protecting Australia's crops from exotic insects and diseases that could devastate the industry.

It is important that you are aware of the risk, and if you spot anything unusual on your plantation you should always check it out and call the **Exotic Plant Pest Hotline** on **1800 084 881**. The call is free (except from mobiles) and early detection will help protect your industry.

Visit www.planthealthaustralia.com.au for further information and a list of the top priority pests.

growcom
together we grow

Plant Health AUSTRALIA

LOOK. BE ALERT. CALL AN EXPERT.

EXOTIC PLANT PEST HOTLINE
**1800 084 881**

Any unusual plant pest should be reported immediately to the relevant state/territory agriculture agency. Early reporting enhances the chance of effective control and eradication.

Some plant pests are notifiable. Landowners and consultants have a legal obligation to notify the relevant state/territory agriculture department of the presence of those pests within 24 hours of detection.

Early reporting enhances the chance of effective pest control and/or eradication.

Reporting an exotic plant pest carries serious implications and should be done via the relevant state/territory agriculture department. Careless use of information, particularly if a pest has not been confirmed, can result in extreme stress for individuals and communities, and possibly damaging and unwarranted trade restrictions.

If you suspect a new pest, please call the **Exotic Plant Pest Hotline on 1800 084 881**.

Suspect material should not generally be moved or collected without seeking advice from the relevant state/territory department, as incorrect handling of samples could spread the pest or render the samples unsuitable for diagnostic purposes. State/territory agriculture department officers will usually be responsible for sampling and identification of pests.

# References

Nairn, M.E., Allen, P.G., Inglis, A.R. and Tanner, C. (1996). Australian Quarantine; a shared responsibility. Report of the Australian Quarantine Review Committee. Department of Primary Industries and Energy, Canberra, ACT.

Plant Health AUSTRALIA

# BIOSECURITY PLAN FOR THE PINEAPPLE INDUSTRY

# CONTINGENCY PLANS AND RESPONSE MANAGEMENT

Plant Health Australia is a peak national coordinating body for plant health in Australia. We commission projects and work with members to coordinate the development of national policy and capability to enhance the ability of Australian agriculture to respond effectively to plant pests, weeds and diseases.

**For more information on Plant Health Australia**

**Location:** Suite 5, FECCA House
4 Phipps Close
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**Phone:** +61 2 6260 4322

**Fax:** +61 2 6260 4321

**E-mail:** admin@phau.com.au

**Visit our web site:** www.planthealthaustralia.com.au

An electronic copy of this plan is available from the web site listed above.



PI06003: This project was facilitated by HAL in partnership with the pineapple industry. It was funded by voluntary contributions from Growcom and Plant Health Australia. The Australian Government provides matched funding for all HAL's R&D activities.

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## TABLES

# Acronyms

| | |
|---|---|
| DAFF | Department of Agriculture, Fisheries and Forestry |
| OCPPO | Office of the Chief Plant Protection Officer |
| PGAG | Pineapple Growers Advancement Group |
| PHA | Plant Health Australia |
| PLANTPLAN | The generic emergency response document which outlines operational procedures for plant pest incursions |

**Note:** The definition of a pest as adopted by the International Plant Protection Convention (any species, strain or biotype of plant, animal, or pathogenic agent, injurious to plants or plant products) is used throughout this plan.

# Introduction

Gathering information, developing procedures, and defining roles and responsibilities during an emergency can be extremely difficult. To address this area, Plant Health Australia (PHA) has developed PLANTPLAN, a national set of incursion response guidelines for the plant sector, detailing procedures required and the roles and responsibilities of all parties involved in an incursion response.

Following PLANTPLAN is a set of threat-specific contingency plans which will be developed to cover the key pests to the pineapple industry. These pests are detailed in the emergency plant pest priority list and have been identified through a process of qualitative risk assessment. Information will be provided on the host range, symptoms, biology and epidemiology of each organism, along with guidelines for general and targeted surveillance programs, diagnosis, and control. These documents are designed to be used in conjunction with the emergency response guidelines in PLANTPLAN.

# PLANTPLAN

PLANTPLAN provides a description of the general procedures, management structure and information flow system for the handling of a plant pest emergency at national, state/territory and district levels. This includes the operations of the control centres, principles for the chain of responsibility, functions of sections and role descriptions. PLANTPLAN is a general manual for use by all jurisdictions for all plant pest emergencies.

The most recent version of PLANTPLAN, at the time of printing, is attached as part of this industry biosecurity plan. PLANTPLAN is regularly reviewed and updated to ensure it provides the best possible guidance to plant industries and governments in responding to serious plant pests. Accordingly, please check the web site (www.planthealthaustralia.com.au/plantplan) to ensure you have the most up to date version.

## Current response management procedures

On finding a pest, or after a pest is reported, the relevant state/territory agriculture agency may collect samples of a suspect organism and seek a positive identification. If the pest is suspected to be an exotic pest (not yet present in Australia) the general process is as outlined in Figure 2. Within 24 hours of the initial identification the agency, through the State Plant Health Manager, will inform the Office of the Chief Plant Protection Officer (OCPPO) which will notify other relevant Australian Government Departments and relevant state agencies and industry representatives. After consultation, appropriate response measures will be decided. See Figure 1 for reporting flowchart.

If the pest is considered potentially serious, then the relevant state/territory agriculture department may adopt precautionary measures. These measures, depending on the pest, may include:

- restriction of operations in the area
- withdrawal of people, vehicles and machinery from the area and disinfection
- restricted access to the area
- interim control or containment measures.

If an exotic plant pest is confirmed, technical and economic considerations are reviewed, and a decision made on whether to eradicate, contain or do nothing about the incursion (depending on the likely costs and impacts of the pest). Under the Emergency Plant Pest Response Deed all decisions are made by committees with government and industry representation.

During this investigation/alert period, the affected area will be placed under quarantine until a decision is made on whether to eradicate or control the pest. Once a decision has been made on a suitable response, efforts enter the operational phase. Eradication or control methods used will vary according to the nature of the pest involved and infested material will be destroyed where necessary. All on ground response operations are undertaken by the relevant state department(s) in accord with relevant state/territory legislation.

In the stand down phase, all operations are wound down. Where a plant pest emergency was not confirmed, those involved will be advised that the threat no longer exists. Where

an eradication or management/control campaign has taken place, quarantine measures will be finalised and reviewed.

**Figure 1 Emergency plant pest detection reporting flowchart**

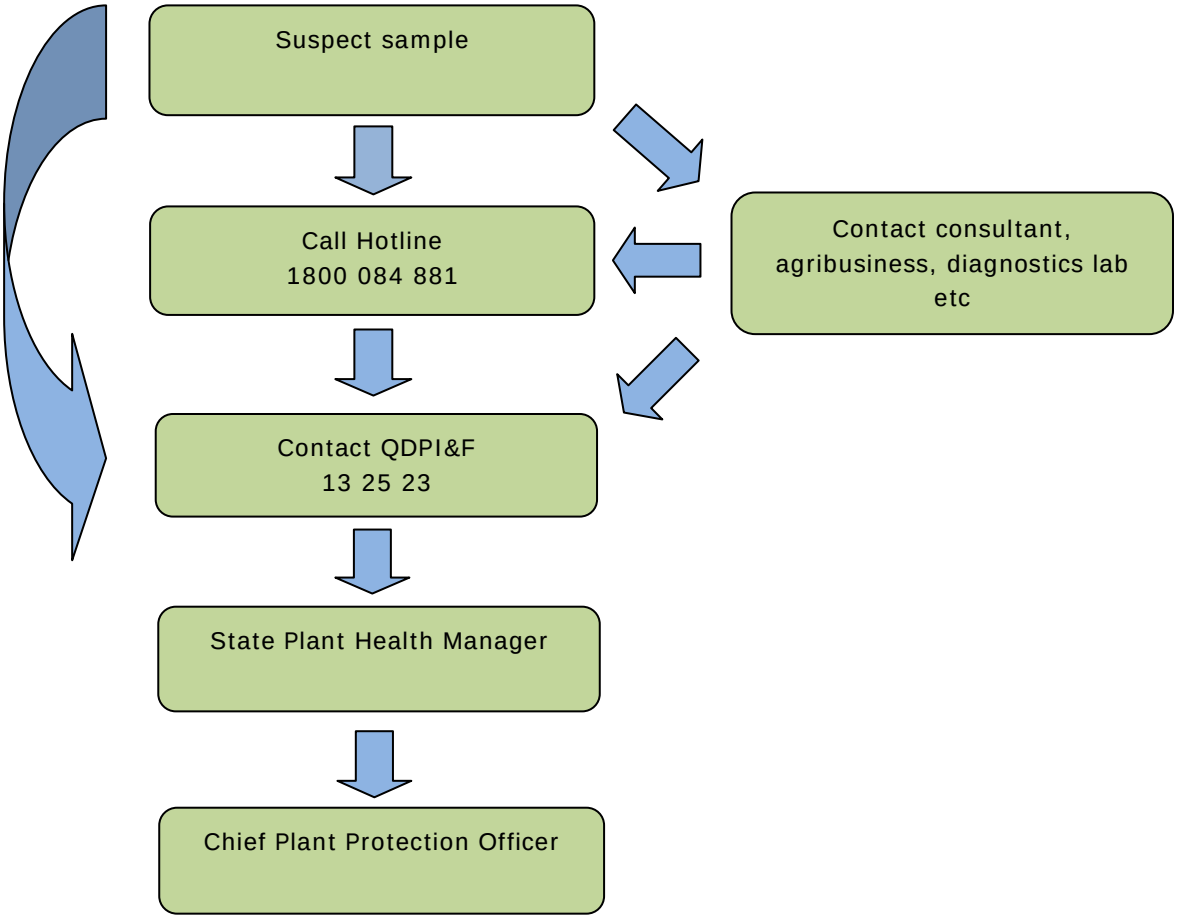

**Figure 2 General decision making and communication chain for a plant pest emergency response**

| Investigation | Alert | Operational | Stand Down |
|---|---|---|---|
| Detection of new pest<br><br>Report forwarded to state agriculture department<br><br>Investigation by state agency – samples collected/identified | Chief Plant Protection Officer (Department of Agriculture, Fisheries and Forestry - DAFF) and other state agencies and industry notified<br><br>Quarantine restrictions imposed if appropriate<br><br>Likely impacts of pest evaluated and decision made on response | State agencies manage operational response under relevant legislation<br><br>State and/or Local Pest Control Centre established (if appropriate)<br><br>Lead agency, DAFF and industry cooperate regarding communication/media relations | Response successful or decision made to move to contain and live with the pest |

The figure and information provided above is a general guide. For more detailed information on how pest responses are managed, please refer to PLANTPLAN.

# Industry specific response procedures

## Industry communication

In the event of a pest incursion affecting the pineapple industry, Growcom will be the key industry contact point and will have responsibility for industry communication and media relations.

Close cooperation is required between relevant government bodies and industry in regards to the effective management of a pest response and media/communication issues. Readers should refer to PLANTPLAN for further information.

Regional or state based industry organisations will be informed of the incident through the national industry contact.

**Table 1** *Key pineapple industry contacts*

| Organisation | Position | Address | Contact details |
|---|---|---|---|
| **National** | | | |
| Jan Davis | CEO, Growcom | PO Box 202 Fortitude Valley 4006 | Ph: 0416 191 932<br>Fax: 07 3620 3880<br>E-mail: jdavis@growcom.com.au |
| Chris Fullerton | Pineapple Growers Advancement Group | C/- Fullerton Farms, 165 Kings Road, Elimbah, QLD 4516 | Ph: 0427 201 410<br>Fax: (07) 5497 4243<br>E-mail: helen.fullerton@bigpond.com.au |
| Chris Doyle | Pineapple Growers Advancement Group | PO Box 26 AMAMOOR QLD 4570 | Ph: 0428 125 003<br>Fax: (07) 5488 4647<br>Email: cjd84dagan@hotmail.com |

## Counselling services

Provision for counselling will be made through the various grower organisations and government agencies. Details are provided below.

**Table 2** *Counselling services*

| State | Organisation | Contact |
|---|---|---|
| National | Australian Government Agriculture Advancing Australia Information Line | Phone **1800 686 175** for referral to your nearest service provider. |
| | Relationships Australia | Phone **1300 364 277** or see http://www.relationships.com.au/ for regional contacts and services. |

Advice on financial support for affected growers can be obtained from the following organisations free of charge.

**Table 3** *Financial counselling services*

| State | Organisation | Contact |
|---|---|---|
| All states | Rural financial Counselling Service | Phone **1800 686 175** for referral to your nearest service provider |

# Threat-specific Contingency Plans

Over time, threat-specific contingency plans will be completed for the exotic threats identified in the emergency plant pest priority list. Updated plans will be made available in electronic format.

Plant Health AUSTRALIA

# BIOSECURITY PLAN FOR THE PINEAPPLE INDUSTRY

# AWARENESS MATERIAL

Plant Health Australia is a peak national coordinating body for plant health in Australia. We commission projects and work with members to coordinate the development of national policy and capability to enhance the ability of Australian agriculture to respond effectively to plant pests, weeds and diseases.

## For more information on Plant Health Australia

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# Priority pests

The following pests have been identified by members of the pineapple industry, government agencies and relevant research bodies as being high priority threats to the industry. They have been assessed as having a high entry and/or high impact potential.

## Fact sheets

This section lists fact sheets for the pests identified in the emergency plant pest priority list, other sources of information and the list of exotic pests currently under active control (refer to section 2 – threat identification, pest risk reviews and incursion management funding arrangements).

| Exotic threat |
|---|
| False Codling Moth<br>*Cryptophlebia leucotreta* |
| Grey pineapple mealybug<br>*Dysmicoccus neobrevipes* |
| Bacterial fruit collapse<br>*Erwinia chrysanthemi* (distinct pathovar) |
| Fusariosis *Fusarium guttiforme* |
| Pineapple fruit borer<br>*Strymon megarus* |

## Current Information Available

| Exotic threat | Current information available |
|---|---|
| False Codling Moth *Cryptophlebia leucotreta* | http://www.padil.gov.au/viewPestDiagnosticImages.aspx?id=314<br>http://www.nappfast.org/casestudies_files/falsecodling_moth.pdf |

| Exotic threat | Current information available |
|---|---|
| Grey pineapple mealybug *Dysmicoccus neobrevipes* | http://www.extento.hawaii.edu/Kbase/crop/Type/d_neobre.htm |
| Bacterial fruit collapse *Erwinia chrysanthemi* (distinct pathovar) | http://www.eppo.org/QUARANTINE/bacteria/Erwinia_chrysanthemi/ERWICH_ds.pdf |
| Fusariosis *Fusarium guttiforme* | |
| Pineapple fruit borer *Strymon megarus* | |

## Pests under active control

| Pests under active control | Information available from |
|---|---|
| N/A | |

# Further information / relevant web sites

Details of relevant government agencies, research organisations and grower groups are provided below for persons seeking further information on biosecurity for the pineapple industry.

# Australian Government

## Department of Agriculture, Fisheries and Forestry

Refer to website for:
the pest disease and weed fact sheet index;
current and finalised Import Risk Analyses; and
emergency plant pest incursion alerts.

http://www.daff.gov.au/

Australian Government Department of Agriculture, Fisheries and Forestry
GPO Box 858
Canberra ACT 2601
Switchboard: +61 2 6272 3933

## Australian Quarantine and Inspection Service

Refer to website for:
fact sheet on quarantine pests
Import Risk Analyses for pineapple imports; and
PHYTO – plant and plant product export conditions database.

http://aqis.gov.au/

Free call from within Australia - 1800 020 504

Plant Health Australia

Refer to website for:
further information on Biosecurity Plans;
other information on plant biosecurity projects;
pest fact sheets, pest risk reviews and contingency plans (where available); and

the Australian Plant Pest Database.

http://www.planthealthaustralia.com.au/

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Email: admin@phau.com.au

## Queensland

Growcom
PO Box 202 Fortitude Valley QLD 4006
Ph: 07 3620 3844
Fax: 07 3620 3880
Email: info@growcom.com.au
Web: www.growcom.com.au

Department of Primary Industries and Fisheries

Refer to website for:
pest fact sheets;
state plant quarantine conditions.

http://www.dpi.qld.gov.au/

To report suspected exotic plant pests call 13 25 23.

For further information on interstate quarantine and pests currently under official control contact:

Department of Primary Industries and Fisheries
Animal and Plant Health Service
3rd Floor, Primary Industries Building
80 Ann Street
BRISBANE QLD 4000
Ph: (07) 3404 6999 Fax: (07) 3211 3293
Email: callweb@dpi.qld.gov.au

## Other Information

General

http://www.padil.gov.au/

http://www.ipmimages.org/

Fact sheet

Plant Health AUSTRALIA


False codling moth
Source: Pest and Diseases Image Library, Bugwood.org

# EXOTIC THREAT: FALSE CODLING MOTH

## What is it?

The false codling moth (*Cryptophebia leucotreta*) is an internal fruit feeding moth that can be found throughout the year in warm climates and has been recorded as feeding on over 50 different plant species[1]. Larval feeding and development can affect fruit development at any stage, causing premature ripening and fruit drop

This moth causes economic loss in a range of crops in sub-Saharan Africa. Losses during infestations, in various crops, have ranged between 20-30%.

## What do I look for?


False codling moth larva
Source:Tertia Grové, Institute for Tropical and Subtropical Crops, Bugwood.org

The female moth lays 100-400 eggs by night, usually singly on the fruits of the plant. The young larvae mine just beneath the surface, or bore into the skin causing premature ripening of the fruit.

When full grown the larva descends to the ground on a silken thread and spins a tough silken cocoon in the soil or amongst debris. The development time for each stage varies considerably with temperature. It has been noted that five generations per year could be achieved by the moth in South Africa.

The adult is nocturnal and is attracted to light.

## Where is it found?

The false codling moth is widespread in Kenya and present throughout Africa.

[1] www.nappfast.org/casestudies_files/**falsecodling_moth**.pdf


Cocoon and pupal case of False Codling Moth.
Pest and Diseases Image Library, Bugwood.org

## Reporting

If you suspect you may have seen the false codling moth, you should report it immediately to maximise the chances of eradicating this pest before it can become established in Australia.

Growers may report suspected exotic pests to the Exotic Plant Pest Hotline (1800 084 881) or can directly contact their relevant state agriculture or primary industries department.

To minimise the risk of disease spread, samples should not be moved until they have been checked by an expert.

This fact sheet is part of the Pineapple Industry Biosecurity Plan. For more information about the Biosecurity Plan, please contact Plant Health Australia.

## Source

www.nappfast.org/casestudies_files/**falsecodling_moth**.pdf

Plant Health AUSTRALIA

FOR MORE INFORMATION
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Plant Health Australia

Phone: +61 2 6260 4322
Fax: +61 2 6260 4321
www.planthealthaustralia.com.au

Fact sheet

Plant Health AUSTRALIA

Gray pineapple mealybug adult.
Source:
http://www.cabicompendium.org/cpc/datasheet


Symptoms of mealybug wilt.
Source:
www.hort.purdue.edu/newcrop/tropical/lecture_30/72m.jpg


Mealybug infestation
Source:
hort.purdue.edu/newcrop/tropical/lecture_30/72m.jpg

# EXOTIC THREAT: GREY PINEAPPLE MEALYBUG

## What is it?

The grey pineapple mealybug (*Dysmicoccus neobrevipes*) does not in itself damage pineapples but has been implicated as a vector of mealybug wilt and is considered one of the most economically important mealybug pests in Hawaii and is the principle cause of pineapple crop failure.

## What do I look for?

The grey pineapple mealybug gives birth to about 350, sometimes as many as 10 00, live young (nymphs) over 30 days. These larvae, called crawlers have flattened bodies and long hairs which aid their dispersal by wind. This stage lasts on average about 35 days, and a little longer for males.

Adults appear predominantly grey in colour due to their waxy coating, making it easy to distinguish from the pink mealybug also known as the pineapple mealybug (*Dysmicoccus brevipes*) which is common in pineapples in Australia. The body is broadly oval and measures about 1 ½ millimetres long and 1 millimetre wide. The back is heavily coated with tiny tufts of white mealy wax and short filaments also extend from the entire body.

The grey pineapple mealybug is normally found on the leaves, stems, aerial roots and flower and fruit clusters.

There are two types of pineapple wilt, “quick wilt” and “slow wilt”. “Quick wilt” is characterised by a discolouration of the leaves to yellows or reds and the loss of rigidity in the leaves. With “slow wilt” there are fewer colour changes. Leaf tips are browned , outer leaves droop and the leaf is flaccid to touch.

## Where is it found?

The grey pineapple mealybug is present in most pineapple growing regions including Fiji, Jamaica, Malaysia, Mexico, Micronesia, Philippines, Taiwan and all of the major Hawaiian Islands.

## Reporting

If you suspect you may have seen the grey pineapple mealybug, you should report it immediately to maximise the chances of eradicating this pest before it can become established in Australia.

Growers may report suspected exotic pests to the Exotic Plant Pest Hotline (1800 084 881) or can directly contact their relevant state agriculture or primary industries department.

To minimise the risk of disease spread, samples should not be moved until they have been checked by an expert.

This fact sheet is part of the Pineapple Industry Biosecurity Plan. For more information about the Biosecurity Plan, please contact Plant Health Australia.

## Sources

http://www.extento.hawaii.edu/Kbase/crop/Type/d_neobre.htm

Rohrbach, K. G., and Johnson, M. W. (2003). Pests, Diseases and Weeds. In 'The Pineapple - Botany, Production and Uses' edited by D. P. Bartholomew and R. E. Paull and K. G. Rohrbach. CABI Publishing.Wallingford. UK. 301 p.

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Fact sheet

Plant Health AUSTRALIA

Adult female pineapple fruit borer
Source: Kim Davis & Mike Stangeland
*http://kimandmikeontheroad.com/*

# EXOTIC THREAT: PINEAPPLE FRUIT BORER

## What is it?

The pineapple fruit borer (*Strymon megarus*) is considered one of the principal pests of pineapple in Brazil. The larvae bore into the fruit causing holes and uneven fruit development. Damage from this pest varies greatly but can reach more than 90% and drier climates seem to favour borer attack.

In most cases fruit borer attacks occur during flowering and formation of the fruit, though this borer can attack slips and rarely acts as a leaf miner.

## What do I look for?

The adult moth has a greyish upper wing surface and a cream colour underneath with a wingspan of 28mm to 35mm.

The adult can be found during the day or night, flying in a rapid and haphazard fashion. Eggs are laid on flowers from emergence to the end of flowering.

Adult male pineapple fruit borer
Source: Kim Davis & Mike Stangeland
*http://kimandmikeontheroad.com/*

Eggs are white, circular and slightly flat and approximately 0.8mm in diameter.

The reddish coloured caterpillar penetrates the inflorescence and remains in the tissue for 15 days, tunnelling and destroying the tissue. After this phase it moves to the base of the peduncle changing into a pupa 12mm long and 5mm wide with a brown colour and a few dark spots and emerges 7 to 10 days later as a butterfly.

As the caterpillar destroys the tissues of the inflorescence a resin coloured liquid gum is exuded from between the fruitlets, which in contact with the air becomes reddish coloured and as it solidifies, turns dark brown.

## Where is it found?

The pineapple fruit borer is currently found in all production regions in Brazil and occurs on the whole American continent.

## Reporting

If you suspect you may have seen the pineapple fruit borer, you should report it immediately to maximise the chances of eradicating this pest before it can become established in Australia.

Growers may report suspected exotic pests to the Exotic Plant Pest Hotline (1800 084 881) or can directly contact their relevant state agriculture or primary industries department.

To minimise the risk of disease spread, samples should not be moved until they have been checked by an expert.

This fact sheet is part of the Pineapple Industry Biosecurity Plan. For more information about the Biosecurity Plan, please contact Plant Health Australia.

## Source

*'**ABACAXI Fitossanidade**', 2000, Embrapa Comunicação para Transferência de Tecnologia Brasília – DF, Empresa Brasiliera de Pesquisa Agropecuária, Embrapa Mandioca e Fruticultura, Ministério da Agricultura e do Abastecimento. Organizador: Aristóteles Pires de Matos. Translated by Roberto Marques and Simon Newett (DPI&F, Nambour) in 2008.*

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Fact sheet

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Fusariosis in a plant sucker of the susceptible variety Perola
Source: G. Sanewski

# EXOTIC THREATS: FUSARIOSIS

## What is it?

Fusariosis (*Fusarium guttiforme*) is a major threat to pineapple cultivation worldwide due to the susceptibility of the main varieties to this disease. This pathogen survives on suckers, slips and crowns that are infected while still attached to the mother plant. Infected planting material is the primary source of spread to new fields. Abandoned plantings are also an important source of inoculums.

Open flowers are the principal site of infection. Injuries caused by insects, particularly the pineapple fruit caterpillar, *Thecla basilides* may promote infection of the inflorescence and fruit. Once established in a region the disease is spread by wind, rain and insect vectors.

*F. guttiforme* does not survive more than 10 months in soil or infested residues, and infected soils are not considered a primary source of inoculum.

## What do I look for?

All parts of the plant can be affected with an exudation of gum from infected tissues. Stem rosetting and curvature of the plant occur because portions of the stem are girdled or killed. Fruit symptoms are characterised by a soft rot of the flesh, gum accumulation in the locules of the ovary and gum exudation from the infected fruit. As disease develops the peel of the infected fruitlet changes to dark brown and becomes sunken.

## Where is it found?

Fusariosis has not been reported outside of South America. It is known to occur in Brazil, Bolivia, Paraguay and Uruguay.

## Reporting

If you suspect you may have seen Fusarium stem rot or Fusariosis, you should report it immediately to maximise the

chances of eradicating this pest before it can become established in Australia.

Growers may report suspected exotic pests to the Exotic Plant Pest Hotline (1800 084 881) or can directly contact their relevant state agriculture or primary industries department.

To minimise the risk of disease spread, samples should not be moved until they have been checked by an expert.

This fact sheet is part of the Pineapple Industry Biosecurity Plan. For more information about the Biosecurity Plan, please contact Plant Health Australia.

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Pineapple leaves invaded by *Erwinia chrysanthemi*,
Source:
http://www.ctahr.hawaii.edu/acad/Research/Downloads/ResearchNews/CTAHR_Research_News_Jan_07.pdf

# EXOTIC THREATS: BACTERIAL FRUIT COLLAPSE/BACTERIAL HEART ROT

## What is it?

*Erwinia chrysanthemi*, which causes bacterial heart rot and fruit collapse, is a soft rot pathogen. The pathogen can form latent, nearly undetectable infections in planting material. The pathogen is dispersed by wind, wind-blown rain, and insects, most often ants and souring beetles.

## What do I look for?

Symptoms typically begin as water-soaked lesions on the white basal parts of the leaves in the centre of the whorl. Symptoms progress to “blisters” (gas filled brown streaks on the laminar). It is this symptom that distinguishes bacterial heart rot from Phytopthora heart rot. Fruit collapse usually appears on fruit 2-3 weeks before normal ripening. Infected fruit exude juice and release gas similar to what occurs during fermentation. The fruit shell becomes olive green in colour and cavities develop within the fruit.

Plants 4 to 8 months old which have been initiated from crowns and suckers are most susceptible to infection. If the conditions are favourable, complete collapse of the plant may occur 1-2 weeks after the initial infection.

The Singapore Spanish cultivar and low acid pineapple hybrids are most susceptible. Smooth Cayenne is more resistant but can be affected.

## Where is it found?

Bacterial heart rot and fruit collapse occurs in Malaysia, Brazil, Costa Rica, the Philippines and Hawaii.

## Reporting

If you suspect you may have seen bacterial heart rot or fruit collapse, you should report it immediately to maximise the chances of eradicating this pest before it can become established in Australia.

Growers may report suspected exotic pests to the Exotic Plant Pest Hotline (1800 084 881) or can directly contact their relevant state agriculture or primary industries department.

To minimise the risk of disease spread, samples should not be moved until they have been checked by an expert.

This fact sheet is part of the Pineapple Industry Biosecurity Plan. For more information about the Biosecurity Plan, please contact Plant Health Australia.

## Sources

http://www.eppo.org/QUARANTINE/bacteria/Erwinia_chrysanthemi/ERWICH_ds.pdf

Diseases of Tropical Fruit Crops. Edited by R. C. Ploetz. 2003. CABI Publishing, Wallingford

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