The Senate

Rural and Regional Affairs and Transport References Committee

Effect on Australian pineapple growers of importing fresh pineapple from Malaysia

Effect on Australian ginger growers of importing fresh ginger from Fiji

Proposed importation of potatoes from New Zealand

Final report

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Membership of the committee

Inquiry into the effect on Australian pineapple growers of importing fresh pineapples from Malaysia

Members 44th Parliament

Senator Glenn Sterle, Chair	Western Australia, ALP
Senator the Hon Bill Heffernan, Deputy Chair	New South Wales, LP
Senator Alex Gallacher	South Australia, ALP
Senator Sue Lines	Western Australia, ALP
Senator the Hon Ian Macdonald	Queensland, LP
Senator Peter Whish-Wilson	Tasmania, AG

Members 43rd Parliament

Senator the Hon Bill Heffernan, Chair	New South Wales, LP
Senator Glenn Sterle, Deputy Chair	Western Australia, ALP
Senator Sean Edwards	South Australia, LP
Senator Christine Milne (until 11 September 2012)	Tasmania, AG
Senator Fiona Nash	New South Wales, NATS
Senator Anne Urquhart (until 27 June 2012)	Tasmania, ALP
Senator the Hon Lin Thorp (from 27 June 2012)	Tasmania, ALP
Senator Peter Whish-Wilson (from 11 September 2012)	Tasmania, AG

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Other Senators participating in this inquiry

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Senator the Hon Ron Boswell	Queensland, NATS
Senator the Hon Richard Colbeck	Tasmania,LP
Senator Alex Gallacher	South Australia,ALP

Membership of the committee

Inquiry into the effect on Australian ginger growers of importing fresh ginger from Fiji

Members 44th Parliament

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Senator the Hon Bill Heffernan, Deputy Chair	New South Wales, LP
Senator Alex Gallacher	South Australia, ALP
Senator Sue Lines	Western Australia, ALP
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Members 43rd Parliament

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Senator Sean Edwards	South Australia, LP
Senator Fiona Nash	New South Wales, NATS
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Senator Peter Whish-Wilson (from 11 September 2012)	Tasmania, AG

Other Senators participating in this inquiry

Senator the Hon Ron Boswell	Queensland, NATS
Senator Nick Xenophon	South Australia, IND

Membership of the committee

Inquiry into the proposed importation of potatoes from New Zealand

Members 44th Parliament

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Senator the Hon Bill Heffernan, Deputy Chair	New South Wales, LP
Senator Alex Gallacher	South Australia, ALP
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Abbreviations

ACERA	Australian Centre of Excellence for Risk Analysis
AGIA	Australian Ginger Industry Association
ALOP	Appropriate Level of Protection
BFC	Botanical Food Company
BIRA	Biosecurity Import Risk Analysis
CCEPP	Consultative Committee on Emergency Plant Pests
CEBRA	Centre for Excellence for Biosecurity Risk Analysis (CEBRA)
DA	Department of Agriculture (formerly known as the Department of Agriculture, Fisheries and Forestry (DAFF)
DAFF	Department of Agriculture, Fisheries and Forestry (now known as the Department of Agriculture (DA)
EAD	Emergency Animal Disease
EPPRD	Emergency Plant Pest Response Deed
EPPS	Emergency Plant Pest
ESG	Eminent Scientists Group
IMAAG	Import Market Access Advisory Group
IPCC	Intergovernmental Panel on Climate Change
IPPC	International Plant Protection Convention
IRA	Import Risk Analysis
IRAAP	Import Risk Analysis Appeals Panel
IRA Handbook	Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*
ISPM	International Standards for Phytosanitary Measures
NMG	National Management Group
OIE	Office International des Epizooties
PHA	Plant Health Australia
QPIF	Queensland Primary Industries and Fisheries
SPS Agreement	World Trade Organisation Agreement on the Application of Sanitary and Phytosanitary Measures
WTO	World Trade Organisation
REM	Risk Estimation Matrix
TST	Threat Summary Tables

List of recommendations

Recommendation 1

2.47 The committee recommends that the Government create a single, independent, statutory authority – separate from the Department of Agriculture – with responsibility for quarantine and biosecurity policy and operations.

Recommendation 2

2.48 The recommends that the Government ensure that Australia's import risk analysis process is consultative, scientifically based, politically independent, transparent, consistent, harmonised and subject to appeal on process.

Recommendation 3

3.83 The committee recommends that the Department of Agriculture give thorough consideration to the Peace report, as well as the underlying themes of all other recommendations contained in this report, in developing the new biosecurity regulations and guidelines.

Recommendation 4

3.85 The committee recommends that the IRA Handbook should be amended to include full details of techniques available to Department of Agriculture risk analysts and any underlying data or research validating those techniques.

Recommendation 5

3.87 The committee recommends that the IRA Handbook should include an IRA effectiveness checklist similar to that recommended by Mr Peace.

Recommendation 6

3.91 The committee recommends that stakeholders' risk perceptions should be incorporated into risk criteria used to analyse the consequences of a given import risk.

Recommendation 7

3.92 The committee recommends that the Department of Agriculture consider ways to improve the way it communicates risk (and the risk assessment process) to stakeholders.

Recommendation 8

3.95 The committee recommends that the Department of Agriculture reconsiders the operation of geographic impacts in the IRA process, and give consideration to developing consequence scales based on, for example, national GDP, percentage of national crop at risk, or viable planting area at risk.

Recommendation 9

4.61 The committee recommends that before commencing the importation of fresh pineapples from Malaysia, the Department of Agriculture should establish to a much greater degree of certainty the degree of post-harvest latency of pineapple fruit collapse and heart rot.

Recommendation 10

4.89 The committee recommends that the Department of Agriculture review its assessment of the probability of importation and the probability of distribution of the *Dickeya* sp. pathogen. If a risk above Australia's ALOP were to emerge from the review, then the committee expects stronger risk management measures would be required. If such risk management measures were not sufficient to reduce the risk to Australia's ALOP, then imports of Malaysian pineapples to Australia should not be permitted.

Recommendation 11

4.100 The committee recommends that the Department of Agriculture review its assessment of the consequences of the establishment of the pineapple heart rot and fruit collapse pathogen *Erwinia chrysanthemi* (pineapple strain, *Dickeya* sp.) in Australia. If a risk above Australia's ALOP were to emerge from the review, then the committee expects stronger risk management measures would be required. If such risk management measures were not sufficient to reduce the risk to Australia's ALOP then imports of Malaysian pineapples to Australia should not be permitted.

Recommendation 12

5.23 The committee recommends that the full reasons and relevant supporting documentation of the Import Market Access Advisory Group should be made publicly available within 30 days of a decision being taken.

Recommendation 13

5.36 The committee recommends that the Department of Agriculture review its assessment of the likelihood of entry, establishment and spread of yam scale. If a risk above Australia's ALOP were to emerge from the review, then the committee expects stronger risk management measures would be required. If such risk management measures were not sufficient to reduce the risk to Australia's ALOP, then imports of Fijian ginger to Australia should not be permitted.

Recommendation 14

5.61 The committee recommends that the Department of Agriculture review its assessment of the likelihood of entry, establishment and spread of the Fijian burrowing nematode variant. If a risk above Australia's ALOP were to emerge from the review, then the committee expects stronger risk management measures would be required. If such risk management measures were not sufficient to reduce the risk to Australia's ALOP, then imports of Fijian ginger to Australia should not be permitted.

Recommendation 15

5.93 The committee recommends that the Department of Agriculture review its assessment of the consequences of the establishment of the Fijian burrowing nematode variant in Australia. If a risk above Australia's ALOP were to emerge from the review, then the committee expects stronger risk management measures would be required. If such risk management measures were not sufficient to reduce the risk to Australia's ALOP, then imports of Fijian ginger to Australia should not be permitted.

Recommendation 16

5.123 The committee recommends that before an import license is granted, the Department of Agriculture make available to stakeholders the scientific evidence used as the basis for the effectiveness of the proposed mitigation measures for yam scale.

Recommendation 17

5.124 The committee recommends that if the Department of Agriculture cannot produce such scientific evidence, the mitigation measures for yam scale must be reassessed.

Recommendation 18

5.130 The committee recommends that the draft work plan for importing ginger from Fiji be made available to the Parliament and industry for appropriate scrutiny over a suitable period of time, prior to it being finalised.

Recommendation 19

5.133 The committee recommends that the Import Risk Analysis for fresh ginger from Fiji be recommenced. In recommencing the IRA, DA Biosecurity should ensure that particular attention is paid to:

- **(a) the likelihood of the Fijian burrowing nematode variant being imported given:**
  - **(i) the potential for the Fijian burrowing nematode variant to be imported via other host crops; and**
  - **(ii) the potential for the Fijian burrowing nematode variant to be imported via other non-host crops grown in the same fields as ginger.**
- **(b) the consequences of importing the Fijian burrowing nematode variant when the following are taken into account:**
  - **(i) the suggestions made in the Peace Report regarding geographic scale for crops that are limited to particular districts or regions due to climatic conditions;**
  - **(ii) the greater geographic scale for other host crops grown in Australia that could be susceptible to the Fijian burrowing nematode variant;**
  - **(iii) proper consultation with stakeholders for other host crops, who should be fully informed of the Fijian burrowing nematode variant and its unknown pathogenicity to those other host crops; and**
  - **(iv) whether there are any effective management measures for the Fijian burrowing nematode variant in other host crops that are grown in Australia.**
- **(c) the effectiveness of the proposed mitigation measures, taking into account:**
  - **(i) the scientific evidence for the limited effectiveness of methyl bromide treatment when the Fijian burrowing nematode variant is resident inside ginger rhizomes;**
  - **(ii) the assessment of the import likelihood, given that the mitigation measures do not guarantee elimination of the Fijian burrowing nematode variant and that inspections will not detect nematodes resident inside the ginger;**

(iii) the relative effectiveness of the mitigation measure for the Fijian burrowing nematode variant compared to the more common variant; and

(iv) a comprehensive examination of overseas practices.

Recommendation 20

5.140 The committee recommends that when the IRA is recommenced for fresh ginger from Fiji, all relevant pests and diseases should be reassessed.

Recommendation 21

6.32 The committee recommends that, before any fresh ginger is imported from Fiji, the Department of Agriculture use its powers under Regulation 69 of the Quarantine Regulations 2000 to resolve the scientific uncertainty surrounding the burrowing nematode and other possible pathogens.

Recommendation 22

6.33 The committee recommends that the proposed merits review process for IRAs also include decisions by the Department of Agriculture on the exercise of information-gathering and other powers under Regulation 69 of the Quarantine Regulations 2000.

Recommendation 23

6.42 The committee recommends that the Department of Agriculture provide industry stakeholders and/or peak bodies with information relevant to IRA processes directly and without delay (and with sufficient time to respond to IRA timelines).

Recommendation 24

7.118 The committee recommends that, before commencing the importation of fresh potatoes from New Zealand, a formal Import Risk Analysis be conducted for fresh potatoes for processing from New Zealand. In conducting the IRA, DA Biosecurity should ensure that particular attention is paid to:

- **the conduct, or commissioning, of scientific research in relation to possible disease pathways for the *Candidatus* Liberibacter solanacearum pathogen;**
- **the lack of reliable diagnostic testing for the zebra chip bacteria;**

- **the large number of bacteria, fungi, nematodes, arthropods and viruses which are known to occur in New Zealand, and which are of concern to Australian potato producers.**

Chapter 1
Introduction

Conduct of inquiries

1.1 During the second half of 2012, the following inquiries regarding the importation of fresh produce were referred to the Senate Rural and Regional Affairs and Transport References Committee (the committee) for inquiry and report:

- the effect on Australian pineapple growers of importing fresh pineapples from Malaysia;
- the effect on Australian ginger growers of importing fresh ginger from Fiji; and
- the proposed importation of potatoes from New Zealand.

1.2 Initial submissions to each of the inquiries indicated that stakeholder groups were keen to raise particular issues with the committee and to provide evidence they viewed as being very specific to their industry. Therefore, whilst the three inquiries were all referred within a three-month period, and shared similar reporting dates, the committee resolved to conduct hearings for each of the inquiries separately.

Independent advice on Risk Estimation Matrix

1.3 As the committee's inquiry into the importation of pineapples progressed, industry stakeholders raised concerns about the way in which the Department of Agriculture (DA)[1] estimates import risk, based on the Risk Estimation Matrix (REM). The committee also received conflicting advice regarding the level of risk involved in importing pineapples from Malaysia. As a result of this conflicting information, the committee resolved to seek independent advice in relation to the REM used by DA as part of the Import Risk Analysis (IRA) process. (Detailed information regarding the consultancy and the report prepared for the committee is provided in Chapter 3).

1.4 The independent analyst's report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process,* confirmed the committee's view that the issues raised in the report are central, and very relevant to all three inquiries.

Amalgamation of the reports

1.5 The committee acknowledges the importance of conducting the three inquiries separately in order to identify the issues which were of specific concern to Australia's pineapple, ginger and potato industries. Having completed the evidence-gathering part of these three inquiries separately, the committee decided that the three reports should be amalgamated and tabled together as a single report. The committee believes that

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1 Under the previous government, the Department of Agriculture (DA) was known as the Department of Agriculture, Fisheries and Forestry (DAFF). The area of DAFF responsible for the management of biosecurity was formerly known as DAFF Biosecurity.

this approach will enable the recurring theme common to each of these inquiries (the operation of DA's REM) to be a central focus, whilst at the same time allowing for detailed consideration of the significant and specific issues relevant to each separate inquiry.

Terms of reference and conduct of inquiries

Importation of pineapple from Malaysia

Terms of reference

1.6 On 20 June 2012, the Senate referred the following matter to the committee for inquiry and report by 10 October 2012:

> The effect on Australian pineapple growers of importing fresh pineapple from Malaysia, including:
>
> (a) the scientific basis on which the provisional final import risk analysis report regarding the importation of fresh, decrowned pineapple has been developed;
>
> (b) the risk and consequences of the importation possibly resulting in the introduction of pest species;
>
> (c) the adequacy of the quarantine conditions recommended by the Department of Agriculture, Fisheries and Forestry; and
>
> (d) any other related matter.

1.7 On 22 November 2012, the Senate granted an extension of time for reporting until 20 March 2013. On 14 March 2013, the Senate granted a further extension of time for reporting until 24 June 2013. A further extension was granted by the Senate on 17 June 2013, and the new reporting date of 19 July 2013 was set.

Re-referral following 2013 election

1.8 On 19 July 2013, (prior to the end of the 43rd Parliament) the committee tabled an interim report and sought a further extension to the reporting date. The committee's interim report also notified the Senate that, in order to give further consideration to the evidence provided and conclude its deliberations, it was likely that the committee would seek re-referral of the inquiry in the 44th Parliament.

1.9 On 14 November 2013, the Senate agreed to the committee's recommendation that this inquiry be re-adopted in the 44th Parliament. The Senate also set a reporting date of 28 February 2014. A further interim report was tabled on 28 February seeking a further extension to the end of March 2014.

Conduct of inquiry

1.10 The inquiry was advertised in *The Australian* and on the committee's website. In addition, the committee wrote to a number of key stakeholder groups, the Queensland Government and the relevant Commonwealth department inviting submissions. The committee continued to accept submissions throughout the inquiry.

1.11 The committee received 10 submissions. A list of individuals and organisations that made public submissions to the inquiry (together with additional information authorised for publication) is at Appendix 1.

1.12 The committee held three public hearings: in Brisbane on 6 August 2012, in Canberra on 23 October 2012 and, finally, in Canberra on 12 March 2013. A list of the witnesses who gave evidence at public hearings is available at Appendix 2. A Hansard transcript of the committee's hearings is available on the committee's website at www.aph.gov.au.

Importation of ginger from Fiji

Terms of reference

1.13 On 19 September 2012, the Senate referred the following matter to the committee for inquiry and report by 29 November 2012:

> The effect on Australian ginger growers of importing fresh ginger from Fiji, including:
>
> (a) the scientific basis on which the provisional final import risk analysis report regarding the importation of fresh ginger has been developed;
>
> (b) the adequacy of the pest risk assessments contained in the provisional final import risk analysis report for fresh ginger from Fiji;
>
> (c) the risk and consequences of the importation resulting possibly in the introduction of pest species or diseases and soil-borne diseases;
>
> (d) the adequacy of the quarantine conditions recommended by the Department of Agriculture, Fisheries and Forestry; and
>
> (e) any other related matter.

1.14 On 22 November 2012, the Senate granted an extension of time for reporting until 20 March 2013. On 14 March 2013, the Senate granted a further extension of time for reporting until 24 June 2013. A further extension was granted by the Senate on 17 June 2013, and the new reporting date of 19 July 2013 was set.

Re-referral following 2013 election

1.15 On 19 July 2013, (prior to the end of the 43rd Parliament) the committee tabled an interim report and sought a further extension to the reporting date. The committee's interim report also notified the Senate that, in order to give further consideration to the evidence provided and conclude its deliberations, it was likely that the committee would seek re-referral of the inquiry in the 44th Parliament.

1.16 On 14 November 2013, the Senate agreed to the committee's recommendation that this inquiry be re-adopted in the 44th Parliament. The Senate also set a reporting date of 28 February 2014. A further interim report was tabled on 28 February seeking a further extension to the end of March 2014.

Conduct of the inquiry

1.17 The inquiry was advertised in *The Australian* and on the committee's website. In addition, the committee wrote to a number of key stakeholder groups, the

Queensland Government and the relevant Commonwealth department inviting submissions. The committee continued to accept submissions throughout the inquiry.

1.18 The committee received 15 submissions. A list of individuals and organisations that made public submissions to the inquiry (together with other information authorised for publication) is at Appendix 3.

1.19 The committee held a public hearing in Canberra on 23 October 2012. A list of the witnesses who gave evidence at the public hearing is available at Appendix 4. A Hansard record of the committee's hearing is available on the committee's website at www.aph.gov.au.

Importation of potatoes from New Zealand

Terms of reference

1.20 On 12 September 2012, the Senate referred an inquiry into the following matter to the Rural and Regional Affairs and Regional Affairs and Transport References Committee for inquiry and report by 21 November 2012:

> The proposed importation of potatoes from New Zealand, including:
>
> (a) the validity and supporting scientific evidence underpinning the Pest Risk Analysis included in the New Zealand Potatoes Import Risk Analysis 2009;
>
> (b) the extent of scientific knowledge and understanding of the Tomato/Potato Psyllid and other pests identified in the Draft Review of Import Conditions; and
>
> (c) any related matters.

1.21 On 21 October 2012, the Senate granted an extension of time for reporting until 20 March 2013. On 14 March 2013, the Senate granted a further extension of time for reporting until 24 June 2013. A further extension was granted by the Senate on 17 June 2013, and the new reporting date of 19 July 2013 was set.

Re-referral following 2013 election

1.22 On 19 July 2013, (prior to the end of the 43rd Parliament) the committee tabled an interim report and sought a further extension to the reporting date. The committee's interim report also notified the Senate that, in order to give further consideration to the evidence provided and conclude its deliberations, it was likely that the committee would seek re-referral of the inquiry in the 44th Parliament.

1.23 On 14 November 2013, the Senate agreed to the committee's recommendation that this inquiry be re-adopted in the 44th Parliament. The Senate also set a reporting date of 28 February 2014. A further interim report was tabled on 28 February seeking a further extension to the end of March 2014.

Conduct of the inquiry

1.24 The inquiry was advertised in *The Australian* and on the committee's website. In addition, the committee wrote to a number of key stakeholder groups, including

state governments and the relevant Commonwealth department inviting submissions. The committee continued to accept submissions throughout the inquiry.

1.25 The committee received 14 submissions. A list of individuals and organisations that made public submissions to the inquiry (together with additional information authorised for publication) is at Appendix 5.

1.26 The committee held a public hearing in Canberra on 24 October 2012. A list of the witnesses who gave evidence at the public hearing is available at Appendix 6. A Hansard transcript of the committee's hearing is available on the committee's website at www.aph.gov.au.

Related inquiries

1.27 The following section of this chapter provides an overview of related inquiries the committee has undertaken in relation to the import (or proposed import) of specific plants or animals. The committee also completed two inquiries which focused on quarantine and biosecurity arrangements more generally.

Inquiries into the import of specific plant or animal products

1.28 Over the past decade, the committee has taken a keen interest in biosecurity and quarantine arrangements in relation to the importation (or proposed importation) of specific plant or animal products. These inquiries include:

- 2000 – inquiry into the importation of Salmon products;[2]
- 2001, 2005 and 2007 – inquiries into the importation of New Zealand apples;
- June 2009 – inquiry into the Import Risk Analysis (IRA) for the importation of Cavendish bananas from the Philippines; and
- June 2010 – inquiry into the possible impacts and consequences for public health, trade and agriculture, of the Government's decision to relax import restrictions on beef.

1.29 A number of the committee's past inquiries have also considered issues surrounding the management of particular incursions of pests and diseases into Australia. Information regarding some of the committee's previous inquiries is provided at Appendix 7.

1.30 The committee's inquiries into Australia's biosecurity and quarantine arrangements have enabled the committee to gain a wider appreciation of the operation of Australia's biosecurity system. The committee has also been afforded the opportunity to examine a number of issues from a more strategic viewpoint and been provided with a valuable source of background material. The knowledge gained during past inquiries has informed the committee's current inquiry.

2 This inquiry was undertaken by committee's legislation committee pair, the Rural and Regional Affairs Legislation Committee.

Biosecurity reform

1.31 Australia's biosecurity system has, over the past twenty years, been the subject of several major reviews.

1.32 In 1995, a review chaired by Professor Malcolm Nairn made a number of recommendations for improvements to the operation of Australia's biosecurity and quarantine system.[3]

1.33 In 2008, a further independent review – chaired by Mr Roger Beale – found that whilst Australia's 'biosecurity system has worked well in the past, and is often the envy of other countries … the system is far from perfect'. The report, titled *One biosecurity: a working partnership* (the Beale report) pointed to a number of systemic deficiencies and concluded that there was room for improvement. The Beale report made a series of recommendations for reform, with the primary intention of strengthening Australia's biosecurity system.[4]

1.34 Proposed reforms included the improved targeting of resources, more efficient timelines and operations, improved risk management, increased transparency and a complete revision of the relevant legislation.[5] (Several of the key outcomes of the Nairn and Beale reviews are discussed further in Chapter 2).

Proposed biosecurity legislation

1.35 In the previous Parliament, the then Government introduced new biosecurity legislation. The Biosecurity Bill 2012 and the Inspector-General of Biosecurity Bill 2012 were introduced into the Senate on 28 November 2012.

1.36 The legislation, which was drafted to take into account the reviews conducted by Nairn and Beale, was developed to 'simplify and clarify biosecurity regulatory requirements' and enhance 'Australia's capacity to manage biosecurity risks into the future'.[6]

1.37 The purpose of the Biosecurity Bill 2012 was described as being to provide:

> …the primary legislative means for the Australian Government to manage the risk of pests and diseases entering Australian territory and causing harm to animal, plant and human health, the environment and the economy.[7]

1.38 It was also proposed that the bills would deliver on five high-level objectives that support the biosecurity reform principle – modern legislation, technology, funding and business systems. The five stated objectives of the bill are listed as:

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3 Department of Primary Industries and Energy, M.E. Nairn, P.G. Allen, A.R. Inglis and C. Tanner, *Australian Quarantine – a shared responsibility*, Canberra, 1996.

4 Beale, Roger et al, *One Biosecurity: a working partnership*, 30 September 2008, p. ix.

5 Department of Agriculture, Fisheries and Forestry, *Reform of Australia's biosecurity system – An update since the publication of One Biosecurity: a working partnership*, March 2012, p. 1.

6 Explanatory Memorandum, Biosecurity Bill 2012, p. 1.

7 Explanatory Memorandum, Biosecurity Bill 2012, p. 1.

- managing biosecurity risk;
- improving productivity;
- strengthening partnerships;
- sound administration; and
- increasing transparency.[8]

1.39 The Biosecurity Bill 2012 also proposed to replace the IRA process with a Biosecurity Import Risk Analysis (BIRA) process. Under the new regulations, it was intended that guidelines in relation to the BIRA process would be required to be made publicly available on the DA website 'to ensure that the BIRA process is transparent for industry and other persons who have a legitimate interest in the outcome of the BIRA process'.[9]

1.40 The legislation also requires the Director of Biosecurity to prepare draft, provisional and final IRA reports. It was anticipated that stakeholders would be able to provide comment on the draft BIRA report and that the provisional BIRA report would 'build on the draft BIRA report, taking into account stakeholder comments'.[10]

1.41 The committee noted the proposed requirement to take stakeholders' feedback into account and viewed it as a positive development. In previous reports, the committee has stressed the importance of stakeholders having their views taken into consideration and being able to fully participate in the import risk analysis process.

1.42 It is noted that the Biosecurity Bill 2012 and the Inspector-General of Biosecurity Bill 2012 bill both lapsed immediately prior to the commencement of the 44th Parliament.

Structure of the report

1.43 Chapter 2 of the report outlines Australia's current biosecurity arrangements, including the management of biosecurity risks, the current risk assessment process and the current arrangements as they apply to incursions of plant and animal pests and diseases.

1.44 Chapter 3 outlines stakeholder and committee concerns regarding the IRA process and the REM used by DA to calculate risk. The chapter also summarises the evidence provided by an independent risk expert – Mr Chris Peace – engaged to review the DA REM and outlines the Department's response to that evidence. The chapter concludes by providing the committee's views on the evidence provided by Mr Peace and DA's response.

1.45 Chapter 4 provides background in relation to Australia's pineapple industry and describes the IRA process undertaken in relation to the importation of pineapples.

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8 Department of Agriculture, Fisheries and Forestry, *Reform of Australia's biosecurity system: New biosecurity legislation,* July 2012, p. 5.

9 *Biosecurity Bill 2012*, Explanatory Memorandum, Clause 166, p. 186.

10 *Biosecurity Bill 2012*, Explanatory Memorandum, Clause 167, p. 186.

The chapter also reviews the evidence acquired during the committee's inquiry and provides the committee's conclusions in relation to the importation of pineapples from Malaysia.

1.46 Chapter 5 provides background in relation to Australia's ginger industry and describes the IRA process undertaken in relation to the importation of fresh ginger from Fiji. The chapter reviews the evidence provided by industry stakeholders in relation to the ginger IRA process and provides the committee's conclusions in relation to the importation of ginger from Fiji.

1.47 Chapter 6 continues the committee's examination of the issues surrounding the proposed importation of fresh ginger from Fiji. Specifically, the chapter outlines issues raised by industry stakeholders, including: the evidence DA Biosecurity relied on in the preparation of the ginger IRA, the Department of Agriculture's powers to obtain additional information (or commission research) and deficiencies in the DA Biosecurity's consultation processes.

1.48 Chapter 7 provides background in relation to Australia's potato industry and describes the review of import conditions undertaken in relation to the importation of potatoes from New Zealand. The chapter also reviews the evidence acquired during the committee's inquiry and provides the committee's conclusions in relation to the importation of potatoes from New Zealand.

Acknowledgements

1.49 The committee acknowledges the contribution of all those individuals and organisations who prepared written submissions and those who appeared as witnesses. Their efforts have assisted the committee considerably in the preparation of this report.

A note on references

References in this report are to individual submissions as received by the committee. For ease of reference, the specific inquiry to which a submission was provided is identified in footnotes. The Hansard transcripts are referred to by inquiry and date and are available on the Parliament's website at www.aph.gov.au. References to the Hansard throughout the report are to the proof transcript. Page numbers may vary between the proof and the official transcript.

Chapter 2

Australia's biosecurity and quarantine arrangements

Introduction

2.1 This chapter outlines Australia's existing administrative and legal arrangements in relation to biosecurity and quarantine. The chapter also provides a brief outline of Australia's current approach to managing the risk of incursions of exotic pests and diseases.

Australia's biosecurity and quarantine arrangements

2.2 Under the Australian Constitution, the Commonwealth does not have exclusive power to make laws in relation to biosecurity and quarantine. The administration of Australia's biosecurity and quarantine is, therefore, governed by both Commonwealth and state and territory laws.

2.3 The Commonwealth's quarantine laws are currently contained in the *Quarantine Act 1908* (the Quarantine Act) and associated subordinate legislation, including the *Environment Protection and Biodiversity Conservation Amendment (Wildlife Protection) Act 1999*, the Quarantine Regulations 2000 and the Quarantine Proclamation 1998. The Quarantine Proclamation identifies goods which cannot be imported into Australia unless the Director of Animal and Plant Quarantine grants an import permit or unless they comply with other specified conditions.[1]

2.4 However, responsibility for the movement of goods of quarantine concern within Australia's border is assumed by state and territory authorities, which undertake both intra- and inter-state quarantine operations that reflect regional differences in pest and disease status, as part of their wider plant and animal health obligations.[2]

Department of Agriculture – management of biosecurity

2.5 The Department of Agriculture (DA) manages quarantine controls at Australia's borders to minimise the risk of exotic pests and diseases entering the country and provides import and export inspection and certification services.

2.6 DA is also responsible for the development of Commonwealth biosecurity policy, for undertaking risk analyses in relation to the importation of new products to Australia and the establishment of appropriate risk management measures.

Managing biosecurity risks

2.7 The Department's *Import risk analysis handbook 2011* (the IRA Handbook) notes that the principal objective of Australia's biosecurity and quarantine measures is:

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1 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 8. (The Secretary of the Department of Agriculture is appointed the Director of Animal and Plant Quarantine under the Act).

2 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 6.

> …the prevention or control of the entry, establishment or spread of pests and diseases that could cause significant harm to people, animals, plants and other aspects of the environment.[3]

2.8 The Government's approach to managing the risk of incursions of exotic pests and diseases is 'multi-layered' in that it involves a series of 'complementary measures applied along the biosecurity continuum – offshore, at the border and onshore.'[4]

2.9 Offshore (or pre-border) activities are described as those which seek to prevent biosecurity risks reaching Australia. In addition to understanding global risks, working with international trading partners and the private sector and engaging with travellers about Australia's biosecurity requirements, specific offshore activities include:

- participation in international standard-setting bodies;
- co-operation in multilateral forums;
- development of offshore quarantine arrangements;
- undertaking import risk analyses; and
- intelligence gathering and audit activities.[5]

2.10 DA is responsible for making quarantine decisions under the Quarantine Act and for the development of border operational procedures. Border activities include the interception of biosecurity risks that present at airports, seaports, mail centres and along Australia's coastline. Activities are therefore centred around the screening of mail, vessels (including aircraft), people and goods entering the country. Border activities also include:

- import permit decisions;
- audit activities; and
- post-entry quarantine.[6]

2.11 Should there be an incursion of a pest or disease of biosecurity risk, Australia's onshore biosecurity and quarantine arrangements endeavour to reduce the likelihood that the pest or disease will become established. The Commonwealth has formal, national arrangements in place for managing responses to both emergency animal and plant pests and diseases and food safety issues in aquatic and terrestrial environments. Onshore (or post-border) activities include:

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3 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 6.

4 Department of Agriculture, Fisheries and Forestry, *Reform of Australia's biosecurity system – an update since the publication of One Biosecurity: a working partnership*, March 2012, p. 6.

5 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 6; and Department of Agriculture, Fisheries and Forestry, *Reform of Australia's biosecurity system – an update since the publication of One Biosecurity: a working partnership*, March 2012, p. 6.

6 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 6 and Department of Agriculture, Fisheries and Forestry, *Reform of Australia's biosecurity system – an update since the publication of One Biosecurity: a working partnership*, March 2012, p. 6.

- monitoring and surveillance activities (for exotic animal and plant pests and diseases);
- development of emergency response plans; and
- coordination of national responses to pest and disease incursions.[7]

Appropriate Level of Protection

2.12 The World Trade Organisation (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) underpins the biosecurity approaches of many WTO members, including Australia. The SPS Agreement defines the concept of an 'appropriate level of sanitary and phytosanitary protection' (ALOP) as:

> …the level of protection deemed appropriate by a WTO member establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory.[8]

2.13 Australia expresses its ALOP in qualitative terms. The IRA Handbook states that Australia maintains a 'conservative, but not a zero-risk, approach to the management of biosecurity risk'.[9] The Commonwealth, with the agreement of all state and territory governments, has described Australia's ALOP as:

> …providing a high level of sanitary and phytosanitary protection aimed at reducing risk to a very low level, but not to zero.[10]

2.14 The above approach is identified by DA as being consistent with the WTO's SPS Agreement.[11]

2.15 In setting an ALOP, WTO members are required to take into account 'the objective of minimising negative trade effects'.[12] The IRA Handbook notes that, in conducting risk analyses, Australia takes into account the following economic factors:

- the potential damage in terms of loss of production or sales in the event of the entry, establishment or spread of a pest or disease in the territory of Australia;
- the costs of control or eradication of a pest or disease; and
- the relative cost-effectiveness of alternative approaches to limiting risks.[13]

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7 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 6 and Department of Agriculture, Fisheries and Forestry, *Reform of Australia's biosecurity system – an update since the publication of One Biosecurity: a working partnership*, March 2012, p. 6.

8 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 6.

9 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 6.

10 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 33.

11 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 6. [The full SPS agreement is set out in Annex 2 of the Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 22].

12 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 6.

The risk assessment process

2.16 Undertaking a risk analysis in relation to a proposed importation (or where new circumstances arise in relation to an existing importation) is a central element of Australia's biosecurity and quarantine framework. The IRA Handbook notes that:

> Within Australia's quarantine framework, the Australian Government uses risk analyses to assist it in considering the level of quarantine risk that may be associated with the importation or proposed importation of animals, plants or other goods.[14]

2.17 In conducting a risk analysis, DA Biosecurity:

- identifies the pests and diseases of quarantine concern that may be carried by the good/s;
- assesses the likelihood that an identified pest or disease would enter, establish or spread; and
- assesses the probable extend of the harm that would result.[15]

2.18 If the assessed level of quarantine risk exceeds Australia's ALOP, DA then considers whether any risk management measures could reduce quarantine risk to achieve the ALOP. If risk measures cannot reduce the risk to the ALOP, the importation of the product in question is not allowed.

Types of risk analysis

2.19 Following the receipt of an import proposal (or notification of a change to the risk profile of existing trade in a good), DA considers whether a risk analysis is required. A risk analysis may take the form of:

- a non-regulated analysis of existing policy or technical advice to DA; or
- an import risk analysis (IRA), in which the key steps of the analysis are regulated under the Quarantine Regulations 2000.[16]

2.20 A non-regulated analysis of existing policy could take the form of, for example, a pest risk analysis or a relatively narrow course of consultation with relevant stakeholders.[17] This approach could be taken where, for example, DA

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13 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 6.

14 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 15.

15 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 9.

16 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, pp 9–10.

17 Pest risk analysis is a concept that is derived from international standards contained in the International Plant Protection Convention. Australia's regulated IRA process is, in fact, an augmented version of a pest risk analysis as defined in international standards (that is, the IRA process contains additional consultative and administrative elements. So, although pest risk analysis may be a 'lesser' form of risk analysis that the regulated IRA process, it contains many of the same elements and, often, a significant level of detail.

Biosecurity has previously undertaken significant analysis in relation to the crop that is the subject of an import proposal.

2.21 The Chief Executive of DA Biosecurity determines whether a risk analysis will be conducted as an IRA. An IRA will generally be undertaken when:

- relevant risk management measures have not been established; or
- relevant risk management measures for a similar good and pest/disease combination do exist, but the likelihood and/or consequences of entry, establishment or spread of pests or diseases could differ significantly from those previously assessed.[18]

2.22 An IRA can be undertaken in either a 'standard' or 'expanded' format. The regulated steps for both types of IRAs include:

- **consultation** – on scope and approach with the proposer, industry and other stakeholders;
- **announcement and commencement** – which triggers the regulated timeframe for the IRA;
- **issues paper preparation** – expanded IRA only;
- **consultation on issues paper** – expanded IRA only;
- **risk analysis and draft IRA report preparation**;
- **consultation on draft IRA report** – through publication on the DA website and an invitation for public comment;
- **review of draft report by the Eminent Scientists Group (ESG)**[19] **–** the ESG is a high level review group, independent from DA Biosecurity. Whilst not used during standard IRA processes, the ESG is tasked with providing external scientific and economic scrutiny of expanded IRAs. The ESG is required to take into account any relevant new information and assess conflicting scientific views to ensure that:
  - all submissions received from stakeholders in response to the draft IRA report have been properly considered;
  - all relevant matters relating to the likely economic consequences of a pest or disease incursion have been properly considered; and
  - the conclusions of the revised draft IRA report are scientifically reasonable, based on the material presented;
- **preparation and publication of the provisional final IRA report** – taking into account stakeholder comments and, in the case of an expanded IRA, any recommendations made by the ESG;

18 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 12.

19 Further details regarding the Eminent Scientists Group (ESG) can be found in Annex 6 of the Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 36.

- **appeal on the provisional final IRA report** – a right of (non-judicial) appeal is available to the Import Risk Analysis Appeals Panel (IRAAP) for any stakeholder who believes there was a 'significant deviation from the [prescribed] IRA process…that adversely affected their interests';[20]
- **final IRA report and recommendation** – which is provided to the Director of Animal and Plant Quarantine for a policy determination;
- **determination by the Director of Animal and Plant Quarantine –** the determination provides a policy framework for decisions on whether or not to grant an import permit and any conditions that may be attached to a permit. In making the determination, the Director considers:
  - the final IRA report and its recommendations;
  - the outcome of any appeals;
  - the ESG report;
  - DA Biosecurity's response to the ESG report; and
  - any other relevant information, including Australia's international rights and obligations.[21]

2.23 The steps outlined above reflect a series of changes to the IRA process that were introduced in 2007, with a view to:

- increasing its transparency and timeliness;
- regulating key steps, such as timeframes for completing IRAs; and
- enhancing consultation with, and scientific scrutiny of, IRAs by the ESG.[22]

Issue of import permit[23]

2.24 At the completion of the IRA process, the risk management measures recommended in the final IRA often become the conditions imposed on any import permits granted by the Director of Animal and Plant Quarantine (or delegate) to limit the level of quarantine risk to an acceptably low level. An IRA may also identify risk management measures that require preparatory work to be undertaken by the appropriate authorities in the exporting country, before trade can commence.

2.25 Before an application for an import permit can be considered, the 'Competent Authority' of the exporting country is required to prepare an operational work plan and

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20 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 18.

21 Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 19.

22 Department of Agriculture, Fisheries and Forestry, *Reforms to the Import Risk Analysis Process, Fact Sheet – September 2007*, www.daff.gov.au/__data/assets/pdf_file/0004/386725/ira-factsheet.pdf, accessed, 18 February 2013.

23 The following section is based on information contained in Department of Agriculture, Fisheries and Forestry, *Import risk analysis handbook 2011*, p. 20.

DA Biosecurity needs to be satisfied that the risk management measures recommended in the IRA have been complied with.

2.26 The Director of Animal and Plant Quarantine may delegate the power to grant import permits under the quarantine proclamations to an officer of DA Biosecurity, or another officer appointed under the Quarantine Act.

Biosecurity Bill – proposed changes to IRA process

2.27 As noted earlier in this report, new biosecurity legislation – the Biosecurity Bill 2012 and the Inspector-General of Biosecurity Bill 2012 – was introduced into the Senate on 28 November 2012. With the introduction of the new legislation, it was proposed to increase the transparency of the biosecurity system for clients and stakeholders (including trading partners) particularly in relation to the assessment and management of biosecurity risks.[24]

2.28 It was also argued that the Biosecurity Bill would lead to:

- better articulation of the role of the Director of Biosecurity and the Minister (which would improve confidence in scientific and operational decision making processes); and
- the establishment of a process for Biosecurity Import Risk Analyses (BIRA) whereby the Director of Biosecurity will be required to take into account Australia's ALOP in conducting risk assessments for the importation of goods.[25]

2.29 With the establishment of the statutory office of the Inspector-General of Biosecurity, it was proposed that:

- the Inspector-General would report directly to the Agriculture Minister;
- the Office of Inspector-General of Biosecurity would be independent from the regulator and the Director of Biosecurity; and
- the Inspector-General of Biosecurity will undertake independent audit and review functions focussed on biosecurity systems and processes.[26]

2.30 It was also argued that the statutory position of Inspector-General would:

> …perform an important role ensuring the integrity and transparency of the Biosecurity Import Risk Analysis process. Stakeholders will have the opportunity to appeal where they believe there was a significant deviation

24 Second Reading Speech, Biosecurity Bill 2012, Inspector-General of Biosecurity Bill 2012, 28 November 2012, p. 10085.

25 Second Reading Speech, Biosecurity Bill 2012, Inspector-General of Biosecurity Bill 2012, 28 November 2012, p. 10086.

26 Second Reading Speech, Biosecurity Bill 2012, Inspector-General of Biosecurity Bill 2012, 28 November 2012, p. 10087.

from the Biosecurity Import Risk Analysis process that adversely affects their interests.[27]

Emergency Plant Pest Response Deed

2.31 The eradication of emergency plant pest incursions which pose a potential threat to Australia's agricultural industry is conducted in accordance with the National Emergency Preparedness and Response Plan (the response plan). The process is similar to that followed for an EAD. The response plan specifies the procedures for handling emergency plant pest incursions at the national, state, territory and district levels.

2.32 Following the detection of an emergency plant pest and declaration of an outbreak, the Consultative Committee on Emergency Plant Pests (CCEPP) meets to determine the feasibility of eradication. The CCEPP is Australia's key technical body for co-ordinating national responses to emergency pest incursions and assessing the technical feasibility for their eradication. The CCEPP makes recommendations to the National Management Group (NMG), which is the decision making body that determines whether to proceed with an eradication campaign and, if so, approves the national cost sharing arrangements to fund the campaign. In addition to the Secretary of the Department of Agriculture, the NMG is made up of the following representatives:

- the Chief Executive Officer/s of the affected state and territory government parties;
- the President/Chairman (or officer who is properly authorised in writing to bind the party) of each of the affected industry parties; and
- the Chairman Plant Health Australia (PHA) (non-voting).[28]

2.33 Funding for eradication campaigns is allocated under the Emergency Plant Pest Response Deed (EPPRD), a formal cost sharing agreement covering industry and government funding arrangements for the eradication of emergency plant pests. The current EPPRD, which came into effect on 26 October 2005, is an agreement between PHA, the Commonwealth government, all state and territory governments and the following plant industry signatories:

- Almond Board of Australia Inc;
- Apple and Pear Australia Ltd;
- Australian Banana Growers' Council Inc;
- Australian Cane Growers' Council Ltd;
- Australian Forest Products Association Ltd;

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27 Second Reading Speech, Biosecurity Bill 2012, Inspector-General of Biosecurity Bill 2012, 28 November 2012, p. 10087.

28 Plant Health Australia, *Government and Plant Industry Cost Sharing Deed in respect of Emergency Plant Pest Responses*, January 2013, Schedule 8, p. 104.

- Australian Honey Bee Industry Council Inc;
- Australian Macadamia Society Ltd;
- Australian Mango Industry Association Ltd;
- Australian Olive Association Ltd;
- Australian Processing Tomato Research Council Inc;
- Australian Table Grape Association Inc;
- Australian Walnut Industry Association Inc;
- AUSVEG Ltd;
- Avocados Australia Ltd;
- Canned Fruit Industry Council of Australia Ltd;
- Cherry Growers of Australia Inc;
- Chestnuts Australia Inc;
- Citrus Australia Ltd;
- Cotton Australia Ltd;
- Dried Fruits Australia Inc;
- Grain Producers Australia Ltd;
- Nursery and Garden Industry Australia Ltd;
- Onions Australia Inc;
- Pistachio Growers Association Inc;
- Queensland Fruit and Vegetable Growers Ltd (Growcom);
- Ricegrowers Association of Australia Inc;
- Strawberries Australia Inc;
- Summerfruit Australia Ltd; and
- Wine Grape Growers Australia Inc.[29]

2.34 Under the EPPRD, Emergency Plant Pests (EPPs) are determined to be in one of four categories. It is these categories which determine the cost sharing split between affected government and industry parties, based on the relative private and public benefits of eradication of the pest (see Table 2.1).

29 Plant Health Australia, *Government and Plant Industry Cost Sharing Deed in respect of Emergency Plant Pest Responses*, January 2013, pp 1–2.

Table 2.1— Emergency Plant Pest Response Deed cost sharing categories[30]

Category of disease	Cost share
Category 1: Major impact on the environment, human health or amenity flora values and relatively little impact on commercial crops. Also covers situations where the EPP has a wide range of hosts including native flora and there is considerable uncertainty as to the relative impact on crops.	100% government funding
Category 2: Significant public losses through serious loss of amenity, and/or environmental values and/or effects on households, or indirectly through very severe impacts on regions and the national economy. Major costs on the affected cropping sectors such that the cropping sectors would benefit significantly from eradication.	80% government funding 20 % industry funding
Category 3: Would primarily harm the affected cropping sectors, but there would also be some significant public costs – ie. moderate public benefits from eradication. Adverse affect on public amenities, households or the environment, and/or could have significant, though moderate trade implications and/or national and regional economic implications.	50% government funding 50% industry funding
Category 4: Little or no public cost implications and little or no impacts on natural ecosystems. The affected cropping sectors would be adversely affected primarily through additional costs of production, extra control costs or nuisance costs. No significant trade issues that would affect national and regional economies. Eradication would have mainly, if not wholly, private benefits.	20% government funding 80% industry funding

2.35 If a national emergency response is agreed under the EPPRD, the Commonwealth pays 50 per cent of the government share in all instances, with the balance of the government share divided between the relevant states and territories.

30 This table is based on information contained in Plant Health Australia, *Government and Plant Industry Cost Sharing Deed in respect of Emergency Plant Pest Responses*, January 2013, p. 20 and Schedule 3, pp 65–66.

2.36 Under the EPPRD, the Commonwealth has agreed to initially meet an industry party's cost sharing obligation where that industry party is unable to do so. The Commonwealth's payment is made on the basis that the industry party will repay the Commonwealth within a reasonable period of time (generally no longer that ten years) using a pre-agreed funding mechanism, such as an EPP Response Levy.[31]

2.37 Parties to the EPPRD can establish an EPP Response Levy to meet financial liabilities for responses under the EPPRD. While this is not the only option, many industries have chosen this approach, as it provides the greatest flexibility in relation to adjusting levy rates to suit particular needs. Other options available include using funds held by the industry in trust accounts, voluntary levies or funds raised by other means.[32]

Committee comment

2.38 The committee notes that Australia's current biosecurity and quarantine arrangements – as summarised in this chapter – have been developed, revised and amended over a long period of time.

2.39 As noted in Chapter 1, Australia's biosecurity system has, over the past two decades, been the subject of several major reviews – including the 1995 Nairn review[33] and the 2008 Beale review.[34]

2.40 The committee notes that the findings of these reviews, and the recommendations made, have provided the basis for reforms to Australia's biosecurity and quarantine system. The Nairn review revealed, for example, that there was a definite imbalance between the animal and plant sectors with regard to quarantine. An examination of incursions since the 1970s showed that the rate of incursions of plant pests and diseases was about ten times more than of animals. As a result, the Nairn review recommended the Establishment of an Australian Plant Health Council and a Chief Plant Protection Officer position within the then Department of Primary Industries and Energy, to assist in achieving a higher status for plant industries.[35]

2.41 The Nairn review also argued that effective quarantine policy and programs are essential if Australia is to maintain its unique natural environment. The review recommended that industry and the community should be encouraged to have greater

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31 Plant Health Australia, *Government and Plant Industry Cost Sharing Deed in respect of Emergency Plant Pest Responses*, January 2013, Schedule 7, p. 95.

32 Plant Health Australia, *Emergency Plant Pest Response Deed (EPPRD), Questions and Answers*, February 2011, p. 9.

33 Department of Primary Industries and Energy, M.E. Nairn, P.G. Allen, A.R. Inglis and C. Tanner, *Australian Quarantine – a shared responsibility*, Canberra 1996.

34 Beale, Roger et al, *One Biosecurity: a working partnership*, 30 September 2008, p. ix.

35 Department of Primary Industries and Energy, M.E. Nairn, P.G. Allen, A.R. Inglis and C. Tanner, *Australian Quarantine – a shared responsibility*, Canberra 1996, p. 5.

involvement in the development of quarantine and biosecurity policy.[36] This is a sentiment with which the committee agrees very strongly.

2.42 The committee notes that the most recent review, chaired by Mr Beale, supported Professor Nairn's concept of biosecurity being a 'shared responsibility'.[37] In addition, Beale proposed a number of major reforms, the majority of which are currently being implemented by DA. These reforms include improved targeting of resources, increased efficiency, increased transparency and improved risk management.[38]

2.43 The committee notes that whilst the basic tenets of the Beale and Nairn reviews have been accepted by previous governments, several key recommendations have not been taken up. Both the Nairn and Beale reviews recommended the establishment of an independent statutory authority to be charged with the responsibility for quarantine and biosecurity. The committee notes, in particular, Beale's recommendation that the functions previously performed by AQIS, Biosecurity Australia and the Product Integrity, Animal and Plant Health Division should be brought together in a single, independent, statutory authority – the National Biosecurity Commission.

2.44 The committee acknowledges that under the new biosecurity legislation introduced in 2012, it was proposed to establish the statutory office of the Inspector-General of Biosecurity under arrangements similar to those proposed by the Beale report.[39] The committee would suggest, however, that whilst the new role of Inspector-General may fulfil the required audit function (recommended by the Callinan Commission[40] and the Beale report) it would not go as far as establishing an independent body to undertake Biosecurity Import Risk Analyses.

2.45 The committee notes the concerns raised by submitters to the Nairn review who pointed to the fact that there is no formal mechanism of appeal against any risk analysis decision. Submitters to the Nairn review indicated that under the current process, DA Biosecurity is 'judge, jury and executioner'[41] – a sentiment also expressed by submitters to a number of the committee's inquiries.

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36 Department of Primary Industries and Energy, M.E. Nairn, P.G. Allen, A.R. Inglis and C. Tanner, *Australian Quarantine – a shared responsibility*, Canberra 1996, p. 5.

37 Beale, Roger et al, *One Biosecurity: a working partnership*, September 2008.

38 Department of Agriculture, Fisheries and Forestry, *Reform of Australia's biosecurity system – An update since the publication of One Biosecurity: a working partnership*, March 2012, p. 1.

39 As part of its preliminary response to the Beale Review, the Government agreed to establish the statutory office of the Inspector-General of Biosecurity. On 1 July 2009, the Government appointed Dr Kevin Dunn as the Interim Inspector-General of Biosecurity. Dr Michael Bond was subsequently appointed to the position on 1 July 2013 (for a period of two years).

40 The Callinan Commission investigated an outbreak of equine influenza at the Eastern Creek Quarantine Station in 2007.

41 Department of Primary Industries and Energy, M.E. Nairn, P.G. Allen, A.R. Inglis and C. Tanner, *Australian Quarantine – a shared responsibility*, Canberra 1996, p. 98.

2.46 The committee agrees with the Nairn review's contention that 'a number of fundamental principles should apply to import risk analysis':[42] they should be consultative, scientifically based and politically independent, transparent, harmonised and subject to appeal on process. The committee also agrees with Nairn's call for a formal appeal mechanism to be instituted.

Recommendation 1

2.47 The committee recommends that the Government create a single, independent, statutory authority – separate from the Department of Agriculture – with responsibility for quarantine and biosecurity policy and operations.

Recommendation 2

2.48 The recommends that the Government ensure that Australia's import risk analysis process is consultative, scientifically based, politically independent, transparent, consistent, harmonised and subject to appeal on process.

2.49 The committee is in agreement with the Beale report's focus and recommendations in relation to involving all appropriate players.[43] The committee has, over many years, stressed the importance of promoting an increased level of cooperation between all stakeholders; including trading partners, Commonwealth, state and territory governments, industry and the community.

2.50 As noted in the previous chapter, the committee is keen to see the knowledge acquired during these three inquiries incorporated into the proposed new biosecurity arrangements and taken into consideration as DA implements future reforms.

42 Department of Primary Industries and Energy, M.E. Nairn, P.G. Allen, A.R. Inglis and C. Tanner, *Australian Quarantine – a shared responsibility,* Canberra 1996, p. 98.

43 Beale, Roger et al, *One Biosecurity: a working partnership,* September 2008, p. IX.

Chapter 3

Risk Estimation Matrix

Background

The Import Risk Analysis process

3.1 As indicated in Chapter 1, the committee has, over recent years, undertaken a number of inquiries into biosecurity and quarantine arrangements in relation to the importation (or proposed importation) of specific plant or animal products. In particular, the committee has undertaken a number of inquiries into the Import Risk Analyses (IRAs) for various plant products – including bananas from the Philippines and apples from New Zealand.

3.2 These inquiries gave stakeholders the opportunity to raise concerns in relation to IRAs conducted for specific products. Industry stakeholders also outlined a number of concerns about the IRA process more generally.

3.3 DA described the IRA process as 'an important part of Australia's biosecurity policies'[1] and argued that the IRA process:

> …enables the Australian Government to formally consider the risks that could be associated with proposals to import new products into Australia. If the risks are found to exceed Australia's appropriate level of protection (ALOP), risk management measures are proposed to reduce the risks to an acceptable level. But, if it is not possible to reduce the risks to an acceptable level, then no trade will be allowed.[2]

3.4 The committee notes however, that as far back as 1996, concerns were being expressed regarding the way in which import risk analysis was being undertaken. The Nairn review noted for example, that:

> A great deal of concern was expressed to the Review Committee on the way risk analysis is conducted on applications to import animals, plants or their products into Australia. There is a lack of confidence in the process used for such analysis, and the recommendations contained in Chapter 7 are designed to rectify the problems that were brought to the Review Committee's attention. Industry and the general public need a greater opportunity for having their views considered and the process should be conducted in a way that is transparent, scientifically based and with a

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1 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* June 2012, p. 1.

2 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* June 2012, p. 1.

> mechanism for appeal on process. All this needs to be done in the context of Australia's international obligations.[3]

Appropriate Level of Protection (ALOP)

3.5 The committee acknowledges that successive Australian Governments have maintained a conservative, but not a zero-risk approach, to the management of biosecurity risks. DA argue that this approach:

> …is expressed in terms of Australia's appropriate level of protection (ALOP), which reflects community expectations through government policy and is currently described as providing a high level of protection aimed at reducing risk to a very low level, but not to zero.[4]

3.6 The committee is aware however, that stakeholders have expressed reservations about Australia's current definition of ALOP, the current import process arrangements, the way DA Biosecurity calculates risk and the formal IRA process itself.

Current inquiries – Risk Estimation Matrix

3.7 The committee notes that over many years, industry stakeholder groups (for example, fruit and vegetable growers) have raised concerns about the way DA Biosecurity calculates risk based on the Risk Estimation Matrix (REM).

3.8 These concerns were again raised during the committee's inquiry into the importation of pineapple, and they were also raised during both the ginger and the potato inquiries. In discharging its responsibilities in relation to the pineapple reference, the committee was provided with conflicting evidence in relation to the way in which DA Biosecurity calculates risk based on the REM.[5]

3.9 Tropical Pines Pty Ltd for example argued that:

> The risk matrices and method of assessing risk, used by DAFF Biosecurity are heavily biased toward achieving overall risk assessments of low or very low. This is a concern for all risk assessments undertaken by DAFF

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3 Department of Primary Industries and Energy, M.E. Nairn, P.G. Allen, A.R. Inglis and C. Tanner, *Australian Quarantine – a shared responsibility*, Canberra 1996, p. 6.

4 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* June 2012, p. 1.

5 The committee was also provided with evidence in relation to both the ginger and the potato references which raised concerns about the way in which DA Biosecurity calculate risk. Stakeholders from both industries also argued that DA Biosecurity had underestimated the level of risk.

> Biosecurity and not just the risk assessment for the import of *Dickey* sp.[6] Working within the constraints of these risk matrices, Tropical Pines and Biosecurity Queensland have concluded the overall risk is either moderate or high, rather than low.[7]

3.10 Mr Glenn Taniguchi, Research Associate, College of Tropical Agriculture and Human Resources, University of Hawaii also stated that:

> The risk rating developed by Biosecurity Australia [now DA Biosecurity] does not clearly state how rankings were determined. The nomenclature of raking probability of likelihoods is heavily skewed and biased towards the low probability.[8]

Engagement of consultant

3.11 From the early stages of the committee's pineapple inquiry it was evident that DA Biosecurity's method of calculating risk and the REM itself would be a central issue for the inquiry and to the committee's deliberations.

3.12 The committee was also aware that in order to give appropriate consideration to stakeholders' concerns about DA Biosecurity's calculation of risk, it would be necessary to review the way in which DA Biosecurity use the REM when preparing IRAs for various products.

3.13 In conducting its inquiry, the committee was aware that the design and operation of the REM is a highly technical and specialised area. As a result, the committee made a decision to seek independent advice in relation to the matrix used by DA Biosecurity as part of the IRA processes.[9]

3.14 The process of identifying a consultant best able to provide appropriate advice and comment on the matrix took several months. During its consideration of a number of consultancy proposals, the committee was mindful that it was not only seeking specialist advice, but advice that was both informed and independent.

3.15 In contacting a number of major organisations and individual risk analysis experts within Australia, the committee became aware that many potential consultants had been employed by DA Biosecurity in the past or had current links to DA through various committees, working groups, research institutions and panels. In general, these

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6 *Erwinia chrysanthemi*, was recently renamed *Dickey* sp.,and is referred to by DAFF Biosecurity as *Erwinia chrysanthemi* (pineapple strain *Dickeya* sp.*).* This bacterial pathogen causes Bacterial Fruit Collapse and Heart Rot in pineapples. Pineapple industry stakeholders argue that the introduction of this pathogen would be devastating for Australia's pineapple industry. Stakeholders cite early studies which indicate that up to 40 per cent of plants/fruit can be affected in severe outbreaks in sensitive cultivars. Evidence provided by Hawaiian experts also indicated that once established, the disease is impossible to eradicate.

7 Tropical Pines Pty Ltd, *Submission 4 (Supplementary),* [pp 4–5].

8 Mr Glenn Taniguchi, *Submission 10,* Appendix 2, p. 1.

9 The matrix, which expresses the likelihood of pest entry, establishment and spread is at Table 2.5 on page 13 of the *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012.

potential consultants declined to apply for the consultancy on the basis of a perceived or actual conflict of interest. Conversely, the committee made a decision that it was inappropriate to engage the services of those professionals who had previously, or were currently, providing advice to industry or other stakeholder groups. Overall the committee was surprised by the extensive links that all risk analysis experts approached had with either DA Biosecurity or with various industry bodies.

3.16 The committee decide to look outside Australia to identify a suitably independent consultant, eventually engaging Mr Chris Peace, Principal Consultant, Risk Management Ltd, Wellington, New Zealand.

3.17 Mr Peace's report – *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process* (the Peace report) – was provided to the committee on 10 January 2013, and published on the committee's website on 6 February 2013. The report was also provided to DA on 7 February 2013, with a request for DA Biosecurity's preliminary views prior to a final hearing on 12 March 2013. A copy of the Peace report is included at Appendix 8.

The Peace report

Terms of reference

3.18 The agreed terms of reference for the review undertaken by Mr Peace were as follows:

- Conduct a literature review covering:
  - earlier DAFF Biosecurity IRA documents published on the DAFF website or elsewhere;
  - any comparable Risk Estimation Matrices developed or used elsewhere;
  - published academic literature critiquing the design and use of matrices.
- Critique the DAFF Biosecurity Risk Estimation Matrix from an informed position.
- Develop and test alternative approaches to quantitative or semi-quantitative risk analysis, some using alternative matrices.
- Suggest risk analysis techniques that would enable DAFF Biosecurity to report more effectively on the nature of the risk.
- Report to the committee by an agreed date and attend a teleconference meeting/hearing at an agreed time.[10]

3.19 The review of the REM included a comparison of the matrix with guidance in the joint Australia/New Zealand Standards Handbook – HB 436 *Risk Management Guidelines: a companion to AS/SNZ 4360:2004* (SA/SNZ, 2004), and draft joint

10 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process,* January 2013, p. 3.

handbook HB 89 *Risk Management – Guidelines on risk assessment techniques* (SA/SNZ, 2001). The author's approach placed the DA Biosecurity REM in the overall context of international treaties, codes, agreements and standards. The review also provided comment and guidance on the use of consequences/likelihood matrices used for risk analyses such as the DA Biosecurity REM.[11]

Issues

Description of REM in IRA Handbook

3.20 In reviewing the REM, Mr Peace noted that the IRA Handbook, 'does not mention, let alone describe the use of, the DAFF risk estimation matrix'.[12] Mr Peace also stated that:

> If the matrix is to be seen as a valid risk technique, capable of withstanding legal scrutiny, its development and application ought to be the subject of a detailed description.[13]

Unreliability of qualitative descriptors

3.21 Mr Peace noted that the Fijian ginger IRA[14] and the New Zealand apple IRA[15] include probability ranges that were not given in other reports. It was also noted that the New Zealand apple IRA gave midpoints of the ranges which were not included in other reports. The indicative probability ranges are shown in Table 3.1 below.[16]

11 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process,* January 2013, p. 3.

12 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process,* January 2013, p. 16.

13 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process,* January 2013, p. 16.

14 Department of Agriculture, Fisheries and Forestry, *Draft import risk analysis report for fresh ginger from Fiji,* April 2012 [See Table 2.1, p. 9].

15 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of apples from New Zealand,* November 2006 [See Table 12, p. 43].

16 Table 3.1 was reproduced by Mr Peace from the Fijian ginger and New Zealand apple IRA's and reproduced as Table 2 in Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process,* January 2013, p. 17.

Table 3.1—Nomenclature for qualitative likelihoods – Fijian ginger IRA

Column 1	Column 2	Column 3	Column 4
Likelihood	**Descriptive definition**	**Indicative probability (P) range**	**Midpoint (if uniform distribution used)**
High	The event would be very likely to occur	$0.7 < P \leq 1$	0.85
Moderate	The event would occur with an even probability	$0.3 < P \leq 0.7$	0.5
Low	The event would be unlikely to occur	$0.05 < P \leq 0.3$	0.175
Very low	The event would be very unlikely to occur	$0.001 < P \leq 0.05$	0.026
Extremely low	The event would be extremely unlikely to occur	$0.000001 < P \leq 0.001$	0.0005
Negligible	The event would almost certainly not occur	$0 \leq P \leq 0.000001$	0.0000005

3.22 Mr Peace noted that qualitative likelihood descriptors – and definitions, without reference to numeric probabilities – are prone to wide interpretation. He used the following example from former CIA officer Sherman Kent who wrote:

> A few days after the estimate appeared, I was in informal conversation with the Policy Planning Staff's chairman. We spoke of Yugoslavia and the estimate. Suddenly he said, "By the way, what did you people mean by the expression 'serious possibility'? What kind of odds did you have in mind?" I told him that my personal estimate was on the dark side, namely, that the odds were around 65 to 35 in favour of an attack. He was somewhat jolted by this; he and his colleagues had read 'serious possibility' to mean odds very considerably lower. Understandably troubled by this want of communication, I began asking my own colleagues on the Board of National Estimates what odds they had in mind when they agreed to that wording. It was another jolt to find that each Board member had had somewhat different odds in mind and the low man was thinking of about 20 to 80, the high of 80 to 20. The rest ranged in between.[17]

3.23 Mr Peace noted that such variations in interpretation have led to a body of research on judgement. Such research indicates that there are large differences in the way in which people understand risk-descriptors such as those used in Table 3.1, and that individual interpretation may lead to confusion and errors in communication. Mr Peace cited specific research undertaken in relation to interpretations of likelihood terms used by the Intergovernmental Panel on Climate Change (IPCC) to communicate 'uncertainty'. The terms use a set of probabilities accompanied by global interpretational guidelines. Mr Peace noted that researchers found that respondents' judgements deviated significantly from the IPCC guidelines, even when the respondents had access to these guidelines.[18]

3.24 In this regard Mr Peace stated that:

> From this research and our experience we find it likely that DAFF risk analysts may place their own interpretations on the words used in table 2.1

17 Sherman Kent (2007) quoted in Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 17.

18 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 18.

> of the Malaysian pineapple report (DAFF 2012b) and other DAFF/Biosecurity reports. In making this statement we are aware the word *likely* is, itself, open to interpretation. We therefore suggest there is an 80% probability of idiosyncratic interpretation of the DAFF nomenclature for qualitative likelihoods. This probability might be revised following research within DAFF.[19]

Combination of qualitative likelihood terms

3.25 Mr Peace noted that Table 2.2 in the Malaysian pineapple IRA (and other DA Biosecurity reports) sets out rules for combining descriptive likelihoods. Mr Peace observed that:

> No rationale or source for these rules is given, making the rules opaque and difficult to comment on. They appear to be the result of combining probabilities and so may be based on logic. If this is the case, DAFF officials should be able to explain it.[20]

3.26 However, Mr Peace also noted that the need for Table 2.2 'only exists if a risk analyst needs to estimate the qualitative likelihood of three events giving rise to the likelihood of a specified consequence'.[21] Mr Peace concluded that:

> This is not good risk analysis practice and is not necessary if establishment of a pest is seen as an event or change in specific circumstances while entry, import and distribution are causes of establishment.[22]

Use of the REM in practice

3.27 The Peace report examined the use of the REM in practice and noted that applying 'the rules for combining qualitative likelihoods can give some apparently strange results'. The report noted for example that:

> Combining two qualitative *low* likelihoods gives a *very low* likelihood. However, *low* has a maximum indicative probability of 0.3 in the Malaysian pineapples report and 0.3 x 0.3 = 0.09. The resulting 0.09 is within the *low* range of indicative probabilities: should a risk analyst determine the probability is *low* (based on the indicative probabilities) or *very low* (based on the rules for combining qualitative likelihoods)?[23]

3.28 The Peace report argued that the distinction outlined above is significant, particularly as *very low* is Australia's ALOP. A *low* risk would require mitigation

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19 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 18.

20 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 19.

21 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 19.

22 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 19.

23 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 20.

measures whereas a *very low* risk would be acceptable. He further argued that this issue has the potential 'to lead to litigation following refusal to allow entry of a *low risk* commodity when a slightly different analysis might have shown it to be a *very low* risk commodity'.[24]

3.29 The Peace report also raised a further problem of interpretation faced by DA Biosecurity risk assessors:

> …0.3 is the top of the *low* range and bottom of the *moderate* range. If a risk analyst determined the probability of an event was 0.3 should they name it *low* or *moderate*?[25]

3.30 Mr Peace further argued that:

> Matrices are too often poorly designed and incorrectly interpreted. If they are to be used, they must be simple, based on relevant data, used following a clear understanding of the nature of a risk, and with their limitations understood by risk assessors and decision-makers.[26]

Consequence scales – geographical impacts

3.31 The Peace report observed that the methodology in the REM describes the assessment of consequences. It is also noted that four levels of consequence are considered for levels of Australian community defined as:

- **Local:** an aggregate of households or enterprises (a rural community, a town or a local government area).
- **District:** a geographically or geopolitically associated collection of aggregates (generally a recognised section of a state or territory, such as 'Far North Queensland').
- **Regional:** a geographically or geopolitically associated collection of districts in a geographic area (generally a state or territory, although there may be exceptions with larger states such as Western Australia).
- **National:** Australia wide (Australian mainland states and territories and Tasmania).[27]

3.32 Mr Peace suggested that whilst the four levels of consequence are reasonable, they may apply to any size of community:

> For example, a small community might be a major contributor to the regional or national economy. As shown, such a contribution may be

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24 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 20.

25 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 20.

26 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 15.

27 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 21–22.

> understated. The reverse might be true with a pest having trivial national impacts felt catastrophically at a local level.[28]

3.33 Mr Peace suggested that this problem could be overcome by 'developing consequence scales based on, for example, national GDP, percentage of national crop at risk, or viable planting area at risk'.[29]

Does the REM overstate or understate the level of risk?

3.34 The Peace report argued that it is possible that the rules for combining qualitative likelihoods, either overstate or understate the level of risk in some cases. It also suggested that 'the rules are opaque with no source cited and therefore leave in doubt their reliability'.[30] Mr Peace also observed that:

> Two of the reports provide indicative probability ranges. These would be most helpful if their sources were cited; we are again left with doubt about the provenance and reliability of the indicative probabilities. Furthermore, our calculations [the author refers to Tables 3 and 4 of his report] suggest that some indicative probability range combinations may give results that breach the DAFF rules for combining qualitative likelihoods.
>
> Overall, combining the likelihoods and/or their indicative probabilities may either overstate or understate the level of import risk.[31]

Risk perception

3.35 Mr Peace argued that if the design of the REM is to be improved, risk analysts need to know and understand the perception of risk, both in DA Biosecurity and external stakeholders, including the committee.

3.36 Mr Peace noted that risk perception is defined in the ISO *Risk Management Vocabulary* as 'the stakeholder's view on a risk' and 'reflects the stakeholder's needs, issues, knowledge, belief and values'.[32]

3.37 The author argued that:

> Risk perceptions of external stakeholders may be intuitive feelings, based on media reports (Slovic, 2000). Some stakeholders may believe that levels of risk are increasing whereas the reverse may be the case. DAFF risk

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28 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 22.

29 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 22.

30 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 22.

31 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 22.

32 ISO *Risk Management Vocabulary* (ISO 2009), quoted in Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 22.

> analysts need to understand the risk perceptions of external stakeholders as distinct from their professional perception of risk.
>
> In Australia, public perceptions of biosecurity risks may be shaded by, for example, environmental damage caused by the release of wild rabbits in the 1800s and the harm caused by cane toads. Or there may be a proposal to import from overseas an exotic species or a species already in Australia that can carry some disease or pest (for example, the recent change to allow imports of European rabbits that might carry epizootic rabbit enteropathy).[33]

3.38 Mr Peace stressed the importance of risk perception and suggested that such 'risk perceptions should be incorporated into risk criteria used to analyse the consequences of a given import risk'.[34]

Conclusions

3.39 The Peace report concluded that the existing Australian biosecurity REM does not meet best practice because:

- it combines likelihoods with events and consequences;
- it is opaque in describing how to combine likelihoods;
- probability and likelihood seem to be confused even though they are distinct concepts;
- sources for the indicative probabilities used in recent reports are not given; and
- the labels on the consequence and likelihood scales and risk level cells are very similar.[35]

Recommendations

3.40 Based on its analysis and conclusions, the Peace report made a number of recommendations, including that:

- The DA Biosecurity REM be redesigned as a simple consequence/likelihood matrix to overcome the deficiencies identified in the report.
- The Senate Rural and Regional Affairs and Transport Committee encourage DA to develop the use of fault tree, event tree and bow-tie analyses and other techniques to help understand and show the nature of import risks. This should be done in combination with a redesigned consequence/likelihood matrix to help determine the level of risk.

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33 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 22.

34 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 22.

35 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 1.

- In order to aid transparency in import risk analysis and decision-making, DA revise the IRA Handbook to include full details of techniques available to DA risk analysts and any underlying data or research validating those techniques.
- A revised IRA Handbook include a copy of the Peace report's draft *Import risk analysis effectiveness checklist*. (The checklist was developed to be an assurance tool demonstrating each import risk analysis meets the World Trade Organization criterion of an 'objective and defensible' import risk analysis. This might be combined with the DA IRA template that now seems to be in use).[36]

Eminent Scientists Group's comments on the Peace report

3.41 On 8 February 2013, the Rural and Regional Affairs and Transport Legislation Committee (the Legislation committee) conducted a hearing in relation to its inquiry into the Biosecurity Bill 2012. During the hearing, Dr John Radcliffe, Chair of the Eminent Scientists Group (ESG) was invited to review Mr Peace's report.

3.42 In reviewing the Peace report, the ESG noted that whilst Mr Peace 'appears to recognise the quality of scientific rigour provided by DAFF Biosecurity in undertaking Import Risk Analyses' the report also discusses changes that could be made to current analytical practices.[37]

Language

3.43 The ESG noted Mr Peace's comments in relation to the variations in meanings and definitions between treaties, agreements and standards and acknowledged that much of the debate revolving around the use of IRAs is of an 'etymological' nature. The ESG suggest that:

> The Committee may wish to explore whether more consistent and better understood terms could be identified for use in Import Risk Analyses (IRAs) by DAFF Biosecurity to minimise what Peace refers to as 'idiosyncratic interpretation'...[38]

36 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 1.

37 Eminent Scientists Group, Additional Information, Correspondence dated 28 February 2013, provided to the committee in response to the request that the ESG review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 1. The ESG's review is at Appendix 9.

38 Eminent Scientists Group, Additional Information, Correspondence dated 28 February 2013, provided to the committee in response to the request that the ESG review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 1.

3.44 The ESG also argued, however, that these 'issues are largely a matter of risk communication and may not materially alter the scientific outcome of the analysis.'[39]

Risk

3.45 The ESG noted Mr Peace's comments regarding risk being the likelihood of the consequences of an event, but argued that this statement may not be 'tacitly correct in that it discounts the likelihood of an event occurring in the first place'.[40] The ESG also stated that:

> We are not convinced that DAFF's definition "risk being the likelihood of an event occurring" is wrong. An event may well occur ("a food product passes undetected through the barrier"), but it may or may not prove to have quarantine consequence ("the importer ate most of it and destroyed the remainder").[41]

Quantitative risk estimates and scientific uncertainty

3.46 The ESG supported Mr Peace's view in relation to quantitative risk assessment, in that the numerical element is only one part of what is essentially a judgement exercise. It further argued that in the context of analysing biosecurity risks from a proposed import:

> …it should be recalled that the analysis has to resolve matters of scientific uncertainty in terms of the potential biological impact of a new species on agricultural practices or the natural environment, if any.[42]

3.47 The ESG further argued that:

> When identifying the risks (hazards) that could eventuate from the introduction of new biological products at the border, the 'level of risk', the probability of occurrence, and the consequences will rarely have any prior measured estimations available in the Australian environment being

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39 Eminent Scientists Group, Additional Information, Correspondence dated 28 February 2013, provided to the committee in response to the request that the ESG review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 2.

40 Eminent Scientists Group, Additional Information, Correspondence dated 28 February 2013, provided to the committee in response to the request that the ESG review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 2.

41 Eminent Scientists Group, Additional Information, Correspondence dated 28 February 2013, provided to the committee in response to the request that the ESG review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 2.

42 Eminent Scientists Group, Additional Information, Correspondence dated 28 February 2013, provided to the committee in response to the request that the ESG review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 2.

> addressed for the purposes of establishing an Appropriate Level of Protection for Australia (ALOP) that is defendable internationally.[43]

3.48 The ESG acknowledged the importance of those doing the estimations being free of any conflict of interest (in terms of benefitting from the judgements to be made). At the same time, the ESG argued that the existing process is designed for that purpose.[44]

Use of matrices and alternative instruments

3.49 In reviewing Mr Peace's theoretical discussion about qualitative risk matrices, the ESG acknowledged its members did not feel qualified to comment specifically on the mathematical issues involved. The ESG did however suggest that the Australian Centre of Excellence for Risk Analysis (ACERA) has been established specifically for this purpose and:

> …receives funding from DAFF to research methodology for biosecurity analysis and could be asked more explicitly by DAFF to provide advice, including any effect of qualitative versus quantitative risk analysis on the consequences and methodology of sampling and on the forms of and use of matrices.[45]

3.50 The ESG suggested that the committee may also wish to seek advice from the ACERA on these issues, and noted that it had previously indicated its support for having a suitable independent party (such as ACERA) review the range of models used in the IRA process by Australia's major trading parties.[46] ACERA's views on the Peace report are outlined below.

Risk analysis checklist and revision of IRA Handbook

3.51 The ESG noted Mr Peace's suggestion in relation to a risk analysis checklist and indicated that it 'would support this as a constructive suggestion'. The ESG also acknowledged that the IRA Handbook will need to be revised as a result of the current review of the biosecurity legislation, and indicated its support for Mr Peace's

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43 Eminent Scientists Group, Additional Information, Correspondence dated 28 February 2013, provided to the committee in response to the request that the ESG review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 2.

44 Eminent Scientists Group, Additional Information, Correspondence dated 28 February 2013, provided to the committee in response to the request that the ESG review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 2.

45 Eminent Scientists Group, Additional Information, Correspondence dated 28 February 2013, provided to the committee in response to the request that the ESG review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 4.

46 Eminent Scientists Group, Additional Information, Correspondence dated 28 February 2013, provided to the committee in response to the request that the ESG review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 5.

suggestion that the IRA Handbook include full details of techniques available to DA Biosecurity risk analysts and any underlying data or research validating those techniques.[47]

DA's response to the Peace report

3.52 On 7 February 2013 the committee requested that DA Biosecurity review and provide an initial response to the issues raised by the Peace report. DA Biosecurity's response, dated 8 March 2013, is provided at Appendix 10.

3.53 The committee also received a detailed response from the (then) Department of Agriculture (DA) Secretary, Mr Andrew Metcalfe AO, on 22 May 2013 which is provided at Appendix 11.

SPS Agreement and International Standards for Phytosanitary Measures (ISPMs)

3.54 In responding to the Peace report, DA Biosecurity noted that it has been the policy of successive Australian governments that risk assessments used to establish phytosanitary measures be consistent with the SPS Agreement. DA also noted that this position is consistent with Australia's obligations as a signatory to the WTO.[48]

3.55 DA also indicated that in conducting import risk analyses for plant products, 'specific guidance is provided by the internationally agreed International Standards for Phytosanitary Measures (ISPMs) which are developed under the International Plant Protection Convention (IPPC)'.[49] It was argued that:

> Other methods may be informative, but it is the SPS Agreement and the ISPMs that establish the basis for import risk analysis. In the case of animals and animal products, guidance similar to the IPPC is provided by the Office International des Epizooties (OIE).[50]

3.56 DA noted that although the Peace report referred to the IPPC and some of its training materials, it did not reference ISPM 2: *Framework for pest risk analysis* or ISPM 11: *Pest risk analysis for quarantine pests, including analysis of environmental*

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47 Eminent Scientists Group, Additional Information, Correspondence dated 28 February 2013, provided to the committee in response to the request that the ESG review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 5.

48 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 1.

49 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 1.

50 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 1.

risk and living modified organisms, 'which provide substantial guidance on pest risk analysis for quarantine pests of plants'.[51]

3.57 DA also noted Mr Peace's observation that chapter two of the Terrestrial Animal Health Code, published by the OIE, does not define hazard, risk, risk analysis and risk assessment – and submitted that 'each of these terms is clearly defined in ISPM 5: *Glossary of phytosanitary terms*'.[52]

Development of REM

3.58 DA Biosecurity's response stated that the matrix-based approach to combining the likelihood of entry, establishment and spread of a pest or disease, with the consequences if that were to occur, first appeared in the draft IRA report for non-domestic Felidae in February 2001.[53] It was noted that current form and labelling of the matrix subsequently appeared in the August 2001 Issues Paper for the generic import risk analysis for fresh pineapple fruit.

3.59 DA argued that the current methodology for assessing biosecurity risks:

> …was the subject of substantial discussion between the Commonwealth Government and the states and territories. These discussions led to the formal endorsement of the current methodology through the Primary Industries Ministerial Council in 2002.[54]

Consequence and likelihood

3.60 In responding to Mr Peace's suggestion that the REM is not a true consequence/likelihood approach, DA argued that its risk analysis process aligns with the relevant international standard for plant pest risk analysis, 'in this case ISPM 11,

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51 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 1.

52 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 1.

53 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 2.

54 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 2.

by considering the probability of introduction and spread and the potential economic consequences'.[55] DA further argued that:

> These are then combined using a matrix based approach as demonstrated in the IPPC training materials, and as endorsed in the annex to ISO:31010 as being 'strongly applicable' for assessing level of risk. DAFF's matrix combines the probability (or likelihood) of entry, establishment and spread with the consequences if that sequence of events were to occur. This results in an assessment of unrestricted risk. If the unrestricted risk is 'low' or greater, specific risk management measures are necessary.[56]

Description of REM in IRA Handbook

3.61 DA Biosecurity noted Mr Peace's comments regarding the REM not being included in the IRA Handbook and the recommendation that the IRA Handbook be revised to include details of techniques available to DA risk analysts and a description of the REM. In responding to this recommendation, DA Biosecurity argued that Mr Peace 'does not have a correct understanding of the purpose of the IRA Handbook':

> …The IRA Handbook describes the administrative process for conducting import risk analyses, regulated steps under the *Quarantine Regulations 2000*, and relevant background information on domestic and international policies.[57]

3.62 DA Biosecurity further noted that:

> To inform stakeholders and readers of import risk analysis reports, each report contains a detailed description of the methodology being employed and worked examples for combining likelihoods.[58]

3.63 However the Secretary of the Department of Agriculture later told the committee that the IRA Handbook is being revised:

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55 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 2.

56 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 2.

57 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 2.

58 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 2.

> I am preparing to withdraw the Handbook and make more up-to-date and comprehensive information available about the department's role in managing imports into Australia, including the IRA process.[59]

Communication of risk

3.64 At the 12 March 2013 hearing, the committee questioned departmental officers about DA's response to the Peace report. In particular, the committee asked whether the report had raised any issues the department may be prepared to 'take on board'.[60]

3.65 In response, DA officers indicated that whilst they were already undertaking a review of the import risk analysis processes, there were a number of things in Mr Peace's report the department could look at and possibly develop further, particularly in relation to communicating risk:

> I think the greatest value that Mr Peace's report provides is, again, identifying where we know one of the things we can work on more is risk communication as opposed to the risk method that we undertake. Certainly the suggestions that Mr Peace provides gives us some further food for thought about how we might better involve and engage stakeholders and make our risk assessments more open for stakeholders to be able to analyse and look at themselves.[61]

3.66 DA also indicated that its work with ACERA had resulted in the evaluation of, and improvement in, policies and operational programs. DA also noted that it is currently developing and seeking stakeholder feedback on new biosecurity regulations and guidelines, including the consideration of issues such as:

- addressing regional differences in biosecurity status;
- independent scientific review of import risk analyses;
- the rights of appeal on the outcome of an import risk analysis; and
- the application of Australia's appropriate level of protection.[62]

3.67 In concluding its comments DA argued that 'there is no substantive evidence that DAFF's risk analysis processes have not been effective in protecting Australia's favourable pest and disease status'.[63]

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59 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 22 May 2013, p. 3.

60 Rural and Regional Affairs and Transport References Committee, *Committee Hansard*, 12 March 2013, p. 10.

61 Dr Vanessa Findlay, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 12 March 2013, p. 11.

62 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 3.

ACERA's comments on the Peace report

3.68 In correspondence to the committee dated 24 May 2013, the Secretary of DA indicated that he had asked the Australian Centre of Excellence for Risk Analysis (ACERA) to review Mr Peace's report.

3.69 In providing advice to DA on the Peace report, ACERA acknowledged that whilst some of the issues raised by Mr Peace were valid, the organisation felt that others were problematic. ACERA noted, for example, that the comment made by Mr Peace at a public hearing, that for 'Australia's risk analyses, using the qualitative matrices, if the overall assessment is 'negligible', there may be as much as a 10-15% likelihood of the risk being higher than 'negligible''[64] was:

> …made, based on a qualitative interpretation of a qualitative risk analysis. While there is almost certainly at least some small chance that the risk is higher than negligible, there is no justification, or any conceivable rational basis on which one could quantify this chance.[65]

3.70 However, ACERA did acknowledge Mr Peace's criticism of qualitative assessments that 'do not provide clear guidelines regarding the meaning of indicative probability distributions'[66]:

> In particular, in his testimony to the committee, he highlighted the difficulties of aggregating qualitative risk assessments without these. We agree that this raises a problem with the transparency of the overall assessment. We note that in other IRAs these indicative qualitative intervals are provided.[67]

3.71 ACERA's response noted Mr Peace's advocacy for the use of a bow-tie analysis in combination with a revised qualitative consequence/likelihood matrix and quantified fault tree and event tree analyses. ACERA agreed with Mr Peace's assertion that this type of analysis provides a way of visualising the causal process and can be an aid to understanding. It was also agreed that this kind of analysis can be qualitative

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63 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 8 March 2013, provided to the committee in response to the request that DAFF review the report titled *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 3.

64 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence to Committee from Secretary, dated 24 May 2013, with attached response from ACERA, dated 22 May 2013 [p. 2].

65 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence to Committee from Secretary, dated 24 May 2013, with attached response from ACERA, dated 22 May 2013 [p. 2].

66 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence to Committee from Secretary, dated 24 May 2013, with attached response from ACERA, dated 22 May 2013 [p. 2].

67 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence to Committee from Secretary, dated 24 May 2013, with attached response from ACERA, dated 22 May 2013 [p. 2].

or quantitative. However, ACERA argued that this type of approach does have a number of weaknesses:

- Because this method uses fault 'trees' rather than 'graphs', it cannot represent all kinds of conditional dependencies. (This means that the simple arithmetic operations on probabilities may make incorrect independence assumptions) which may result in incorrect overall probabilities.
- An event tree typically 'fans out' to numerous possibilities, meaning that they are inherently limited for modelling the impact of many factors or intervention actions.
- The bow-tie analysis is based around a single event (the introduction of a single pest) and does not appear to provide any obvious way to aggregate. This means that scalability seems to be problematic for the bow-tie approach.[68]

3.72 ACERA's response concluded by noting that:

> To our knowledge, there are no case studies demonstrating how bow-tie analysis (combining fault-tree and event-tree analysis) can be used for IRAs (particularly in combination with Australia's qualitative matrices as proposed by Peace). It is not advocated for use in IRAs in the peer-reviewed research literature.[69]

Meeting between Mr Peace and Department of Agriculture officials

3.73 On 3 July 2013, officers from the Department of Agriculture met with Mr Peace to discuss his review of the department's import risk assessment methods.

3.74 In addition to officers from the department, Professor Mark Burgman from the Centre for Excellence for Biosecurity Risk Analysis (CEBRA)[70] was also present at the meeting.[71] Meeting participants agreed that the points of difference related to the REM, and Mr Peace emphasised his view that 'the matrix was "opaque" for stakeholders outside DAFF who would find difficulties understanding how probabilities and consequences were combined'. The group also discussed the need for

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68 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence to Committee from Secretary, dated 24 May 2013, with attached response from ACERA, dated 22 May 2013 [p. 2].

69 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence to Committee from Secretary, dated 24 May 2013, with attached response from ACERA, dated 22 May 2013 [p. 2].

70 The Centre for Excellence for Biosecurity Risk Analysis (CEBRA) was formerly known as the Australian Centre for Excellence in Risk Analysis (ACERA).

71 Department of Agriculture, Fisheries and Forestry, Additional Information, Correspondence dated 12 July 2013 from the Secretary of the Department of Agriculture, Fisheries and Forestry, p. 1.

some alternative risk analysis technique that was transparent and the documentation and publication of the import risk analysis process.[72]

3.75 At the conclusion of the meeting, the group had reached agreement that:

- the department would consider alternative options to better represent the import risk analysis process and outcomes; and
- the import risk analysis process and techniques used will be documented and published on the DAFF website so stakeholders can download, read and better understand the process.[73]

Committee comment

3.76 As indicated previously in this report, the committee was aware from the early stages of its inquiry into the Malaysian pineapple IRA, that DA Biosecurity's method of calculating risk and the REM itself would be issues of central importance to the committee's inquiry.

3.77 The committee was also aware that, if it were to give appropriate consideration to the issues of concern to stakeholders, it would be necessary to have a clearer understanding of the REM and the way in which DA Biosecurity use it when preparing IRAs for various commodities.

3.78 The committee believes that the review undertaken by Mr Chris Peace has been both informed and independent. The Peace report has provided the committee with valuable information, in relation to processes for assessing or analysing risks, risk matrix literature, alternative risk techniques and the 'language' of risk.

3.79 The Peace report has also provided the committee with a more thorough understanding of DA Biosecurity's REM, the way in which DA Biosecurity use the REM to calculate risk, and the ways in which both of these could be improved.

3.80 The committee acknowledges the comments provided by the ESG, DA Biosecurity and ACREA (recently renamed CEBRA) in response to the Peace report. The committee notes that successive Australian governments have maintained a policy of risk assessments used to establish phytosanitary measures being consistent with the SPS Agreement. The committee also notes that this position is consistent with Australia's obligations as a signatory to the WTO.

3.81 The committee is aware that the current form and labelling of the matrix, and the current methodology for assessing biosecurity risks, has been developed over a considerable period of time. The committee acknowledges that these issues have been the subject of considerable high level discussion, and subsequent agreement between federal and state governments.

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72 Additional Information, Correspondence to Committee from Mr Chris Peace, dated 9 July 2013, p. 1.

73 Additional Information, Correspondence to Committee from Mr Chris Peace, dated 9 July 2013, p. 1.

3.82 The committee notes that DA Biosecurity has not refuted many of the issues raised by the Peace report, including:

- the unreliability of qualitative descriptors;
- the combination in the DA Biosecurity REM of the terms *likelihoods* with *events* and *consequences*;
- the opacity of the DA Biosecurity REM in describing the method for combining *likelihoods*;
- the lack of sources for the indicative probabilities used in recent reports;
- the apparent confusion of the terms *probability* and *likelihood*;
- labels on the *consequence* and *likelihood* scales and risk level cells are very similar – which leads to confusion;
- limitations in the consequence scales' use of geographical impacts;
- difficulties associated with combining qualitative likelihoods; and
- the need for risk perceptions to be incorporated into risk criteria.

Recommendation 3

3.83 The committee recommends that the Department of Agriculture give thorough consideration to the Peace report, as well as the underlying themes of all other recommendations contained in this report, in developing the new biosecurity regulations and guidelines.

3.84 In addition, the committee notes the Peace recommendation that a revision of the IRA Handbook should include full details of techniques available to DA risk analysts and any underlying data or research validating those techniques. The committee notes DA Biosecurity's response that some of this information is provided in individual IRA reports. The committee believes, however, that the REM used by DA Biosecurity to calculate risk has been identified as central to the IRA process, and therefore supports Mr Peace's recommendation to include these additional details in the IRA Handbook.

Recommendation 4

3.85 The committee recommends that the IRA Handbook should be amended to include full details of techniques available to Department of Agriculture risk analysts and any underlying data or research validating those techniques.

3.86 The committee is also of the view that the IRA Handbook should include an IRA effectiveness checklist similar to that recommended by Mr Peace (and included at Appendix 12) – a proposal the ESG indicated it would be support. In this regard, the committee notes that the DA Secretary has indicated that the department is preparing to withdraw the Handbook and make more up-to-date and comprehensive information available about the department’s role in managing imports into Australia, including the IRA process.

Recommendation 5

3.87 The committee recommends that the IRA Handbook should include an IRA effectiveness checklist similar to that recommended by Mr Peace.

3.88 The committee notes Mr Peace's comments in relation to 'perception of risk' and the suggestion that those undertaking risk analysis should know and understand how risk is perceived – particularly by external stakeholders. The committee agrees that if the IRA process or the design of the REM are to be improved, stakeholders' needs, issues, knowledge, beliefs and values – their risk perceptions – need to be taken into consideration. This is a proposal for which DA has also indicated support.

3.89 As indicated earlier in this report, the committee has over a number of years undertaken a number of inquiries in relation to the importation (or proposed importation) of specific plant or animal products. The committee's reports on these issues have always stressed the importance of stakeholders having their views taken into consideration and being able to fully participate in the import risk analysis process.

3.90 The committee supports Mr Peace's recommendation that stakeholder's risk perceptions should be incorporated into risk criteria used to analyse the consequences of a given import risk.

Recommendation 6

3.91 The committee recommends that stakeholders' risk perceptions should be incorporated into risk criteria used to analyse the consequences of a given import risk.

Recommendation 7

3.92 The committee recommends that the Department of Agriculture consider ways to improve the way it communicates risk (and the risk assessment process) to stakeholders.

3.93 The committee notes views expressed by Mr Peace in relation to the issue of geographic impacts and the assessment of consequences. The committee agrees with Mr Peace's view that the definitions used for the four levels of consequence – local, district, regional and national – are reasonable. However, the committee also agrees that they could nonetheless easily apply to any size of community.

3.94 The committee notes, for example, that it is often the case that a small community contributes significantly more to the regional or national economy than a large community. It is also true that the impact of specific pests can have a minor impact nationally, but prove devastating at a local level.

Recommendation 8

3.95 The committee recommends that the Department of Agriculture reconsiders the operation of geographic impacts in the IRA process, and give consideration to developing consequence scales based on, for example, national GDP, percentage of national crop at risk, or viable planting area at risk.

Chapter 4

The proposed importation of pineapples from Malaysia

4.1 The terms of reference for this inquiry required the committee to examine the scientific basis on which the Import Risk Analysis (IRA) report for the importation of fresh, decrowned[1] pineapple was developed. The committee was also required to determine the adequacy of quarantine conditions and measures recommended by DA Biosecurity in relation to the importation of pineapple from Malaysia.

Australia's pineapple industry

4.2 The Australian pineapple industry is a relatively small but important agricultural industry. The following section provides a brief background on the Australian pineapple industry and provides context for the later discussion of the December 2012 *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus (L.) Merr) *fruit from Malaysia* (the pineapple IRA).[2]

4.3 The most suitable soils for pineapple production are non-compacted, well-aerated loams, sandy loams and clay loams, which have no heavy clay or rock within one metre of the surface. Good drainage is essential, particularly because poor drainage can lead to a weak root system and make plants more susceptible to root and heart rot diseases.

4.4 Temperature is the most important climatic factor affecting productivity. The optimum air temperature is 32˚ Celsius during the day and 20˚ Celsius at night. For every 1˚ above or below these temperatures, the optimum growth rates decrease by about 6 per cent. During periods of intense sunlight and high temperature (above approximately 35˚ Celsius) fruit also becomes susceptible to sunburn damage. A frost-free site is essential and for non-irrigated crops, rainfall should be well distributed throughout the year and in excess of 750 mm per annum.

4.5 Australian pineapples are grown year round – primarily in Queensland – with an average turn-around of 18 months from planting to crop harvest and 16 months from crop harvest to the ratoon crop[3] harvest.

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1 Decrowned pineapple fruit is fruit that has had both the crown and basal leaves removed.

2 The following background in relation to Australia's pineapple industry is based on information contained in Australian Pineapple Industry, Strategic Plan 2011–2016, p. 6, Queensland Government, Department of Agriculture, Fisheries and Forestry website www.daff.qld.gov.au/26_16329.htm, accessed 21 January 2013; Plant Health Australia, *National Pineapple Industry Biosecurity Plan*, Version 1, July 2008, pp 5–6; and Growcom, *Submission 5*, p. 4.

3 Ratoon cropping is growing a fresh crop from the stubbles or suckers of the plant crop without replanting. It is also referred to as stubble cropping, re-harvesting or second crop. Ratoon cropping is used extensively in sugarcane, banana and pineapple plantations.

4.6 In the 2009-10 season, the Australian pineapple processing sector produced 41 000 tonnes of fruit for canning and juicing, which was worth $13.25 million. This sector of the industry, has however, been in decline over many years, due in part to competition from cheaper imported product.

4.7 In contrast, the fresh pineapple sector has expanded considerably over the last 12 years, due to both improved quality and the adoption of better fresh market fruit varieties. In the 2009-10 season, 43 720 tonnes of fresh pineapple was produced and sold on the domestic market. The gross value of Australian pineapples at the farm gate is currently estimated at $79 million.

4.8 Production is predominantly concentrated in South East Queensland and key production districts include: North Queensland, Yeppoon and Cawarral, Bundaberg, Maryborough and Hervey Bay, Mary Valley and Nambour, Glasshouse Mountains and Beerwah, Wamuran and Elimbah. It is estimated that approximately 60 per cent of pineapples produced for the fresh fruit market and for processing are grown in the Cooloola-Sunshine Coast region.

4.9 More than 70 per cent of fresh pineapples are packed and marketed through four primary packhouses. Golden Circle, which was recently acquired by Heinz Australia, is the one primary pineapple processor. As noted above, however, the industry is becoming increasingly fresh-market based, due to new fresh-market varieties and competition from imported processed fruit.

4.10 The fresh fruit market is split between Smooth Cayenne, Queen (rough leaf) and new hybrid varieties. The hybrid varieties are noted for their higher sugar to acid ratios and greater consistency. Current hybrid varieties include 73-50, MD2 (73-114) which are marketed under various brand names, and Aus-Jubilee and Aus-Carnival.

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

4.12 There are limited fresh pineapple imports into Australia, but extensive processed imports. Countries currently able to import fresh pineapple include the Philippines, Sri Lanka, the Solomon Islands and Thailand.

Pests and diseases

4.13 The National Pineapple Industry Biosecurity Plan for the pineapple industry (the Pineapple Biosecurity Plan) was developed by Plant Health Australia (PHA) in collaboration with industry and government stakeholders. It was launched in July 2008. The Pineapple Biosecurity Plan argues that Australia's geographic isolation has resulted in the region being relatively free of many of the pests and diseases that have impacted overseas plant industries. The Pineapple Biosecurity Plan also notes that:

> Freedom from these exotic pests is a real trade benefit for Australia in terms of securing market access domestically and internationally. Maintenance of our plant health status is vital for retaining trade opportunities, negotiating access to new overseas markets and ensuring the future profitability and sustainability of our plant industries.[4]

4.14 The development of each Biosecurity Plan commences with the production of Threat Summary Tables (TST). These tables identify all the potential exotic pest threats to an industry and with expert consultation, rank their potential threat based on entry, establishment, spread potential, consequences of establishment and eradication potential (where available). From this information, the high priority Emergency Plant Pests can be established (for which diagnostic protocols and contingency plans are created).[5]

4.15 The Pineapple Biosecurity Plan lists (in alphabetical order) the top-ranked pest threats to the Australian pineapple industry as:[6]

- **False codling moth; bollworm** – *Cryptophlebia leacotreta or*
- *Argyroploce leucotreta; Cryptophlebia roerigi; Thaumatotibia roerigii; Olethreutes leucotreta;*
- **Grey pineapple mealybug; annona mealybug** – *Dysmicoccus neobrevipes;*
- **Bacterial fruit collapse** – *Erwinia chrysanthemi* (distinct pathovar);
- **Fusariosis** – *Fusarium guttiforme*; and
- **Pineapple fruit borer** – *Strymon megarus* or *Thecia basilides.*

4.16 The pest threats on this 'Emergency plant pest priority list' are all exotic pests not currently found in Australia. Importantly, for this inquiry, the risks associated with Bacterial fruit collapse are rated as 'high' in relation to entry potential, establishment potential, spread potential, economic impact and risk (see Appendix 13 for further detail).

4.17 The Pineapple Biosecurity Plan stresses the importance of a consistent approach to threat identification and risk assessment, and argues that facilitating a more coordinated strategy will provide a stronger base for future risk management activities.[7]

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4 Plant Health Australia Fact Sheet, *National Biosecurity Plan for the Pineapple Industry*, June 2008, p. 1.

5 Plant Health Australia Fact Sheet, *National Biosecurity Plan for the Pineapple Industry*, June 2008, p. 2.

6 Plant Health Australia, *National Pineapple Industry Biosecurity Plan*, Version 1, July 2008, Table 1, Emergency Plan Pest Priority List, p. 7.

7 Plant Health Australia, *National Pineapple Industry Biosecurity Plan*, Version 1, July 2008, p. 5.

4.18 As part of a coordinated approach, the Pineapple Biosecurity Plan defines 'Emergency plant pests' 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.[8]

4.19 The Pineapple Biosecurity Plan also argues that the identification of high risk pests facilitates:

- a more pre-emptive approach to risk management;
- the implementation of effective grower and community awareness campaigns;
- targeted biosecurity and education and training programs for growers and diagnosticians; and
- the development of pest-specific incursion response plans.[9]
- Listed on PHA plant pest priority list

Committee comment

4.20 The committee notes that PHA's description of the impact of Emergency Plant Pests (EPPs) echoes the sentiments expressed by industry stakeholders over the years. PHA argues that EPPs:

> …have the potential to deeply impact on the livelihoods of producers and others along the value chain, damage the economic health of industries and

8 Plant Health Australia, *National Pineapple Industry Biosecurity Plan*, Version 1, July 2008, p. 5.

9 Plant Health Australia, *National Pineapple Industry Biosecurity Plan*, Version 1, July 2008, p. 5.

> regional economies, deplete amenity values and food security for the broader Australian community, and tarnish Australia's reputation as a producer of clean, quality product internationally.[10]

4.21 The committee also notes that PHA supports the adage that 'prevention is better than cure'[11] and agree with industry stakeholders who argue very strongly that preventing incursion is ultimately preferable to managing incursion:

> When EPPs are detected early enough, eradication may be an option, but these are invariably expensive and technically challenging exercises with no guarantee of success.[12]

The import risk analysis for pineapples from Malaysia

4.22 The Department of Agriculture[13] received a formal request for market access for fresh pineapple fruit to Australia (from the Malaysian Department of Agriculture) in May 2004. The Malaysian submission included information on the pests associated with pineapple crops in Malaysia and the standard commercial production practices for fresh pineapple fruit in Malaysia.

Timeline of events

4.23 Table 4.1 below provides a timeline of events in relation to the Malaysian pineapple IRA.[14]

Table 4.1—Timeline of Malaysian pineapple IRA

May 2004	DA Biosecurity[15] received a formal request from the Malaysian Department of Agriculture, seeking market access for fresh pineapple fruit to Australia.
September 2007	DA Biosecurity advised stakeholders that changes to the IRA process had been implemented when regulations made under the *Quarantine Act 1908* formally took effect. That advice also notified the transitional arrangements for DAFF Biosecurity's

10 Plant Health Australia, *Who is Plant Health Australia?* p. 2, accessed at www.phau.com.au/go/phau/our-company/documents, 5 March 2013.

11 Plant Health Australia, *Who is Plant Health Australia?* p. 2, accessed at www.phau.com.au/go/phau/our-company/documents, 5 March 2013.

12 Plant Health Australia, *Who is Plant Health Australia?* p. 2, accessed at www.phau.com.au/go/phau/our-company/documents, 5 March 2013.

13 Formerly known as the Department of Agriculture, Fisheries and Forestry (DAFF).

14 Unless otherwise indicated, the information provided in this table has been sourced from Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* June 2012.

15 DA Biosecurity was formerly known as Biosecurity Australia.

	import work program, including pineapples from Malaysia that would be conducted under the new regulated IRA process.[16]
2009	A supplementary submission was provided by the Malaysian Department of Agriculture.
January 2010	The scope of the request from the Malaysian government was changed to consider fresh, decrowned pineapple fruit.
9 June 2010	DA Biosecurity formally announced the commencement of the IRA on pineapples from Malaysia and advised stakeholders that it would be progressed as a standard IRA, using the process described in the IRA Handbook.
July 2010	DA Biosecurity met with industry representatives to discuss development of the draft IRA report.
11 April 2011	DA Biosecurity provided a draft pest categorisation table for decrowned pineapple fruit from Malaysia to state and territory departments of primary industry/agriculture for their informal consideration of regional pests.
19 October 2011	DA Biosecurity released the draft IRA report for a 60 day stakeholder comment period.
25 November 2011	DA Biosecurity met with industry stakeholders.
Date unknown	Two submissions on the draft IRA report were received from the pineapple industry representative, Growcom and from the Queensland Department of Agriculture Fisheries and Forestry.
7 June 2012	DA Biosecurity notified stakeholders of the release of the Provisional final IRA for fresh pineapple fruit from Malaysia. Stakeholders were informed that the report had identified four species of mealybugs which required quarantine measures to manage risks to a very low level (in order to achieve Australia's ALOP). Stakeholders were also informed that appeals could be lodged (in writing) to the Import Risk Analysis Appeals Panel

16 Department of Agriculture, Fisheries and Forestry, Biosecurity Australia Advice 2010/18, *Commencement of an import risk analysis for fresh decrowned pineapple fruit from Malaysia*, 9 June 2010.

	(IRAAP) – within 30 days. The deadline for appeals was set as 7 July 2012.[17]
13 July 2012	DA Biosecurity notified stakeholders that an IRAAP had been convened to consider an appeal submitted on the Provisional final IRA report for fresh decrowned pineapple fruit from Malaysia. The IRAAP Secretariat advised that one stakeholder had provided a submission during the appeal period and that IRAAP would consider the appeal and deliver a finding (or series of findings) in relation to the appeal by 21 August 2012.[18]
14 December 2012	DA Biosecurity notified stakeholders that Australia's Director of Animal and Plant Quarantine had determined a policy for the importation of fresh decrowned pineapple from Malaysia, based on consideration of the IRA for fresh decrowned pineapple fruit from Malaysia. (In doing so, the Director provided guidance to the Department's permit issuing staff to take account of the measures set out in the final IRA report in considering applications for permits).[19]

Scope of the IRA[20]

4.24 The scope of the Malaysian pineapple IRA involved the consideration of:

> ...the quarantine risk that may be associated with the importation of commercially-produced fresh decrowned pineapple fruit *Ananas comosus* (L.) Merr. (decrowned pineapple fruit) free from trash from Malaysia, for human consumption in Australia.[21]

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17 Department of Agriculture, Fisheries and Forestry, Biosecurity Advice 2012/13, *Provisional final import risk analysis report for the importation of fresh decrowned pineapple fruit from Malaysia*, 7 June 2012.

18 Department of Agriculture, Fisheries and Forestry, Biosecurity Australia Advice 2012/15, *Appeal on the provisional final import risk analysis for decrowned pineapple from Malaysia*, 13 July 2012.

19 Department of Agriculture, Fisheries and Forestry, Biosecurity Australia Advice 2012/27, *Final import risk analysis report for fresh decrowned pineapple fruit from Malaysia*, 14 December 2012.

20 The detail provided in this section is based on information contained in the Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia*, December 2012.

21 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia*, December 2012, p. 2.

4.25 In the IRA, decrowned pineapple fruit are defined as fruit with crown and basal leaves removed. The IRA assessed all commercially-produced pineapple fruit *Ananas comosus* (L.) Merr. varieties of Malaysia and the regions in which they are grown.[22]

4.26 As noted above, Australia currently permits the importation of fresh pineapple fruit from the Philippines, Thailand, Sri Lanka and the Solomon Islands, subject to a range of phytosanitary measures, including decrowning.

4.27 The committee was told that Australian imports of pineapple from these countries have been very limited. It was noted, for example, that there had been a small number of pineapples imported from the Philippines in 2006. These importations had however proved commercially unsuccessful. The committee also received anecdotal evidence regarding a small amount of imported fruit which had, over recent years, been provided to the Western Australian market.[23]

4.28 In conducting the IRA, DA Biosecurity indicated that it had considered all pests previously identified in the IRAs for the importation of fresh pineapple fruit from the Philippines, Thailand, Sri Lanka and the Solomon Islands and taken them into account in the current policy where relevant. It is noted that these IRAs recommended decrowning as a risk management measure to meet Australia's ALOP.[24]

4.29 The Malaysian pineapple IRA also noted that standard hygiene and cleaning practices, the registration of export grade fresh pineapple fruit plantations and phytosanitary inspections further reduce the risk of weed species entering Australia on decrowned fresh pineapple fruit.[25]

Results of the IRA

4.30 The *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia* (the final IRA) identified four species of mealybugs as quarantine pests that require measures to manage risk to a very low level in order to achieve Australia's ALOP.[26]

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22 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 2.

23 Mr Les Williams, Pineapple Growers Advancement Group, *Committee Hansard,* 6 August 2012, p. 14.

24 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, pp 2–3.

25 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 3.

26 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. xi.

4.31 Regional differences were identified for one quarantine pest—a mealybug species—for Western Australia. DA Biosecurity indicated that the proposed quarantine measures would take account of these regional differences.[27]

4.32 The final IRA report recommended a combination of risk management measures and operational systems aimed at reducing the risk associated with the importation of fresh decrowned pineapple fruit from Malaysia into Australia to achieve Australia's ALOP. These measures included:

- pre-shipment or on-arrival methyl bromide fumigation or an alternative post-harvest treatment as approved by DA Biosecurity for mealybugs, and;
- an operational system for the maintenance and verification of the phytosanitary states of pineapple fruit, including:
  - registration of export plantations;
  - registration of packing houses and auditing of procedures;
  - registration of fumigators/treatment facilities and auditing of procedures;
  - packing and labelling requirements;
  - specific conditions for storage and transport;
  - pre-export phytosanitary inspection and certification by the Malaysian Department of Agriculture; and
  - on-arrival phytosanitary inspection, remedial action when required, and clearance by DA Biosecurity.[28]

Changes to final IRA

4.33 DA Biosecurity noted that following consideration of stakeholder comments (in relation to the draft IRA) and a subsequent review of the literature, a number of changes were made to the risk analysis. These amendments included:

- additional points have been included under 'probability of importation and distribution' in the risk assessment of bacterial fruit collapse and heart rot disease caused by *Erwinia chrysanthemi* (pineapple strain, *Dickeya* sp.), and minor changes to the rating for consequences (but not resulting in any change to the unrestricted risk estimate);
- identification of the armoured scale, *Unapsis citri*, as a pest of regional concern to South Australia;

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27 Department of Agriculture, Fisheries and Forestry, Biosecurity Advice 2012/13, *Final import risk analysis report for the importation of fresh decrowned pineapple fruit from Malaysia*, p. 1.

28 Department of Agriculture, Fisheries and Forestry, Biosecurity Advice 2012/13, *Provisional final import risk analysis report for the importation of fresh decrowned pineapple fruit from Malaysia*, pp 1–2.

- a summary of major stakeholder issues and how they were considered; and
- minor corrections and rewording for consistency and clarity.[29]

Issues raised by stakeholders

4.34 The committee received submissions from a number of individual growers, industry organisations and peak bodies which expressed a lack of confidence in the Malaysian pineapple IRA, and its recommendation that imports of fresh, decrowned pineapple should be allowed for all commercial production areas of Malaysia (subject to a range of quarantine conditions).

Erwinia chrysanthemi (pineapple strain, Dickeya sp.)[30]

4.35 Stakeholders, including the Queensland government, raised serious concerns about DA's assessment of the risks posed to Australia's pineapple industry by the importation of pineapples from Malaysia. Specifically, the Queensland government and industry representatives argued that there was a lack of knowledge and a limited understanding of the science in relation to the pathogen *Erwinia chrysanthemi* recently renamed *Dickeya* sp. and referred to by DA Biosecurity as *Erwinia chrysanthemi* (pineapple strain *Dickeya* sp.).

Scientific background

4.36 The Malaysian pineapple IRA noted that in 1953, the bacterial species *Erwinia chrysanthemi* was first proposed for the agent causing blight in chrysanthemums. Similar bacteria were later isolated from soft rots and wilts of numerous diseased plant species. Following extensive biochemical studies, all isolates were gathered into the single species *Erwinia chrysanthemi* (syn. *Pectobacterium chrysanthemi*. Subsequently, the genus *Pectobacteriuym* was included within the genus *Erwinia* and in 1980, phytobateriologists divided *E. chrysanthemi* into six pathovars.[31]

4.37 The use of pathogenicity tests to define the affiliation of a strain to a given pathovar ultimately proved difficult to implement. Therefore, in the early 1980s it was proposed that the pineapple strain be known as *E. crysanthemi* (pineapple strain).

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29 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. xi.

30 Unless otherwise stated, the following section is based on information contained in Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 37. Throughout this report "*Dickeya* sp." is used as shorthand for the pathogen "*Erwinia chrysanthemi* (pineapple strain, *Dickeya* sp.)".

31 These pathvars were: pv, *chrysanthemi*, pv. *dianthicola,* pv. *diffenbachiae,* pv. *paradisiaca,* pv. *parthenii*, and pv. *zeae.*

4.38 In 2005, Samson *et al* proposed a new genus—*Dickeya*—to accommodate bacterial species previously assigned to *E. chrystanthemi* and *P. chrysanthemi* and proposed six species of *Dickeya*.

4.39 However, the study found that the status of pineapple infecting strains was unclear. A strain isolated from pineapples in Martinique (France) was placed under *Dickeya zeae* and the strain isolated from pineapples in Malaysia was placed under *Dickeya* sp. without being able to allocate it into any of the other six *Dickeya* species.

4.40 In 2009, Parkinson *et al* attributed the Malaysian pineapple infecting strain to *D. zeae*. However, this study used the gene sequence at one locus and in 2011, the limitations of this type of approach were highlighted.

4.41 In 2010, Peckham *et al* argued that until the pineapple strains are genetically characterised, the strains infecting pineapples should be referred to as unclassified *Dickeya* sp. Marrero *et al* argued (in 2009 and 2010) that the pathogen infecting pineapple warranted classification as a new species or subspecies of *D. zeae.* Most recently (2011) Marrero and Alvarez used the name *E. chrysanthemi* (*Dickeya* sp).

Defining the pest

4.42 The Malaysian pineapple IRA noted that 'even after several decades of work, the position of the Malaysian pineapple affecting strains has not been resolved satisfactorily'.[32] However, it was also noted that international guidelines for Pest Risk Analysis require that the identity of pests be 'clearly defined to ensure that the assessment is being performed on a distinct organism and that the biological and other information used in the assessment is relevant to the organism in question'.[33] It was decided, therefore, that in order to avoid confusion, and for the purposes of the IRA, the pineapple affecting strain would be referred to as *Erwinia chrysanthemi (pineapple strain,* Dickeya *sp.).*

4.43 The Malaysian pineapple IRA notes that the strain of the bacterium *E. chrysanthemi* infecting pineapple in Malaysia is specific to pineapple and that recent molecular studies 'support that the Malaysian pineapple strain is distinct'.[34]

Fruit collapse and bacterial heart rot

4.44 The strain of *Erwinia chrysanthemi* infecting pineapples in Malaysia causes two diseases—fruit disease called 'fruit collapse' and a leaf and stem disease called 'bacterial heart rot'. Both diseases have been known in the Malaysian pineapple

32 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 38.

33 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 38.

34 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 38.

industry from around 1937. It has been reported that both diseases are now present in Costa Rica, the Philippines and Brazil.

4.45 In 2003, *Dickeya* sp. was discovered in Hawaii and it has been suggested that the first appearance of the pathogen in Hawaii 'coincided with importation of planting material from Costa Rica, Honduras, and Philippines'.[35] Although strains of *E. chrysanthemi* infecting other hosts including corn, potato, banana and ginger are present in Australia, the specific strain infecting pineapple in Malaysia is considered absent.

Threat to Australian pineapple industry

4.46 Stakeholders pointed to the inclusion of the pathogen *Dickeya* sp. on the Pineapple Biosecurity Plan's 'Emergency plant pest priority list',[36] and noted that the Pineapple Biosecurity Plan lists the level of threat (in relation to this pathogen) as 'high' for entry potential, establishment potential, spread potential, economic impact and overall risk.[37] It was argued, therefore, that the estimation of risk from this pathogen in the Pineapple Biosecurity Plan is in stark contrast to the IRA prepared by DA Biosecurity.[38]

4.47 It was argued that both fruit collapse and bacterial heart rot pose 'serious biosecurity threats to the Queensland pineapple industry',[39] particularly as both diseases are systemic (able to spread throughout the whole plant and the fruit) and the pathogen can remain latent in fruit—even after harvest.[40]

4.48 The Queensland Department of Agriculture, Fisheries and Forestry (DAFF Queensland) submission stated that:

> DAFF Queensland scientists are of the opinion that these two diseases would have a high risk of spreading to Australia in imported fruit, even under strict inspection procedures.
>
> In Malaysia, both diseases are endemic, with field crop losses of up to 40% recorded. These diseases were detected in Hawaii in 2003, and have subsequently caused significant crop losses.
>
> Australia has very similar climatic conditions and pineapple varieties to both Hawaii and Malaysia. Therefore the impact of this disease in Australia

35 Mr Glenn Taniguchi, *Submission 10,* Appendix 1, [p. 1].

36 See, for example, Mr Chris Fullerton, *Submission 3,* p. 1, Pinata Farms, *Submission 6,* p. 1, Growcom, *Submission 5,* p. 4 and Queensland Department of Agriculture, Fisheries and Forestry, *Submission 8,* p. 1.

37 Growcom, *Submission 5,* p. 4.

38 Growcom, *Submission 5,* p. 4 and Queensland Department of Agriculture, Fisheries and Forestry, *Submission 8,* p. 5.

39 Queensland Department of Agriculture, Fisheries and Forestry, *Submission 8,* p. 1.

40 Queensland Department of Agriculture, Fisheries and Forestry, *Submission 8,* p. 1.

> could reasonably be expected to approximate the field losses (up to 40 percent) reported from Malaysia.[41]

4.49 The Malaysian pineapple IRA indicated that the prevalence of the pathogen causing fruit collapse in Malaysian pineapple production systems has, over the past 50 years, been reported at various levels—ranging from 0–40 per cent. The IRA also noted that while there were no specific figures available regarding the incidence of fruit collapse in the new 'Josapine' and 'N36' varieties, 'the incidence of heart rot has been demonstrated to cause losses as high as 64 per cent in the 'Josapine' variety'.[42]

Undetected (latent) infections

4.50 The Malaysian pineapple IRA noted that 'while the greatest incidence of fruit collapse can be observed in the field and such fruit excluded from harvest',[43] there is also research which indicates that a small percentage (up to 2 per cent) of fruit 'can remain as undetected latent infections beyond the initial picking phase'.[44]

4.51 Stakeholders raised concerns about the possible latency of infection in pineapple fruit. The IRA report indicated, for example, that in the case of fruit collapse, the pathogen 'enters the plant through the flower and remains latent in the developing fruit for over 2 months'.[45] Stakeholders argued that this is problematic, particularly as it means that up to 2 per cent of fruit with latent infections could go undetected at harvest.

4.52 The Malaysian pineapple IRA noted that the percentage of fruit collapse is highest 2–3 weeks before harvest. It was also noted that:

> DAFF agrees, like any other biological process, latency break and symptom expression times are variable and as seen from Liam and Lowings (1979), up to about 2% of fruit may not have expressed symptoms at harvest and may still have latent infection.[46]

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41 Queensland Department of Agriculture, Fisheries and Forestry, *Submission 8,* p. 1.

42 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 39.

43 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 40.

44 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 40.

45 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 40.

46 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 41.

Uncertainty about latency

4.53 Stakeholders also challenged the credibility of the 2 per cent latency figure cited in the IRA. It was noted, for example, that although the IRA report referred to Lim (1986) and Lim and Lowings (1979) to support the 2 per cent figure, the reliability of this information was questionable, given that it relies on data originally published in 1937 (Thompson).[47]

4.54 Officers from DA Biosecurity acknowledged that 'up to two per cent of a consignment [of pineapples] will have a latent infection'[48] and argued that the two per cent latency figure is based on scientific research conducted in Malaysia and published in scientific journals.[49] In addition, DA Biosecurity also told the committee that:

> The disease usually expresses two to three weeks before harvest. You will see it on the pineapples in the field; it will be quite obvious and it might be explosive in some cases. Obviously they are not going to pick those pineapples that are rotting and not very good. These are commercial plantations sending to an export market. They are looking to send the best fruit they can. The latency does not always break two or three weeks before harvest but the majority of them well, so you will see those symptoms on the fruit. Those will be excluded. So it will be there some time before you take them off and put them through the processing plant for export. There will be up to two per cent – and we have used a very conservative figure. That does not mean to say that every pineapple plantation in Malaysia will have two per cent latency in their fruit, but we were looking on the conservative side that up to two per cent will – and in may be fewer than that.[50]

4.55 The Malaysian pineapple IRA also indicated that the Malaysian Department of Agriculture had provided some preliminary unpublished results from a field and packing house survey conducted in April 2012. The survey was designed to evaluate current rates of infection of pineapple fruit with the fruit collapse bacterium *E. chrysanthemi* and latency in export production systems.[51]

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47 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 40.

48 Dr Colin Grant, Department of Agriculture, Fisheries and Forestry, *Committee Hansard,* 6 August 2012, p. 34.

49 Ms Ann Gardner, Department of Agriculture, Fisheries and Forestry, *Committee Hansard,* 6 August 2012, p. 34.

50 Ms Ann Gardner, Department of Agriculture, Fisheries and Forestry, *Committee Hansard,* 6 August 2012, p. 34.

51 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 41.

4.56 The IRA noted that the results of the survey were based on pineapples sampled from several fields and packing houses during the export packing process, and generally supported the possibility of fruit carrying lower levels of latent infection at harvest than indicated in the Lim and Lowings papers in the 1970s. It was acknowledged, however that 'DAFF is unable to fully assess this survey and trial with the limited methodological details and data provided'.[52]

4.57 The issue of latent infection rates and the audit process was raised with peak industry body Growcom at the committee's August hearing:

> **Senator BOSWELL**: We are in Malaysia. Someone is going to bring in some pineapples… Do you know what would be required in the audit?
>
> **Dr Gambley**: I do not believe that they can audit for latently infected fruit in Malaysia. They can audit for fruit that is obviously showing symptoms and discard that fruit, but you cannot audit for something that is not showing disease. It would be packed and sent without detection.
>
> **Senator BOSWELL**: So there is no way of knowing that the particular fruit could be diseased and there is no way of auditing it through the packing house. All you can audit is something that has the symptoms of the disease?
>
> **Dr Gambley**: That is correct.[53]

4.58 Mr Alex Livingstone, Chief Executive Officer of Growcom, agreed that the disease, in its latent phase, is undetectable and therefore it is likely that diseased fruit will be picked and shipped without being detected. Mr Livingstone argued that, as a consequence:

> When that fruit comes into Australia it would bring the disease in with it. A serious point of contention is whether or not the disease will spread from there. We contend that the imported fruit could find its way anywhere around the retail distribution chain. It could find its way into the processing chain. Nobody knows what happens to the waste product. If a consumer buys a pineapple that is imported and this disease starts to take hold, the fruit will look unappealing and they will just toss the whole thing in the bin. So where does that end up? We do not know.[54]

4.59 It was argued that the latency of the pathogen is just one of a number of areas where scientific information is inadequate and inconclusive. It was further argued the

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52 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 41.

53 Dr Cherie Gambley, Pineapple Industry Development Officer, Growcom, *Committee Hansard,* 6 August 2012, p. 4.

54 Mr Alex Livingstone, Growcom, *Committee Hansard,* 6 August 2012, p. 3.

lack of conclusive information about the latency of the pathogen is unsatisfactory it is an area that should be researched and tested properly.[55]

Committee comment

4.60 It is clear to the committee that there is considerable uncertainty surrounding latent infection rates of *Dickeya* sp., particularly as DA Biosecurity's best estimate of up to 2 per cent post-harvest latency is based on a study from the 1970s, which itself is based on research from the 1930s. The committee notes that DA was unable to fully assess a 2012 survey conducted by the Malaysian Department of Agriculture due to the provision of limited methodological details and data. The committee strongly supports the collection of more robust data and further analysis of this critical issue, prior to the commencement of any imports of fresh pineapple from Malaysia.

Recommendation 9

4.61 The committee recommends that before commencing the importation of fresh pineapples from Malaysia, the Department of Agriculture should establish to a much greater degree of certainty the degree of post-harvest latency of pineapple fruit collapse and heart rot.

DA Biosecurity has underestimated the risk

4.62 Stakeholders also argued that DA Biosecurity has underestimated the risks associated with *Dickeya* sp. It was claimed that DA Biosecurity not only underestimated the risk of the pathogen's arrival in Australia, but also underestimated the pathogen's potential to be distributed within Australia, to become established, and to spread.

4.63 The IRA contains a detailed assessment of the various preconditions necessary for an incursion of the pineapple fruit collapse and heart rot pathogen *Dickeya* sp. to occur.

Importation risk: low

4.64 The IRA concludes that there is a low likelihood that *Dickeya* sp. will arrive in Australia as a result of the importation of decrowned pineapple fruit from Malaysia. It is argued that:

> As the exported fruit will be without crowns and all basal leaves, the association of the pest with the pathway would be only as the fruit collapse disease and not as the heart rot disease.
>
> Although the incidence of fruit collapse in Malaysian pineapple plantations can sometimes be as high as 40%, the biology of the disease is such that infected fruit can be easily detected before or at harvest and inclusion of infected fruit in exports will be reduced to a high degree. However, a small volume (estimated as up to 2%) of export fruit may contain latent or visibly

55 Mr Alex Livingstone, Growcom, *Committee Hansard*, 6 August 2012, p. 2-3 and Mr Les Williams, Pineapple Growers Advancement Group, *Committee Hansard*, 6 August 2012, p. 13.

> undetectable infection. Therefore the likelihood estimate for importation is 'low'.[56]

4.65 Mr Glenn Taniguchi, Entomologist and Plant Pathologist from the University of Hawaii provided his views on evidence provided by DA Biosecurity and raised questions about how the figure of two per cent was arrived at:

> Throughout this testimony the figure of 2% risk of importing infected fruits into Australia is mentioned. The question of how this figure was derived has not been answered. Is this an arbitrary number to coincide with "low risk"? A 2% risk cannot be a fixed figure when dealing with infections with *Dickeya* sp. because field infections fluctuate with weather conditions. Normal field infection ranges between 5% and 40%. Thus your risk goes up when field infection is higher.[57]

4.66 Tropical Pines noted the concerns raised about *Dickeya* species (and the dangers of importing pineapples from Malaysia) by scientists in both Hawaii and Malaysia. Tropical Pines suggested that these concerns 'may have been ignored because their concerns have not been published as peer reviewed scientific papers'.[58]

4.67 Tropical Pines also argued that the Department of Agriculture's own estimate is that infected pineapples will be imported into Australia at a rate of 2 per cent, and that the 'infection will be in a latent form and completely undetectable'. Tropical Pines therefore asked the question:

> If, as DAFF biosecurity says, the disease would be very difficult to eradicate, why take any form of risk to allow the entry of a potentially damaging pathogen? While 2% may seem a low incidence, in real terms it amounts to 2 cases in every 100 cases of fruit. i.e. 14 fruit per pallet.[59]

4.68 In its supplementary submission to the inquiry, Tropical Pines told the committee that by working through the IRA, they had 'reached very different conclusions about the overall risk of this bacterium'.[60] It was argued that:

> The probability of importation has been assessed by DAFF Biosecurity to be low. Our view is that the risk of importation is certain or high as it has been acknowledged that the bacterium will enter Australia in 2% of the fruit that is imported.[61]

4.69 Growcom's submission expressed a similar view to that of Tropical Pines in relation to the risk of importing the pathogen, and noted that:

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56 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 43.

57 Mr Glenn Taniguchi, *Submission 10,* p. 1.

58 Tropical Pines Pty Ltd, *Submission 4,* p. 1

59 Tropical Pines Pty Ltd, *Submission 4,* p. 1

60 Tropical Pines Pty Ltd, *Submission 4,*Supplementary Submission, [p. 2].

61 Tropical Pines Pty Ltd, *Submission 4,*Supplementary Submission, [p. 2].

> It is the industry's position that DAFF Biosecurity has significantly underestimated the risk posed by the potential introduction of a bacterial pathogen that causes serious fruit disorders and crop failure.[62]

Distribution risk: low

4.70 The IRA concludes that there is a low likelihood that the pineapple heart rot and fruit collapse pathogen *Dickeya* sp. 'will be distributed within Australia in a viable state as a result of the processing, sale or disposal of decrowned pineapple fruit from Malaysia and subsequently transfer to a susceptible part of a host.'[63]

4.71 The IRA also states that the waste from any fruit carrying the latent infection would be 'discarded mostly into municipal waste by retailers, consumers, or processing plants.'[64] It goes on to describe the possible transfer mechanisms of the pathogen from infected fruit in waste to a susceptible host plant as a 'complex variable' which is dependent on a number of critical factors including:

> ...the location of the bacteria; survival in waste and viability; survival in water; survival in soil; transfer mechanisms; availability of hosts; host susceptibility and entry points; and inoculum source, dose and host proximity.[65]

4.72 In summary the IRA concludes that:

> ...with a host range limited to pineapple, a number of factors would need to align in order to facilitate a successful transfer of this pathogen to a susceptible host. A freshly discarded infected fruit or infected waste would need to be in close proximity to a susceptible pineapple plant, with suitable vectors in the direct vicinity.
>
> …
>
> Potential vectors and agents of transfer are available; however, the transfer opportunity for ants and beetles and the viability of the bacterium in soil and water is short. Considering the low volume of fruit expected to be imported into Australia and distributed to and potentially disposed of in areas near pineapple production, the number of infected fruit that are likely to come in close proximity to susceptible pineapple plants would be limited. This will minimise the likelihood of achieving all the necessary factors for a

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62 Growcom, *Submission 5*, p. 3.

63 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia*, December 2012, p. 43.

64 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia*, December 2012, p. 43.

65 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia*, December 2012, p. 44.

> successful transfer. Therefore the likelihood estimate for distribution is 'low'.[66]

4.73 However, this is not the conclusion of other stakeholders. At the Brisbane hearing, Mr Alex Livingstone, CEO, Growcom, noted that, according to the pineapple industry's national biosecurity plan, the *Dickeya* sp. pathogen is one of the pineapple industry's greatest biosecurity threats. Mr Livingstone also noted that in the Pineapple Biosecurity Plan the 'level of threat was estimated to be high for entry potential, establishment potential, spread potential, economic impact and overall risk'.[67]

4.74 Mr Livingstone argued that the disease's spread potential is a serious point of contention. He told the committee that it was Growcom's position that:

> …the imported fruit could find its way anywhere around the retail distribution chain. It could also find its way into the processing chain. Nobody knows what happens to the waste product. If a consumer buys a pineapple that is imported and this disease starts to take hold, the fruit will look unappealing and they will just toss the whole thing in the bin. So where does that end up? We do not know.
>
> There has been no work done on what are called vectors or methods of transmission of the disease around Australia. That work cannot be done, because the disease is not here and some of the proposed vectors are native Australia. Therefore, you cannot do the research without matching those two up. We do not know how much transmission would happen through native Australian species.[68]

4.75 NQ Paradise Pines raised similar concerns regarding the disposal of waste:

> The possibility of infected fruit from Malaysia being purchased for example by a processor, who would be after a quantity of cheaper fruit, opens the door for the potential waste of cores and peel being dumped in a pineapple growing area with a very high chance of disease spreading to growing plants.[69]

4.76 It is worth noting that Department of Agriculture officials acknowledged at the hearings that once fresh pineapples from Malaysia passed Australia's border controls, there would be no restriction on where they can be distributed:

> If they have cleared the border, and we are satisfied that they have met our conditions, they can go wherever.[70]

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66 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, p. 51.

67 Mr Alex Livingstone, Growcom, *Committee Hansard,* 6 August 2012, p. 2.

68 Mr Alex Livingstone, Growcom, *Committee Hansard,* 6 August 2012, p. 3.

69 NQ Paradise Pines, *Submission 2,* [p. 2].

70 Dr Vanessa Findlay, Department of Agriculture, Fisheries and Forestry, *Committee Hansard,* 12 March 2103, p. 19.

4.77 Furthermore, departmental officials explained that the shelf life of pineapples, and their rate of deterioration once they have cleared the border, 'is not relevant from the biosecurity perspective.'[71]

Establishment and spread risk: high

4.78 The IRA concludes that if *Dickeya* sp. were to achieve entry into Australia, the probably of establishment would be high:

> The presence of the vectors of the disease and suitable environmental conditions in Australia, the strong reproductive and survival characteristics of the pest within pineapple plants, and a lack of fully effective cultural practices and control measures, all support a likelihood estimate for establishment of 'high'.[72]

4.79 The IRA further concludes that once established, the likelihood of *Dickeya* sp. spreading within Australia is high:

> Suitable environmental conditions and the presence of vectors in Australia, the intended use of the commodity, short distance movement with fruit and long distance movement with infected planting material, all support a likelihood estimate for spread of 'high'.[73]

4.80 DA Biosecurity's assessment of the risk of the pathogen's spread as high, was one conclusion stakeholders were able to agree on.[74]

Committee comment

4.81 The committee notes DA Biosecurity's assessment in relation to the probability of entry, establishment and spread of *Dickeya* sp. – the pathogen responsible for pineapple fruit collapse and heart rot.

4.82 It is clear to the committee that DA Biosecurity has undertaken an extensive assessment, but harbours concerns about the assessment in two important areas.

4.83 First, DA Biosecurity has assessed the probability of importation as 'low'. In the committee's view this appears to defy common sense. Although there is some uncertainty surrounding the precise figure, the Pineapple IRA has estimated that there is a two per cent latency rate post-harvest. The committee understands this to mean that for every 100 pineapples imported from Malaysia, up to two would be infected

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71 Ms Rona Mellor, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 13 March 2103, p. 20.

72 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia*, December 2012, p. 53.

73 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia*, December 2012, p. 53.

74 See, for example, Tropical Pines Pty Ltd, *Submission 4*,Supplementary Submission, [p. 2] and Growcom, *Submission 5*, p. 5.

with *Dickeya* sp. but show no visible signs of fruit collapse and heart rot at the time of quarantine inspection.

4.84 The committee notes that, based on 2009-10 data, were Malaysian pineapples were to capture just one per cent of the domestic fresh pineapple market, up to approximately 8.5 tonnes of imported fresh pineapple would contain the undetected *Dickeya* sp. pathogen, and would be free to enter the Australian domestic fresh pineapple market.

4.85 Based on the above scenario, it is the committee's view that, should the proposal to import proceed, it is almost certain that pineapples infected with the *Dickeya* sp. pathogen will be imported into Australia. The committee therefore does not support the IRA's conclusion that the risk of importation of the *Dickeya* sp. pathogen is low and would expect a significantly higher probability to be assigned.

4.86 Second, as noted earlier, DA has no role in the process of post-quarantine control. Departmental officials told the committee that once cleared at the border 'they can go wherever'.[75] The committee acknowledges the complex path that would be required to distribute the *Dickeya* sp. pathogen from a retail outlet to pineapple growing areas. However, the committee has, over the years, observed many examples of flagrant biosecurity risks which were entirely unpredicted and unanticipated.[76]

4.87 The committee is well aware that humans do not always act in entirely rational and predictable ways. It is for this reason that the committee does not support the IRA's conclusion that the risk of distribution of the *Dickeya* sp. pathogen is 'low' and would expect a moderately higher probability to be assigned.

4.88 The committee concludes, therefore, that DA Biosecurity should review its assessment of the probability of importation and the probability of distribution. If a risk above Australia's ALOP were to emerge, then the committee expects stronger mitigation measures would be required.

Recommendation 10

4.89 The committee recommends that the Department of Agriculture review its assessment of the probability of importation and the probability of distribution of the *Dickeya* sp. pathogen. If a risk above Australia's ALOP were to emerge from the review, then the committee expects stronger risk management measures would be required. If such risk management measures were not sufficient to reduce the risk to Australia's ALOP, then imports of Malaysian pineapples to Australia should not be permitted.

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75 Dr Vanessa Findlay, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 12 March 2103, p. 19.

76 The committee has over the years questioned the circumstances surrounding several biosecurity incidents. These incidents include the 2005 shipment of Brazilian beef (some of which was found dumped at the Wagga Wagga tip); a 2011 incident involving a group of Condobolin farmers who ordered fertiliser on the internet and were delivered 600 tonnes of Chinese soil; and a shipment of Malaysian raw peeled prawns (which tested positive for white spot syndrome virus) which was released into Australia in September 2010.

Assessment of consequences[77]

4.90 DA Biosecurity noted that, in terms of the IRA process, the objective of the consequence assessment is to provide a structured and transparent analysis of the 'likely consequences if the pests or disease agents were to enter, establish and spread in Australia'.[78] It is also stated that the assessment considers 'direct and indirect pest effects and their economic and environmental consequences'.[79]

4.91 According to DA Biosecurity, the IRA considered the direct pest effects in the context of the effects on plant life or health and other aspects of the environment. However, indirect pest effects are considered in the context of the effects on:

- eradication, control etc;
- domestic trade;
- international trade; and
- environment.

4.92 As previously indicated in Chapter 3, for each of the criteria listed above, the consequences were estimated over four geographic levels, defined as:

- **Local:** an aggregate of households or enterprises (a rural community, a town or a local government area).
- **District:** a geographically or geopolitically associated collection of aggregates (generally a recognised section of a state or territory, such as 'Far North Queensland').
- **Regional:** a geographically or geopolitically associated collection of districts in a geographic area (generally a state or territory, although there may be exceptions with larger states such as Western Australia).
- **National:** Australia wide (Australian mainland states and territories and Tasmania).

4.93 The magnitude of the potential consequences at each of these levels is then described, using the categories of indiscernible, minor significance, significant and major significance.

4.94 Estimates of the magnitude of the potential consequences over the four geographic levels were translated into a qualitative impact score from A to G using the

77 The following section is based on information contained in Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple* (Ananas comosus *(L.) Merr.) fruit from Malaysia,* December 2012, pp 10-12.

78 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple fruit from Malaysia,* p. 10.

79 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple fruit from Malaysia,* p. 10.

Pineapple IRA's Table 2.3.[80] For example, a consequence with a magnitude of 'significant' at the 'district' level will have a consequence impact score of 'D'.

Table 2.3 Decision rules for determining the consequence impact score based on the magnitude of consequences at four geographic scales

		Geographic scale			
		Local	**District**	**Region**	**Nation**
Magnitude	Indiscernible	A	A	A	A
	Minor significance	B	C	D	E
	Significant	C	D	E	F
	Major significance	D	E	F	G

4.95 The overall consequence for each pest is achieved by combining the qualitative impact scores (A–G) for each direct and indirect consequence using a series of decision rules.[81] These rules are mutually exclusive, and are assessed in numerical order until one applies.

Committee comment

4.96 Any 'consequence assessment' in relation to a crop such as pineapple must take into consideration its growing conditions. As indicated earlier in this chapter, to ensure optimum growth rates, pineapple is a crop that requires temperatures between 32˚ Celsius during the day and 20˚Celsius at night, well-drained soil and rainfall in excess of 750 mm, evenly distributed throughout the year.

4.97 These specific growing conditions mean that pineapple is not a crop that will ever be grown in Australia's arid centre or its more temperate climates. This, therefore, excludes vast areas of Australia. Even on a regional scale, pineapples will never be suitable to be grown across all parts of Queensland – some parts of the state will be too hot and others too cold or too dry.

4.98 The committee is concerned, therefore, that because the growing conditions for pineapples are limited to a relatively small geographic area, the DA Biosecurity rules applied in tables 2.3 and 2.4 of the Pineapple IRA mean that regardless of how serious the impact of a pest may be on the pineapple industry, the consequence could never be rated above 'moderate'.

4.99 The committee also notes that DA Biosecurity also rated the consequence to 'plant life and health' as 'significant at a regional level'. 'Significant' is said to be related to a moderate increase in mortality/morbidity, or a moderate decrease in production. The committee is of the view that losses of 40 per cent and up to 64 per cent would better be described as a 'large decrease in production' which equates to a 'major consequence' rating. The committee notes that a 'major consequence' rating

80 Table 2.3 reproduced from Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple fruit from Malaysia,* p. 11.

81 These are contained in Table 2.4: Decision rules for determining the overall consequence rating for each pest, Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for the importation of fresh decrowned pineapple fruit from Malaysia,* p. 12.

would then shift the overall consequence to 'high' rather than 'moderate'. Based on this scenario, the overall rating would be increased to 'low' which is above Australia's ALOP.

Recommendation 11

4.100 The committee recommends that the Department of Agriculture review its assessment of the consequences of the establishment of the pineapple heart rot and fruit collapse pathogen *Erwinia chrysanthemi* (pineapple strain, *Dickeya* sp.) in Australia. If a risk above Australia's ALOP were to emerge from the review, then the committee expects stronger risk management measures would be required. If such risk management measures were not sufficient to reduce the risk to Australia's ALOP then imports of Malaysian pineapples to Australia should not be permitted.

Chapter 5

The proposed importation of fresh ginger from Fiji

5.1 As mentioned in Chapter 1, the terms of reference for this inquiry required the committee to examine, amongst other things, the scientific basis on which the Import Risk Analysis (IRA) for the importation of fresh ginger has been developed. While the committee focussed on the Provisional Final Import Risk Assessment (PFIRA) during much of its inquiry, the final IRA was published in late January 2013, and is therefore used as the main reference in this chapter.

5.2 The ginger industry is a very important industry to Australia, even though it is small when compared to a range of other agricultural crops. Therefore, the proposed importation to Australia of fresh ginger from Fiji could have a major impact.

5.3 The central issue for this inquiry has been to examine whether the IRA for fresh ginger from Fiji is adequate. This chapter covers the committee's examination and findings regarding the IRA process undertaken, and examines whether the consequences, likelihoods and risks have been appropriately estimated for the importation of fresh ginger from Fiji.

Australia's ginger industry

5.4 Ginger is thought to have originated in the southern Asian and Indian regions and was first grown commercially in Australia in South East Queensland in the early 1900s, mainly for the domestic fresh market. At that time, all processed ginger was imported from China. Imports of processed product were disrupted during World War II and, consequently, the first processing facility was built in Buderim in 1941. Ginger is now grown in areas in and around Caboolture, Nambour and Gympie.[1]

5.5 The Queensland Department of Agriculture, Fisheries and Forestry (DAFF Queensland) advises on its website that growing ginger requires relatively flat, well drained soils that are free of rocks, sunny aspects with wind protection, high-quality water and particular chemical conditions in the soil. The website also advises that it is important that growers spell the land for two years between crops to control nematodes.[2]

5.6 Australia is a relative small producer of ginger, contributing less than one per cent of global production. The global market is dominated by China and India, with Indonesia, Nepal and Nigeria also producing significant crops. Production of ginger is both labour and capital intensive. Of the 8000 tonnes produced annually in Australia, 45 per cent is supplied to the domestic fresh market, with much of the remainder destined for processing:

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1 Queensland Government, Department of Agriculture, Fisheries and Forestry, *Ginger*, www.daff.qld.gov.au/26_18195.htm, (accessed 10 December 2012).

2 Queensland Government, Department of Agriculture, Fisheries and Forestry, *Ginger*, www.daff.qld.gov.au/26_18793.htm, (accessed 10 December 2012).

> Queensland Primary Industries and Fisheries (QPIF) estimates the current farm-gate value of the Australian ginger industry at approximately A$15.6 million. Ginger is also used as a vital ingredient in a wide range of semi-processed products for the food manufacturing sector and processed products for the retail sector. The value of these products, in which Australian ginger is a key ingredient, is estimated at over A$80 million.
>
> The Sunshine Coast region produces approximately 6075 tonnes of ginger annually. The Wide Bay-Burnett [the coastal and hinterland areas between Caloundra and Gladstone] is the second largest growing region, with production estimated at 1837 tonnes per year.
>
> Buderim Ginger is the largest ginger processor in Australia, taking over 95% (4200 tonnes) of the ginger produced for processing.[3]

5.7 Ginger is also exported from Australia in both raw and semi-processed forms to destinations including Japan, the United States, New Zealand and the United Kingdom. As with many other crops, the prices for fresh ginger vary with supply, demand, seasonal factors, product quality and levels of promotional activity.

> Growers indicated that during the 2006-2007 season the average price received from wholesalers purchasing fresh ginger was between $2.50 and $4.00 per kilogram, but prices have spiked as high as $12.00 and dropped as low as $1.50 due to fluctuations in supply capacity.[4]

5.8 At the inquiry hearing in October 2012, Mr Ashley Gill informed the committee that retail prices range between $2.50 for early-harvest ginger and $20 for old ginger.[5]

Pests and diseases

Previous outbreaks

5.9 The committee received evidence about previous outbreaks of pests and diseases in Australia's ginger industry during the inquiry. Buderim Ginger informed the committee, for example, that the pythium outbreak had significantly affected its processing operations:

> …since the outbreak of pythium in Australia in 2010, the ginger processed by Buderim has been sourced from within Australia, from its own operations in Fiji and from third party suppliers in China and other parts of Southeast Asia.[6]

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3 Queensland Primary Industries and Fisheries (Department of Employment, Economic Development and Innovation), *The Australian Ginger Industry – Overview of market trends and opportunities*, November 2009, pp ix–x.

4 Queensland Primary Industries and Fisheries (Department of Employment, Economic Development and Innovation), *The Australian Ginger Industry – Overview of market trends and opportunities*, November 2009, p. x.

5 Mr Ashley Gill, *Committee Hansard*, 23 October 2012, p. 11.

6 Buderim Ginger, *Submission 1*, [p. 2].

5.10 Buderim Ginger added that:

> Any inadvertent introduction of other pest varieties into the Australian growing region that severely impacted the supply of ginger available would have the capacity to significantly disrupt these arrangements and adversely impact on Buderim's profitability and threaten the viability of the Australian ginger industry.[7]

5.11 The committee was also informed of a previous outbreak of bacterial wilt that was devastating for the industry. Templeton Ginger's submission noted that the company had seen:

> …the introduction of Bacterial Wilt Biotype IV which almost wiped out the industry in the 1960's. Bacterial Wilt Biotype IV can start in a small corner of a 2Ha field and spread across it in 3-5 days causing 100% loss. The only way to combat this was to quarantine any infected fields and either leave the infected equipment there or steam sterilize it thoroughly so as not to shift any infected soil particles elsewhere.[8]

Current pests and diseases

5.12 The ginger IRA identified over 60 pests for fresh ginger in Fiji, including beetles, hemiptera, butterflies, moths, nematodes, bacteria and viruses.[9] Of the 60 pests, nine were identified as requiring a pest risk assessment on the basis of:

- their potential to be imported;
- whether they were already present within Australia;
- the potential for them to establish and spread; and
- the potential for economic consequences.

5.13 These nine pests are shown in Table 5.1. Two of these nine pests – yam scale and burrowing nematode – required risk mitigation measures in order to fall below Australia's ALOP.

Table 5.1—Restricted and unrestricted[10] risk assessments for quarantine pests for fresh ginger from Fiji

Pest	Common name	Unrestricted risk assessment	Restricted risk
Arthropods			
Elytroteinus subtruncatus	Fiji ginger weevil	Negligible risk	
Aspidiella hartii	Yam scale[11]	Low risk[#]	Very low risk

7 Buderim Ginger, *Submission 1*, [p. 2].

8 Templeton Ginger, *Submission 5*, [p. 2].

9 Department of Agriculture, Fisheries and Forestry, *Provisional final import risk analysis report for fresh ginger from Fiji*, Appendix A, August 2012.

10 The unrestricted risk assessment is the risk assessment before any mitigation or control measures are applied.

Nematodes			
Radopholus similis – putative intraspecific ginger variant	Burrowing nematode[12]	Low risk[#]	Very low risk
Discocriconemella discolabia	Ring nematodes	Negligible risk	
Mesocriconema denoudeni			
Helicotylenchus egyptiensis	Spiral nematodes	Very low risk	
Helicotylenchus indicus			
Helicotylenchus mucronatus			
Sphaeronema sp.	Cystoid nematode	Very low risk	

Source: Department of Agriculture, Fisheries and Forestry, *Provisional final import risk analysis report for fresh ginger from Fiji*, August 2012, pp 21 and 54–56.

5.14 The draft IRA for fresh ginger from Fiji identified burrowing nematode as a pest that is present in Fiji. However, at that time it was concluded that a pest risk assessment was not required as burrowing nematodes had been recorded as being present in Australia – in Queensland, the Northern Territory and Western Australia.[13]

5.15 The committee notes that the presence of a Fijian variant of the burrowing nematode was brought to DA's attention by the ginger industry. The ginger IRA states that:

> Information was provided by the Australian Ginger Industry Association (AGIA) and Department of Agriculture Fisheries and Forestry Queensland (DAFF Queensland) researchers through stakeholder submissions on the draft IRA report and subsequent consultation that a new, yet to be described, intraspecific variant of burrowing nematode, (*Radopholus similis*), is likely present in Fiji.
>
> The characteristics of this putative intraspecific ginger variant, as described by the DAFF Queensland researchers, are: 1) The Fijian variant is highly pathogenic on ginger, while banana is a poor host. 2). In contrast, the Australian variant is highly pathogenic on banana, while ginger is a poor

11 Yam scale is an insect that can attack yams and a range of other crops including ginger. Adult female scales are pinkish-brown, roughly oyster-shaped, conical, with a white patch at the tip of the cone. Younger scales are relatively more white. Crawlers are yellow. Infestations of tubers and sometimes foliage cause poor growth. Stored yam tubers are particularly susceptible to attack and large numbers of scales cause shrivelling, Infonet-biovision, www.infonet-biovision.org/default/ct/146/crops, (accessed 12 March 2013).

12 Burrowing nematodes (*Radopholus similis*) are parasites that attack a range of crops including bananas and ginger. Burrowing nematodes are around 0.55 to 0.88 mm in length and have a life cycle of around 21 days. They attack and enter the roots of host plants, causing damage and impeding the function of the plants roots. They are known to be widespread in most banana growing regions of the world, Wikipedia, *Radopholus Similis*, http://en.wikipedia.org/wiki/Radopholus_similis, (accessed 13 March 2013).

13 Department of Agriculture Fisheries and Forestry, *Draft import risk analysis report for fresh ginger from Fiji*, April 2012, p. 64.

host (Mike Smith, Jenny Cobon, DAFF Queensland, *personal communication*).[14]

The import risk analysis for fresh ginger from Fiji

5.16 The proposed importation of fresh ginger from Fiji has been a long-standing issue, with a formal request from Fiji received in 2003. Fiji currently exports fresh mature ginger to a number of countries including New Zealand, Canada and Hawaii for direct retail in supermarkets. The DA Biosecurity report on its field visit to Fiji in 2007 noted that:

> Fiji previously exported fresh mature ginger to the United States but the export program has since ceased due to a reduction in prices following China's access for ginger to the United States. This has further elevated the importance of the access for baby ginger to Australia for the Fiji Government.
>
> Fresh mature ginger for further processing is currently permitted from Fiji to Australia subject to specific import requirements. The import requirements stipulate that the imported fresh mature ginger is to be processed commercially in an AQIS Approved Premises.
>
> Fiji also exports processed ginger (preserved in sugar, preserved in brine, and ginger powder etc) to Australia. [15]

5.17 Table 5.2 below provides a timeline of events in relation to the Fijian ginger IRA.

Table 5.2—Timeline of Fijian ginger IRA

November 2003	Biosecurity Australia[16] received a formal request from Fiji, seeking market access for fresh ginger to Australia.[17]
2004 and 2007	Further information was provided on the Fiji ginger production system, land preparation, pest management, pre- and post-harvest handling.[18]
23 – 29 September 2007	DA Biosecurity officers observed ginger production, cultivation and harvesting practices in Fiji.[19]
2008	The Import Market Access Advisory Group (IMAAG) allocated priority A to the IRA for fresh ginger from Fiji.[20]

14 Department of Agriculture Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 32.

15 Department of Agriculture, Fisheries and Forestry, *Field Visit Report – Ginger Production and Processing in Fiji*, September 2007, p. 4.

16 DA Biosecurity was formerly known as Biosecurity Australia.

17 Department of Agriculture, Fisheries and Forestry Biosecurity, *Draft import risk analysis report for fresh ginger from Fiji*, April 2012, p. 1.

18 Department of Agriculture, Fisheries and Forestry Biosecurity, *Draft import risk analysis report for fresh ginger from Fiji*, April 2012, p. 1.

19 Department of Agriculture, Fisheries and Forestry, *Draft import risk analysis report for fresh ginger from Fiji*, April 2012, p. 15.

2008	DA Biosecurity work program adjusted to include Fiji ginger.[21]
13 August 2010	Commencement of the IRA for the import of ginger from Fiji.
September 2011	DA Biosecurity met with the Australian Ginger Industry Association to discuss the IRA process and the pests of quarantine concern.[22]
March 2012	The IMAAG advised DA that ginger from Fiji was Priority A.[23]
16 April 2012	Release of the draft IRA for the importation of fresh ginger from Fiji.
25 May 2012	Field trip report on ginger production and processing in Fiji, made available to industry.[24]
10 August 2012	PFIRA report released by DA.
10 September 2012	No appeals were received by the IRA Appeals Panel during the regulated timeframe. The Chair has confirmed that no IRAAP will be convened.[25]
22 January 2013	Final IRA for fresh ginger from Fiji released.[26]

Source: Department of Agriculture, Fisheries and Forestry, www.daff.gov.au/ba/ira/current-plant/ginger_from_fiji, (accessed 10 December 2012).

Reasons for the IRA

5.18 In advancing the IRA process, the Department of Agriculture (DA) has undertaken some background work including a field trip to Fiji. In 2008, the request was allocated 'priority A' by IMAAG and work on the request commenced under the department's work program. DA advised the committee that the importation of fresh ginger from Fiji was discussed a number of times during bilateral discussions and official government-to-government representations.[27]

5.19 DA further advised that it provided the following written advice to IMAAG for its consideration of the priority for fresh ginger imports from Fiji. DA Biosecurity recommended that Fiji be allocated priority A:

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20 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 4, 20 December 2012.

21 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 4, 20 December 2012.

22 Department of Agriculture, Fisheries and Forestry, *Draft import risk analysis report for fresh ginger from Fiji*, April 2012, p. 3.

23 Department of Agriculture, Fisheries and Forestry, *Import Market Access Advisory Group*, www.daff.gov.au/about/contactus/governance/import-market-access-advisory-group#plant, (accessed 11 December 2012).

24 Peasley Horticultural Services, *Submission 7*, p. 1.

25 Department of Agriculture, Fisheries and Forestry, Import Risk Analysis Appeals Panel, *Latest News*, www.daff.gov.au/about/contactus/governance/import-risk-analysis-appeals-panel, (accessed 11 December 2012).

26 Department of Agriculture, Fisheries and Forestry, *Final Import Risk Analysis Report for fresh ginger for consumption from Fiji*, 22 January 2013.

27 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 4, 20 December 2012.

Top priority for Fiji. Preliminary pest list sent to Fiji for comment in 2004. Main activity for AusAID-funded IRA officer for the South Pacific.[28]

Committee comment

5.20 It is unclear to the committee why importing fresh ginger from Fiji was the main activity for Commonwealth-funded AusAID officer. It is also unclear to the committee why the importation of fresh ginger from Fiji was given priority A status, particularly when, in response to questions from this committee, DA Biosecurity confirmed that there is no avenue for a formal appeal of an IMAAG decision to assign a specific priority.[29]

5.21 The confirmation by DA Biosecurity that Australian taxpayers have been funding an AusAID IRA officer to assist with the Fijian ginger import proposal (amongst others) is troubling, given that DA Biosecurity has steadfastly refused to commission research that would clarify the level of risk posed by the Fijian burrowing nematode variant to the Australian ginger industry. It would appear that the Government has been providing funding to assist importers, while denying the Australian ginger industry appropriate access to the resources needed to properly determine the risks arising from importing fresh ginger from Fiji.

5.22 The committee is concerned by the lack of transparency and opportunity for review of the decisions made by IMAAG. The committee therefore recommends that the full reasons and relevant supporting documentation for IMAAG's decisions should be made publicly available.

Recommendation 12

5.23 The committee recommends that the full reasons and relevant supporting documentation of the Import Market Access Advisory Group should be made publicly available within 30 days of a decision being taken.

Risk and consequences of importation

5.24 Industry witnesses provided the committee with evidence about the risks and consequences of the importation of fresh ginger for Australian industry. As noted above, ginger crops have already been adversely affected by pythium and bacterial wilt. The industry's concerns centred on any inadvertent importation of a pest which could threaten the viability of the Australian ginger industry.

5.25 The committee was particularly interested in the issues surrounding pests such as nematodes and their propensity to spread and the substantial crop loss of up to 70 per cent reported in some instances in Fiji.[30] Dr Graham Stirling, informed the

28 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 4, 20 December 2012.

29 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No.4, 20 December 2012.

30 Dr Graham Stirling, Independent consultant assisting the Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 18.

committee how easily other nematodes had spread and impacted farming across wide areas:

> We have a major nematode problem in our cereal industry. In 1965 there was a paper published that showed this nematode occurred on five farms within 20 kilometres of Toowoomba—that is 1965. Now, 45 or 50 years later, it is in every field just about in Queensland, New South Wales and everywhere. Once you introduce it, it gets taken around in soil to other places, and so what might start off as a minor problem because of soil transmission can finish up everywhere.[31]

Unrestricted risk assessment for quarantine pests for fresh ginger from Fiji

5.26 DA Biosecurity explained how the risk analysis process works:

> The risk analysis looks at the unconstrained risk: what would happen if you just allowed this into the country? Then we look at what we can do to prevent this happening, to reduce the risk of this happening to a very low level but not zero. Those are the measures we put in place. This is the process. It is a very repetitive and simple process.[32]

5.27 As discussed previously in this report, DA Biosecurity uses a risk management process to derive the unconstrained risk of an event, such as an outbreak of a particular disease or pest. A key feature of the process is the use of a risk estimation matrix (REM) to combine the likelihood and consequences of an event to obtain a risk assessment.

5.28 The pests considered in the ginger IRA and the unrestricted and restricted risk assessments for fresh ginger from Fiji are listed in Table 5.1. The 'low' unrestricted risk assessed for yam scale and burrowing nematode exceeded Australia's ALOP of 'very low'. The ginger IRA includes additional phytosanitary measures (discussed later in this chapter), which DA argued are effective in reducing these 'low' risks to 'very low'.[33]

5.29 The AGIA was not convinced that the overall risk estimate was correct for several pests, based on specific research it had conducted in relation to one of the pests – the burrowing nematode:

> Given that several pests could be potentially imported and could wipe out the industry, the risks presented by those pests should not be assessed as any lower than moderate. Independent advice in relation to the risk matrix should be conducted. Industry has shown this test case with the evidence provided through *Radopholus similis.* This potentially could be the case for other pests and diseases. We believe it is up to the Fijian ginger industry to

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31 Dr Graham Stirling, Independent consultant assisting the Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 19.

32 Dr Colin Grant, First Assistant Secretary, Plant Division, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 23 October 2012, p. 45.

33 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, pp 54–61.

> conduct further research to really examine their own industry and their own pests.[34]

Assessment of likelihood of entry, establishment and spread

5.30 The ginger IRA sets out how the overall likelihood of pest entry, establishment and spread is estimated using the likelihood of importation, distribution, establishment and spread individually and then combining those likelihoods using a set of matrix rules.[35] This section examines those assessments in some detail for the two pests that did not initially achieve Australia's ALOP: yam scale; and Fijian burrowing nematode variant.

Yam scale

5.31 In relation to yam scale, the likelihoods of entry establishment and spread are as follows:

Table 5.3—Likelihoods of entry, establishment and spread by yam scale

Entry – Importation	High
Entry – Distribution	High
Entry – Overall	High
Establishment	High
Spread	High
Overall entry, establishment and spread	High

Source: Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, pp 54–55.

5.32 The ginger IRA states that, in relation to yam scale:

> The major risk from *Aspidiella hartii* is the importation of live scales on ginger rhizomes that are subsequently diverted from their intended use for human consumption and used as planting material. Infested rhizomes could also be discarded in the vicinity of suitable host plants, although most life stages are immobile and unlikely to establish.[36]

5.33 The risk management measure proposed is pre-export phytosanitary inspections by the Biosecurity Authority of Fiji (BAF) to ensure that infested ginger is

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34 Mr Anthony Rehbein, President, Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 15.

35 Department of Agriculture, Fisheries and Forestry, *Provisional final import risk analysis report for fresh ginger from Fiji*, August 2012, pp 7–10.

36 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 55.

identified and subjected to appropriate remedial action.[37] This action is aimed at achieving Australia's ALOP of very low risk.

5.34 The committee heard evidence, however, about the ineffectiveness of visual inspections for the presence of yam scale:

> Yam scale is another thing that can decrease yields on ginger and leave unmarketable parcels of ginger. The yam scale can get that small that it is undetectable by the eye. So I do not know how having Biosecurity Fiji just physically inspect for yam scale is going to stop the yam scale coming into the country.[38]

5.35 Concerns were also raised about the proposed arrangements in relation to fumigation treatments – specifically, whether they were compulsory:

> Page 55 of the Provisional Final IRA also notes fumigation for Burrowing Nematode (ginger variant) will also be effective for Yam Scale. This is correct if it was compulsory, but it is not so how can this statement [be] made?[39]

Recommendation 13

5.36 The committee recommends that the Department of Agriculture review its assessment of the likelihood of entry, establishment and spread of yam scale. If a risk above Australia's ALOP were to emerge from the review, then the committee expects stronger risk management measures would be required. If such risk management measures were not sufficient to reduce the risk to Australia's ALOP, then imports of Fijian ginger to Australia should not be permitted.

Burrowing nematode

5.37 Burrowing nematode is the second pest with an unrestricted risk above the ALOP. The likelihood, entry, establishment and spread set out in the ginger IRA in relation to this pest are as follows:

Table 5.4—Likelihoods of entry, establishment and spread by burrowing nematode

Entry – Importation	Medium
Entry – Distribution	High
Entry – Overall	Medium
Establishment	High

37 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 55.

38 Mr Shane Templeton, Templeton Ginger, *Committee Hansard*, 23 October 2012, p. 5.

39 Templeton Ginger, *Submission 5*, [p. 6].

Spread	High
Overall entry, establishment and spread	Medium

Source: Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, pp 54–55.

5.38 The ginger IRA states that in relation to the burrowing nematode:

> The major risk from *Radopholus similis* – putative intraspecific ginger variant is the importation of live nematodes on ginger rhizomes that are subsequently diverted from their intended use for human consumption and used as planting material. Infested rhizomes could also be discarded in the vicinity of suitable host plants. The use of clean seed, application of manure and rotation of crops have been shown to reduce burrowing nematode populations to undetectable levels (Turaganivalu *et al*. 2012).[40]

5.39 Combining the 'medium' probability of entry, establishment and spread, with the 'low' consequence for burrowing nematode results in the IRA with the unrestricted risk of 'low'. DA Biosecurity informed the committee that:

> We have said that there is a risk. The unrestricted risk would be too high. We are, therefore, going to place measures upon the introduction of ginger from Fiji into Australia and those measures, as has been indicated in reports and today in evidence, will work if applied appropriately. We will require it to be applied appropriately. This is standard process. We do it over and over again.[41]

5.40 Industry stakeholders disputed DA Biosecurity's view and provided the committee with evidence to suggest that:

- there is potential for nematodes to reside in remnant soil;
- nematodes have the capacity to reside within ginger and remain undetectable and possibly untreatable;
- there is the potential for burrowing nematode to spread from residential use ginger to farms;[42] and
- the Fijian burrowing nematode variant has greater pathogenicity.

Soil contamination

5.41 One mitigation measure proposed by DA Biosecurity involved inspections to confirm that ginger is 'visually free of soil'.[43] Industry stakeholders noted, however,

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40 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, pp 55–56.

41 Dr Colin Grant, First Assistant Secretary, Plant Division, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 23 October 2012, p. 37.

42 Australian Ginger Industry Association, *Submission 9*, [p. 2].

43 Dr Colin Grant, First Assistant Secretary, Plant Division, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 23 October 2012, p. 34.

that it was very difficult to clean all the soil off ginger because of its complex shape. Mr Shane Templeton of Templeton Ginger stated that:

> When we wash ginger to send to the fresh markets, we have always got those little crevices that it is very hard to get the soil out of. [44]

5.42 Concerns about the ineffectiveness of visual inspections were also raised by Peasley Horticultural Service:

> The PFIRA also minimises the potential risk of soil as a vector of a range of pests. It is well understood that soil is a hitchhiker on a wide range of commodities entering Australia however the PFIRA fails to concede that the ginger rhizome is not a smooth conventional shape and contains crevices which commonly trap soil clods which cannot be effectively removed by conventional high pressure water treatment.[45]

5.43 The Botanical Food Company outlined its experience in trying to ensure ginger is free from soil and argued that:

> Given BFC's considerable experience in this field, BFC totally supports the findings of the AGIA submission Appendix 1 June 2012: Due to the morphology of the ginger rhizome it is not possible to remove all traces of soil from ginger destined for the fresh market in a commercial operation.
>
> In fact BFC experience has proven 100% removal of soil and other potential contaminants can only be removed from fresh ginger by slicing, sorting and sanitising.[46]

5.44 The committee was also told that tiny amounts of remnant soil could contain large numbers of nematodes:

> Ginger has a complex morphology with lots of crevices allowing soil to hide in corners and between rhizomes. A study conducted by Deedi showed soil less than 1 gram in weight still contained up to 17 nematodes. Free from soil must be just that, free from soil. A few grains of soil is all it would take to introduce Burrowing Nematode. Otherwise other risk mitigation measures are required.[47]

5.45 Given that nematodes can remain in small amounts of soil, industry stakeholders have ongoing concerns about how the issue of soil contamination will be managed and exactly how much soil would be allowed. The AGIA told the committee that:

> Throughout the IRA process, the issue of soil has been debated and to this point the goal posts consistently vary when the topic is discussed. Australia has a zero tolerance of soil. From documented minutes between industry and DAFF Biosecurity, we are constantly told that perhaps a cup of soil will

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44 Mr Shane Templeton, Templeton Ginger, *Committee Hansard*, 23 October 2012, p. 4.

45 Peasley Horticultural Service, *Submission 7*, p. 2.

46 Botanical Food Company, *Submission 12*, [p. 4].

47 Templeton Ginger, *Submission 5*, [p. 3].

> be allowed. It is then up to AQIS to deal with it and make a line call decision if the product does not meet its import guidelines.[48]

5.46 The AGIA further questioned information provided by DA Biosecurity regarding the amount of soil that leads to the introduction of burrowing nematodes:

> Dr Colin Grant stated in 'Official Committee Hansard, Senate, Rural and Regional Affairs and Transport Legislation Committee Estimates Monday, 21 May 2012' that 'A few grains of soil will not be a medium sufficient to maintain nematodes. You would have to have clumps of soil—fairly small clumps, admittedly'. However, data supplied in the AGIA's response to the Draft IRA (pp. 12–13 and Table A.1 on p. 66) show that even extremely small amounts of soil can harbour nematodes. Up to 17 nematodes were extracted from each of 10 samples of less than 1 gram of soil hidden in crevices on ginger rhizomes.[49]

Burrowing nematode present inside ginger

5.47 Industry stakeholders told the committee that, even if it were possible to remove all the soil from imported ginger, it was still likely that the Fijian burrowing nematode variant could exist inside the ginger and thereby be imported into Australia.[50] AGIA noted, for example, that the burrowing nematode reproduces internally in the ginger rhizome.[51]

5.48 The evidence offered in the ginger IRA that 'the experience of Fiji's ginger exports to other markets over a number of years does not suggest a high likelihood that *Radopholus similis* would be present in export-quality ginger'[52] is not particularly convincing. This position is reinforced by an answer to a question on notice which indicated that there have been three consignments (to New Zealand) over a period of 10 years where nematodes have been intercepted.[53]

Burrowing nematode entry with other host and non-host crops

5.49 Burrowing nematodes are able to live and multiply on a number of other host crops, such as bananas, carrots, citrus, lettuce, mango, rice, tomatoes, black peppercorn, coconuts, coffee, pineapples, sugarcane and tea.[54]

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48 Mr Anthony Rehbein, President, Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 14.

49 Australia Ginger Industry Association, *Submission 9*, [p. 2].

50 Mr Shane Templeton, Templeton Ginger, *Committee Hansard*, 23 October 2012, p. 4.

51 Mr Anthony Rehbein, President, Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 15.

52 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 34.

53 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 15, 20 January 2013.

54 http://plpnemweb.ucdavis.edu/nemaplex/taxadata/G111S2.HTM, (accessed 13 March 2013).

5.50 However, in response to questions from the committee, DA Biosecurity indicated that:

> Rice, black pepper, coconuts, coffee and tea can be imported from Fiji. None of these imported products are considered a viable pathway for the burrowing nematode to enter and establish in Australia.[55]

5.51 DA Biosecurity also acknowledged that in conducting the IRA on fresh ginger from Fiji it did not assess the likelihood of the Fijian burrowing nematode variant being imported into Australia via other crops from Fiji. Crops including – but not limited to – carrots, citrus, lettuces, mangoes, rice, tomatoes, bananas, black peppers, coconuts, coffee, pineapples, sugarcane and tea.[56]

5.52 The committee is aware that taro (as a non-host crop for burrowing nematodes) is often grown in rotation with ginger in Fiji and sought to explore whether there were any risks associated with the import arrangements for taro from Fiji.

5.53 When questioned by the committee, DA Biosecurity confirmed that nematodes had been found on taro imported from Fiji [57] however, to date, the Fijian burrowing nematode variant had not been found on taro.[58] In addition, DA Biosecurity confirmed that fresh taro from Fiji is moved into ginger growing regions:

> Fresh taro from Fiji is imported into Brisbane on a regular basis. DAFF does not monitor the movement of goods once they are released from quarantine control.[59]

5.54 As discussed in Chapter 4, DA Biosecurity has indicated that it is unable to control what happens to imported produce once quarantine clearance is given at the border. The committee is aware, therefore, that in the same way as fresh pineapple from Malaysia could pass Australian border controls and not be restricted in its distribution, there would be no restrictions placed on the distribution of fresh ginger from Fiji. The committee notes that once border clearance is provided, the distribution of that product ceases to be relevant from the biosecurity perspective:[60]

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55 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 7, 20 January 2013.

56 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 8, 20 January 2013.

57 Mr Bill Magee, Assistant Secretary, Department of Agriculture, Fishers and Forestry, *Committee Hansard*, 23 October 2013, p. 42.

58 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 21, 20 January 2013.

59 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 21, 20 January 2013.

60 Ms Rona Mellor, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 13 March 2103, p. 20.

> If they have cleared the border, and we are satisfied that they have met our conditions, they can go wherever.[61]

Committee comment

5.55 The committee considers that the ginger IRA does not adequately address the difficulties associated with ensuring that soil containing burrowing nematodes is removed from ginger being imported from Fiji. The level of difficulty in ensuring that very small amounts of soil are not present is not adequately reflected in the 'medium' likelihood of entry prior to mitigation measures, or the lower likelihood of entry after the mitigation measures.

5.56 The committee therefore considers that for the purposes of the unrestricted risk assessment, the likelihood that the Fijian burrowing nematode variant would be imported into Australia with fresh ginger from Fiji is 'almost certain'. This likelihood was estimated in the ginger IRA as 'moderate' with a probability of 0.3 to 0.7, but the committee considers this is not a credible assessment for an event that is 'almost certain' to occur. The three cases of nematodes detected in ginger consignments to other countries over the past decade highlight for the committee the very high likelihood of nematodes being imported. The committee notes that these are the detected cases and that there may have been cases where nematodes went undetected by quarantine inspection.

5.57 The committee notes that if the likelihood of importation had been rated as 'high' which would be more appropriate for an event that is 'almost certain' to occur, the overall probability of entry, establishment and spread would also be 'high'.

5.58 The committee is concerned that it has identified a significant shortcoming in the ginger IRA as it did not consider that the more pathogenic Fijian burrowing nematode variant could be imported from Fiji on other host crops, such as rice, black pepper, coconuts, coffee and tea.

5.59 In addition, the committee remains concerned about the potential for the Fijian burrowing nematode variant to be imported on taro which is grown in rotation with ginger in Fiji. While the committee acknowledges that Fijian burrowing nematode variant have not been found on taro imported from Fiji to date, DA Biosecurity has admitted that other nematodes have been found on taro from Fiji. The committee considers that this demonstrates that the burrowing nematode could also be imported and thus pose a threat to Australian ginger crops.

5.60 The committee therefore considers the likelihood of entry, establishment and spread of the Fijian burrowing nematode should be reassessed.

Recommendation 14

5.61 The committee recommends that the Department of Agriculture review its assessment of the likelihood of entry, establishment and spread of the Fijian burrowing nematode variant. If a risk above Australia's ALOP were to emerge

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61 Dr Vanessa Findlay, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 12 March 2103, p. 19.

from the review, then the committee expects stronger risk management measures would be required. If such risk management measures were not sufficient to reduce the risk to Australia's ALOP, then imports of Fijian ginger to Australia should not be permitted.

Assessment of consequences

5.62 As discussed in previous chapters, the assessment of the consequences that may arise from a pest incursion is a key part in determining the risks associated with importation of ginger from Fiji.

5.63 The IRA sets out how the consequences are assessed over four geographic levels: local, district, regional and national, against the following six criteria:

- plant life or health;
- other aspects of the environment;
- eradication, control;
- domestic trade;
- international trade; and
- environment.[62]

5.64 The magnitude of the potential consequence at each geographic level is put into one of four categories: indiscernible, minor, significant, and major significant. The magnitudes for the six criteria are then combined into overall consequence ratings for each pest through two sets of decision rules.[63]

Burrowing nematodes and yam scale

5.65 The consequences for both yam scale and burrowing nematode are both assessed by DA Biosecurity as 'low'. Both pests were given an impact score of 'D' meaning 'significant at the district' level for plant life or health.[64] In relation to the burrowing nematode, the ginger IRA states that:

> *Radopholus similis* – putative intraspecific ginger variant may have an impact on ginger production where poor crop management and production practices are in place. *Radopholus similis* – putative intraspecific ginger variant was not detectable in crops that employed crop rotation with non-host crops and which used hot water treated seed planting material (Turaganivalu *et al*. 2009). Infestation results in stunted, chlorotic low

62 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 10.

63 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, pp 10–12.

64 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, pp 30, 36.

> yielding crops (Vilsoni *et al*. 1976). Rhizomes can be completely destroyed (Turaganivalu *et al*. 2009).[65]

5.66 However, key industry stakeholders were not convinced that the consequence of an infestation of burrowing nematode should be assessed as 'low'. Rather, it was argued that the ginger IRA has underestimated the risks. The AGIA stated for example:

> ...that DAFF Biosecurity has significantly underestimated the risks posed by the introduction of various pest and disease organisms and has not provided for adequate risk mitigation measures...[66]

5.67 Similarly, Buderim Ginger submitted its concerns about the level of risk assigned to yam scale and burrowing nematode:

> Buderim supports the industry position that DAFF Biosecurity has significantly underestimated the risk posed by the potential introduction of these two pests.
>
> …the assumption that it is possible to rely on farm management practices alone without the mandatory fumigation of the imported ginger to control the pests identified is impractical and ill-conceived.[67]

5.68 Templeton Ginger told the committee that if burrowing nematode were to enter Australia, it would be as devastating to the ginger industry as Foot and Mouth disease would be to the cattle industry.[68] It was also submitted that:

> Burrowing Nematode has been found to be pathogenic on ginger in Fiji, with losses of up 70% of their crop. It could not only affect our yields but would affect our access to overseas markets like Japan.[69]
>
> This import request is to deliver ginger into Australia, anywhere! It is not limited to 1or 2 places with strict quarantine restrictions. It can be bought by anyone, anywhere for almost any use. Any piece of ginger can be used as planting material intentionally or unintentionally.[70]

Impact of geographic scale in the assessment of consequences for ginger

5.69 The committee is concerned that because the highly specialised growing conditions for ginger limit its production to a relatively small geographic area, the DA Biosecurity decision rules in Tables 2.3 and 2.4 of the ginger IRA mean that

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65 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 36.

66 Mr Anthony Rehbein, President Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 14. For other examples see: Botanical Food Company, *Submission 12*, [pp 2 and 6]; Mr David Gibson MP, *Submission 13*, [p. 1]; and Murray Bros., *Submission 14*, p. 1.

67 Buderim Ginger, *Submission 1*, [pp 1 and 3].

68 Templeton Ginger, *Submission 5*, [p. 2].

69 Templeton Ginger, *Submission 5*, [p. 2].

70 Templeton Ginger, *Submission 5*, [p. 3].

regardless of how serious the impact of a specific pest would be on the ginger industry, the consequences could never be rated above 'moderate'.[71]

5.70 As noted previously, ginger requires light shade, a well-drained soil, frost-free climate and 1500 mm of rain annually or supplementary irrigation. Ginger grows well in loamy or alluvial fertile soils and likes the addition of well-rotted manure or compost. It cannot stand waterlogging.[72] The Queensland Government's 2009 overview of the Australian ginger industry states:

> Ginger is a tropical crop and therefore grows particularly well in the wet tropics and subtropics. It also grows well in areas that experience a dry season, provided there is irrigation. Areas that are too windy or too exposed may cause issues for growers as crops perform best in more sheltered areas. For this reason, the majority of Queensland's ginger farms are located along coastal areas such as the Sunshine Coast that experience high temperatures and humidity, and high rainfall during summer.[73]

Committee comment

5.71 The committee is concerned that the IRA does not allow 'high' or even 'extreme' consequences to be determined when, for example, the entire or large proportion of the area capable of growing a crop such as ginger is under a threat of 'major significance'.

5.72 The committee notes that Mr Peace identified this limitation in his report to the committee on the DA Biosecurity REM. Mr Peace suggested several alternatives to crude geographic levels, including percentage of national crop at risk, or viable planting area at risk.[74] The committee has made a recommendation on the broader issue of geographic level in Chapter 3.

Assessment of consequences for other crops

5.73 The committee was informed that in addition to ginger crops, yam scale can also affect other crops:

> Yam Scale has been determined as a quarantine pest. Yam Scale Pest Risk Management measures are Phytosanitary inspection by BAF.
>
> Yam Scale could affect Australian grower's yields and leave pieces unmarketable if introduced into Australia. It should also be noted that Yam Scale has many other host crops…[75]

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71 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, pp 10–11.

72 Greenharvest, www.greenharvest.com.au/Plants/Information/Ginger.html, (accessed 25 March 2013).

73 Queensland Government, *The Australian Ginger Industry – Overview of market trends and opportunities*, 2009, p. 11.

74 Peace, C., *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process*, January 2013, p. 22.

75 Templeton Ginger, *Submission 5*, [p. 6].

5.74 The committee notes that the ginger IRA drew on references regarding a range of tropical root crops as potential hosts of yam scale.[76]

5.75 For the burrowing nematode, the IRA acknowledges a wide range of other potential host crops, including bananas, black peppers, coconuts, coffee, ginger, pineapples, sugarcane and tea. However, bananas are the only other host crop explicitly considered in terms of the Fijian burrowing nematode variant that is highly pathogenic for ginger. While bananas in Fiji are shown to be a poor host,[77] it is less clear whether the Fijian burrowing nematode variant is pathogenic to Australian bananas.

5.76 DA Biosecurity indicated in an answer to a written question on notice that, in its view, it was not applicable for the Chief Executive to use the powers available under regulation 69G(1) of the Quarantine Regulations 2000 to obtain further information regarding the impact of the Fijian burrowing nematode variant on other host crops grown in Australia.[78]

5.77 The committee observes that DA Biosecurity appears to consider it unnecessary to seek further information on the consequences of the Fijian burrowing nematode variant. The committee assumes that this is because it has put in place mitigation measures to reduce the risk below Australia's ALOP. However, as discussed elsewhere in this chapter, the committee is not convinced that the mitigation measures are effective, or that the risk is below Australia's ALOP.

5.78 The committee sought information on whether in conducting the IRA, DA Biosecurity explicitly considered the extent and consequences of the Fijian burrowing nematode variant to the particular species of other known host crops grown in Australia, including, but not limited to carrots, citrus, lettuces, mangoes, rice, tomatoes, bananas, black peppers, coconuts, coffee, pineapples, sugarcane and tea. DA Biosecurity responded:

> The key attribute of *Radopholus similis* intraspecific variant is its postulated pathogenicity on ginger. As there is no published information available on the pathogenicity of the *Radopholus similis* intraspecific variant on crops other than ginger, the pest risk assessment took a conservative approach in rating the consequences of this pest on plant life or health, including other crops. The report specifically recognised the putative intraspecific strain on ginger and addressed those risks.[79]

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76 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 30.

77 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, pp 32–36.

78 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 5, 20 January 2013.

79 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 5, 20 January 2013.

Baby ginger versus mature harvest ginger

5.79 Dr Graham Stirling, a consultant to the AGIA, clarified that if the Fijian burrowing nematode variant escaped into Australian ginger growing areas, it may not prevent all ginger growing, but would affect the higher quality ginger that is obtained by leaving the crop in the ground for longer:

> If we got this pest in Australia, we would be able to grow early-harvest ginger, which only grows in the ground for four or five months. The problem will come after that. We would lose these two-year plantings... They would be destroyed. We would lose, probably, a large percentage of our market, but we would still be able to grow ginger provided we harvested it early, before the nematodes did the damage.[80]

5.80 DA Biosecurity informed the committee that the IRA covered both immature and mature ginger, but that different harvest times were not assessed.[81]

Committee comment

5.81 The committee acknowledges that the IRA's assessment of consequences is inherently prone to a degree of subjectivity. Nevertheless, the committee considers that the language used by industry stakeholders indicates that the magnitude of the consequence of the entry of Fijian burrowing nematode variant is likely to be of 'major significance'. The IRA defines major significance as:

> …expected to threaten the economic viability through a large increase in mortality/morbidity of hosts, or a large decrease in production. Expected to severely or irreversibly damage the intrinsic 'value' of non-commercial criteria.[82]

5.82 However, in the ginger IRA, DA Biosecurity appear to consider that if Australian farmers use crop rotation and hot water treatment of seed ginger, the magnitude of the consequences of burrowing nematode will only be 'significant'.[83] As discussed later in this chapter, the committee has concerns about both the effectiveness of the proposed mitigation measures and whether the consequences have been correctly assessed.

5.83 The committee observes that if the percentage of the national crop at risk or the proportion of the possible growing area were used instead of geographic size, the consequences would possibly be assessed as 'moderate' or higher for both yam scale and burrowing nematode. As a result, the unrestricted risk may be 'moderate' or higher.

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80 Dr Graham Stirling, Independent consultant assisting the Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 24.

81 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 14, 20 January 2013.

82 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 11.

83 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 36.

5.84 Even if the proposed mitigation measures reduced the likelihood of entry, establishment and spread of yam scale and burrowing nematode to 'low', the restricted risk assessment for both pests would be 'low risk' and therefore above the ALOP and fresh Fiji ginger would not be able to be imported without the application of further mitigation measures.

5.85 The committee also observes that if the same adjustments to assessment consequences were made for some of the other seven quarantine pests associated with fresh ginger from Fiji, the unrestricted risk may also be higher than what was previously assessed and additional mitigation measures may be required.

5.86 The committee therefore reiterates the importance of the recommendation made in Chapter 3 in relation to the way in which geographic impacts are taken into consideration in the IRA process.

5.87 The committee is concerned at the assessment of potential consequences of the Fijian burrowing nematode variant spreading in Australia as 'low', in spite of the fact that there does not appear to be any information on the consequences for crops other than ginger.

5.88 The statement by DA that a conservative approach had been taken regarding the consequence for other crops does not appear to be consistent with plant life or health impact score given in the ginger IRA of 'D—significant at the district level'.[84] The other host crops are grown in areas extending far beyond the district level in which ginger is grown.

5.89 In addition, as noted above, the ginger IRA appears to assess consequences as 'significant' on the basis that crop rotation and hot water treatment can be used to manage the Fijian burrowing nematode variant in Australian ginger crops. However, it is not at all clear to the committee that crop rotation and hot water treatment are effective against the Fijian burrowing nematode variant for other host crops in Australia. Again, this draws into question the assertion by DA Biosecurity that a conservative approach was taken in rating the consequence for other host crops.

5.90 The committee considers that based on the above, and using Table 2.3 of the IRA, the plant life or health impact score for the Fijian burrowing nematode variant should be at least 'E' and quite possibly 'F'. Hence, the overall consequence rating based on Table 2.4 of the ginger IRA would then be 'moderate' or 'high'. The corresponding unrestricted risk based on Table 2.5 of the IRA would then be 'moderate' or 'high'. Even if the entry mitigation measures were as effective as DA Biosecurity propose, the restricted risk would be 'low' or 'moderate' and therefore above the ALOP.

5.91 The committee considers this to be a significant flaw in the IRA, particularly given that the Fijian burrowing nematode variant has been shown to be so much more pathogenic for ginger.

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84 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 36.

5.92 The committee therefore considers that the consequences of the Fijian burrowing nematode variant entering Australia should be reassessed.

Recommendation 15

5.93 The committee recommends that the Department of Agriculture review its assessment of the consequences of the establishment of the Fijian burrowing nematode variant in Australia. If a risk above Australia's ALOP were to emerge from the review, then the committee expects stronger risk management measures would be required. If such risk management measures were not sufficient to reduce the risk to Australia's ALOP, then imports of Fijian ginger to Australia should not be permitted.

Adequacy and effectives of quarantine conditions and arrangements

Requirements for mitigation measures

5.94 The identification and assessment of risk management measures is a key part of any IRA process. If the risks associated with an import proposal are determined through an IRA process to exceed Australia's ALOP, there are two possible paths. First, risk management measures are proposed to reduce the risks to a level that achieves Australia's ALOP; or secondly where it is not possible to reduce the risks to below the ALOP, trade will not be allowed.[85]

5.95 In the case of fresh ginger from Fiji, the ginger IRA identified two pests (yam scale and the Fijian burrowing nematode variant) for which the unrestricted risk is 'low' and above Australia's ALOP of 'very low'.[86]

Yam scale

5.96 The IRA proposed the following mitigation measures in relation to yam scale:

> ...pre-export phytosanitary inspection by BAF for *Aspidiella hartii* [yam scale] to ensure that infested ginger rhizomes are identified and subjected to appropriate remedial action.[87]

5.97 Stakeholders raised concerns about the proposed mitigation measures and raised questions about whether inspections for yam scale would be effective given the size of yam scale.[88]

5.98 The ginger IRA also suggests that the proposed methyl bromide fumigation for burrowing nematode would also be effective for yam scale.[89] However, it was

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85 Biosecurity Australia, *Import Risk Analysis Handbook*, 2011, p. 5.

86 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 54.

87 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 55.

88 See, for example, Mr Shane Templeton, Director, Templeton Ginger, *Committee Hansard*, 23 October 2012, p. 5.

89 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 55.

pointed out that the fumigation would only work if it is compulsory and the ginger IRA currently lists it as an optional treatment.[90]

Fijian burrowing nematode variant

5.99 The IRA proposed the mitigation measures set out below for the Fijian burrowing nematode variant:

> It is proposed that the risk of *Radopholus similis* – putative intraspecific ginger variant in ginger exported to Australia be managed by either:
>
> 1) a systems approach, such as, but not limited to: the use of clean seed certified as nematode-free, or seed dipped in hot water at 51°C for ten minutes, and either:
>
> - a crop rotation program using non-crop hosts and fallow period, or
> - production in a recognised area of low pest prevalence.
>
> or
>
> 2) methyl bromide fumigation or other suitable treatment of rhizomes, either in Fiji or on arrival in Australia.[91]

5.100 DA Biosecurity informed the committee that in general, systems approaches are quite commonly used[92] and summarised the systems approach as follows:

> We have talked about the use of clean seed certified as nematode free or seed dipped in hot water at 51 degrees for 10 minutes and either a crop rotation program using non-crop hosts and fallow period or production in a recognised area of low pest prevalence.
>
> That is a combination that would give us our systems approach. We would also consider other systems approaches that might be proposed to us by the Fijian government, and we would make some assessment of those. The alternative to that systems approach for *Radopholus similis* is a methyl bromide fumigation or other suitable treatment, either in Fiji or on arrival in Australia.[93]

5.101 The ginger IRA asserts that the objective of the mitigation measures is to reduce the likelihood of importation for the Fijian burrowing nematode variant to at least 'low'.[94] The committee sought further information on two key points in relation to the proposed mitigation measures – including the systems approach. Firstly,

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90 Department of Agriculture, Fisheries and Forestry *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 56.

91 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, pp 55–56.

92 Dr Colin Grant, First Assistant Secretary, Plant Division, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 23 October 2012, p. 32.

93 Mr Rob Schwartz, Senior Director, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 23 October 2012, pp 34–35.

94 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 56.

whether there is scientific evidence that properly implemented mitigation measures would guarantee elimination of the nematodes, and secondly, whether the mitigation measures would be implemented correctly.

Evidence for the effectiveness of mitigation measures

5.102 Stakeholders informed the committee of their concerns that the proposed management approaches were not sufficient[95] and the scientific basis of the systems approach was queried by some submitters. For example, Peasley Horticultural Services stated that:

> The risk management measures proposed in the PFIRA are scientifically and commercially unproven and have not been technically or practically demonstrated.[96]

5.103 The Chairman of the AGIA also argued that:

> The Provisional Final IRA (PFIRA) had implemented mitigation measures for *Radopholus similis* [burrowing nematodes]. These measures are simply inadequate. Based on my industry experience as a seed grower, my conclusion is that heat treating, certified seed and crop rotation are not adequate measures.[97]

5.104 Templeton Ginger raised concerns about the hot water treatment part of the risk management approach, and suggested that it may not eliminate burrowing nematodes:

> From what I can see it has been taken from the ACIAR [Australian Centre for International Agricultural Research] report and it has taken sections out of it so that it says using a clean seed scheme with hot water treatment will do. It also says in that report that hot water treatment is not being done well in Fiji, and there is no science around that says that that will eliminate burrowing nematode. It also says in that report, where it is taken out, that there is crop rotation and retillering of ginger. So you have affected plants once again as well as other weed hosts that actually come in.[98]

5.105 In its submission on the draft IRA, the AGIA asserted that the guidelines for hot water treatment are aimed at controlling rather than eliminating nematodes:

> …most guidelines for hot-water treatment are aimed at reducing pest populations rather than eliminating them. For most pests, protocols have not been developed to eliminate organisms; this would likely require higher temperatures or longer treatment times, and these may affect the resultant quality of ginger rhizomes. Where required for particular organisms, methods

95 Mr John Allen, *Submission 2*, [p. 1]; Mr Barry Gill, *Submission 3*, [p. 1].

96 Peasley Horticultural Services, *Submission 7*, p. 3.

97 Australian Ginger Growers Association, *Submission 4*, [p. 2].

98 Mr Shane Templeton, Templeton Ginger, *Committee Hansard*, 23 October 2012, p. 2.

> must be developed to achieve elimination without affecting the quality of ginger rhizomes intended for human consumption.[99]

5.106 The committee notes that in relation to the effectiveness of dipping in hot water, the ginger IRA itself states that 'steps such as hot water dipping do not guarantee the rhizomes will be pest free'.[100]

5.107 Mr John Allen from Oakland Farms also expressed concerns about the proposed protocols:

> The protocols that DAFF Biosecurity required for their containment of burrowing nematodes will not work here, and I am sure that Fiji will not be much different. In my view, unless very definite and stringent protocols are put in place, this pathogen will enter Australia.[101]

5.108 One of the risk mitigation measures proposed by DA Biosecurity for use against burrowing nematode was methyl bromide – a measure widely considered by stakeholders as being largely ineffective The committee notes, however, that the AGIA did consider methyl bromide fumigation 'potentially effective' against the Fijian burrowing nematode variant.[102]

5.109 Dr Stirling stated that:

> It is a question about what rate of methyl bromide. We do not even have the research to actually know that it will actually do the job. So it may very well be okay but, as far as I am aware, I have not seen any literature which actually indicates that it is effective.[103]

5.110 Mr Shane Templeton informed the committee that when a burrowing nematode burrows into ginger, the wounds will heal over and the methyl bromide might not effectively get to those burrowing nematodes.[104] Similarly the Australian Ginger Growers Association (AGGA) argued that:

> Methyl bromide was put forward by DAFF B as the alternative control measure. Due to the reproductive system of *Radopholus similis* [burrowing nematode], will this fumigant be 100% affective when the burrowing nematode reproduces internally in the ginger rhizome? Methyl bromide is not systemic. One must question whether this mitigation measure requires further research before ginger is imported. How long and at what rate and at

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99 Australian Ginger Industry Association, *Response to: 'Draft import risk analysis report for fresh ginger from Fiji'*, June 2012, pp 22 and 44.

100 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 84.

101 Mr John Allen, Owner/Manager, Oakland Farms, *Committee Hansard*, 23 October 2012, p. 9.

102 Dr Mike Smith, Technical adviser to the ginger industry, *Committee Hansard*, 23 October 2012, p. 23.

103 Dr Graham Stirling, Independent consultant assisting the Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 18.

104 Mr Shane Templeton, Templeton Ginger, *Committee Hansard*, 23 October 2012, p. 2.

> what temperature will methyl bromide be used? Who will be required to conduct this operation?[105]

5.111 While willing to admit the potential effectiveness of methyl bromide fumigation, the AGIA expressed similar concerns in relation to fumigation in respect of internal organisms:

> However, there is little information available on the effectiveness of fumigation on organisms living inside plant tissue. As *R. similis* is an endoparasitic nematode, reproducing inside the rhizome, we believe that further work is needed to determine the effect of methyl bromide fumigation on nematodes contained within rhizomes.[106]

5.112 The AGIA also informed the committee of the area freedom requirements for export of Australian ginger to Japan and suggested that this would be a suitable measure for fresh ginger coming into Australia:

> *R. similis* is not found in Australian ginger, yet area freedom is the requirement for export of Australian ginger to Japan. Therefore, importation of ginger from Fiji, where *R. similis* is found extensively, should require measures no less stringent than area freedom and/or methyl bromide fumigation.
>
> The AGIA proposes that the minimum suitable risk mitigation strategy for *R. similis* on ginger imported from Fiji includes area freedom *and* fumigation with methyl bromide.[107]

5.113 The Biosecurity Authority of Fiji also questioned the scientific validity of the proposed mitigation measures:

> …the Provisional Final IRA has recommended measures for the burrowing nematode without validated scientific evidence to support these measures. The evidence that has been provided is insufficient and flawed. Fiji looks forward to the removal of these unjustified measures in the near future.[108]

5.114 The committee notes that in response to questions from the committee, DA Biosecurity admitted that 'no quarantine treatment can guarantee total elimination of any pest in practice.'[109] In addition DA stated that:

> Methyl bromide is an effective quarantine treatment used by many countries. In practical application it is possible that low numbers may survive a quarantine treatment.[110]

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105 Australian Ginger Growers Association, *Submission 4*, [p. 2].

106 Australian Ginger Industry Association, *Submission 9*, [p. 4].

107 Australian Ginger Industry Association, *Submission 9*, [p. 4].

108 Biosecurity Authority of Fiji, *Submission 11*, p. 2.

109 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 18, 20 January 2013.

110 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 19, 20 January 2013.

5.115 The committee sought further information from DA Biosecurity on what mitigation measures are applied in other countries including Japan, Britain, the United States, New Zealand, Canada, China and the European Union. In response, DA Biosecurity noted that some countries use only inspections, however, information was not available on countries including Japan, the United Kingdom, China and the European Union.[111]

Implementation of the mitigation measures

5.116 A closely associated further issue explored by the committee was the extent to which the mitigation measures, even if capable of being effective, would be likely to be effective if not properly implemented. The committee took specific evidence on the likelihood of full and correct implementation of measures in Fiji, and took evidence which suggested that, in the past, mitigation measures have been poorly implemented. Dr Stirling explained the systems approach to the committee and in doing so, informed them of a range of problems with the implementation of the systems approach in Fiji:

> Dr Smith and I did some research in Fiji... Basically we showed…that they have got serious *Radopholus* problems. They grow taro and cassava as rotation crops. If you grow taro and cassava that are non-hosts for the nematode, the population will drop. What we found was that the nematode was being carried over on volunteer ginger. There are still a few ginger plants that come up in the field, or weeds. Providing you grow cassava and taro properly and keep all your weed and your volunteer ginger down, you can get quite a low population of nematodes in three years time when you come back to plant ginger. That is the first part of the systems approach, to get that right. Then they plant dirty seed that has already got the nematode in it and they have completely wasted their time. So the second part of the system is to hot water treat the seeds and eliminate the nematodes. If that was done properly, it would not completely eliminate the nematode but it has a good chance of reducing the populations to more manageable levels. That is what we call the systems approach. We saw no evidence in Fiji that they are capable of doing it properly.[112]

5.117 Dr Stirling also pointed out that there had been issues with implementing the hot water dipping approach correctly:

> If you have to hot-water treat to 51 degrees for 10 minutes, that does not mean 50 degrees for nine minutes. It has to be done properly. We actually measured temperatures in tanks over there, and they were 42 degrees. That is not going to do anything.[113]

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111 Department of Agriculture, Fisheries and Forestry Biosecurity, Answer to question on notice No. 6, 20 December 2012.

112 Dr Graham Stirling, Independent consultant assisting the Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 23.

113 Dr Graham Stirling, Independent consultant assisting the Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 16.

5.118 The committee queried DA Biosecurity in relation to how the hot water treatment would work in practice, including how the temperature would be maintained above 51 degrees. At the time of the hearing, DA Biosecurity were not clear on how it would work, or how appropriate temperatures would be maintained.[114]

5.119 The field trip to Fiji undertaken by DA Biosecurity in 2007 also uncovered evidence of poor implementation of mitigation measures and varying practices:

> The results from farmers who follow the ginger production procedures (such as dipping in hot water) are mixed, and do not conclusively indicate that a single factor (pests and diseases or environmental conditions, or both) is responsible for the loss of the ginger for some farmers. This raises the question of whether factors other than nematodes are affecting the ginger during its growth.
>
> For example, the ginger planted on the slopes where the soils are well drained has high yields (approx less than 3 per cent loss of total crop) despite avoiding the dipping of the planting material in hot water. On the other hand, the farmers on relatively flat land who did not follow the hot water treatment suffered losses of around 70 per cent due to rotting of the rhizomes.[115]

5.120 DA Biosecurity acknowledged that the details of how the mitigation measures would be put in place through an appropriate work plan were still to be worked out. DA Biosecurity also told the committee that making the work plans available to the committee and the Australian ginger industry was subject to the willingness of Fijian authorities.[116]

Committee comment

5.121 The ginger IRA notes that for yam scale, the 'risk management measure is consistent with Australia's quarantine policy for scale species on other imported commodities.'[117] While consistency with other policy is potentially useful, the committee considers that it is necessary for DA Biosecurity to reference appropriate scientific evidence that the proposed inspections regime is effective.

5.122 The committee also considers that, to allow appropriate scrutiny, scientific evidence in relation to the effectiveness of fumigation for yam scale should be set out in the ginger IRA.

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114 Dr Colin Grant, First Assistant Secretary, Plant Division, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 23 October 2012, p. 39.

115 Department of Agriculture, Fisheries and Forestry Biosecurity, *Field Visit Report – Ginger Production and Processing in Fiji*, September 2007, pp 7–8.

116 Dr Colin Grant, First Assistant Secretary, Plant Division, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 23 October 2012, p. 33.

117 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 55.

Recommendation 16

5.123 The committee recommends that before an import license is granted, the Department of Agriculture make available to stakeholders the scientific evidence used as the basis for the effectiveness of the proposed mitigation measures for yam scale.

Recommendation 17

5.124 The committee recommends that if the Department of Agriculture cannot produce such scientific evidence, the mitigation measures for yam scale must be reassessed.

Committee comment

5.125 The committee notes that while some other countries appear to use only inspections, DA Biosecurity was not able to inform the committee of what mitigation measures are used in key markets, including Japan, China, the United Kingdom and the European Union. In the committee's view this indicates that DA Biosecurity has not adequately benchmarked their proposed mitigation measures against international best practice. The committee observes that this is a further example of IRAs being completed without taking sufficient information into account.

5.126 The committee acknowledges that the mitigation measures for the Fijian burrowing nematode variant do have some utility in controlling and reducing the populations of the nematode and that there is scientific evidence to support that.

5.127 However, the committee is not convinced by the information in the ginger IRA, or evidence provided by DA Biosecurity that there is scientific evidence that the mitigation measures will be effective in the elimination of the Fijian burrowing nematode variant. As a result, Fijian burrowing nematodes are almost certain to be present in fresh ginger from Fiji. The committee therefore considers that the 'low' likelihood of entry stated in the IRA[118] cannot possibly be credible or correct.

5.128 The committee remains concerned that significant systems upgrades and compliance monitoring would have to occur in Fiji for there to be confidence that the mitigation measures would be implemented correctly. In this regard, the committee considers that it is essential that the work plan be made publicly available in Australia, so that the Parliament, the public and the ginger industry can apply appropriate scrutiny to it.

5.129 However, the committee notes that, as discussed in the previous section, even if the mitigation measures are implemented fully, an appropriate standard of evidence has not been provided to ensure confidence as to their effectiveness. This is especially concerning in relation to the Fijian burrowing nematode variant, as DA Biosecurity has not examined the effectiveness of the measures relative to the previously unknown burrowing nematode variant.

118 Department of Agriculture, Fisheries and Forestry, *Final import risk analysis report for fresh ginger from Fiji*, 22 January 2013, p. 56.

Recommendation 18

5.130 The committee recommends that the draft work plan for importing ginger from Fiji be made available to the Parliament and industry for appropriate scrutiny over a suitable period of time, prior to it being finalised.

5.131 The above examination of the ginger IRA's likelihoods, consequences, unrestricted and restricted risks has identified a number of serious flaws.

5.132 The committee has persistent concerns regarding the IRA framework as discussed in Chapter 3. When combined with the additional flaws and concerns discussed above that have arisen in relation to the ginger IRA, the committee does not have confidence that the IRA for fresh ginger from Fiji is credible or viable in its current form. The committee therefore recommends DA Biosecurity repeat the IRA, taking account of the issues set out in the recommendation below.

Recommendation 19

5.133 The committee recommends that the Import Risk Analysis for fresh ginger from Fiji be recommenced. In recommencing the IRA, DA Biosecurity should ensure that particular attention is paid to:

- **(a) the likelihood of the Fijian burrowing nematode variant being imported given:**
  - **(i) the potential for the Fijian burrowing nematode variant to be imported via other host crops; and**
  - **(ii) the potential for the Fijian burrowing nematode variant to be imported via other non-host crops grown in the same fields as ginger.**
- **(b) the consequences of importing the Fijian burrowing nematode variant when the following are taken into account:**
  - **(i) the suggestions made in the Peace Report regarding geographic scale for crops that are limited to particular districts or regions due to climatic conditions;**
  - **(ii) the greater geographic scale for other host crops grown in Australia that could be susceptible to the Fijian burrowing nematode variant;**
  - **(iii) proper consultation with stakeholders for other host crops, who should be fully informed of the Fijian burrowing nematode variant and its unknown pathogenicity to those other host crops; and**
  - **(iv) whether there are any effective management measures for the Fijian burrowing nematode variant in other host crops that are grown in Australia.**
- **(c) the effectiveness of the proposed mitigation measures, taking into account:**

(i) the scientific evidence for the limited effectiveness of methyl bromide treatment when the Fijian burrowing nematode variant is resident inside ginger rhizomes;

(ii) the assessment of the import likelihood, given that the mitigation measures do not guarantee elimination of the Fijian burrowing nematode variant and that inspections will not detect nematodes resident inside the ginger;

(iii) the relative effectiveness of the mitigation measure for the Fijian burrowing nematode variant compared to the more common variant; and

(iv) a comprehensive examination of overseas practices.

Other Pests and Diseases

5.134 While the report in relation to the ginger IRA has largely focussed on yam scale and the burrowing nematode, the committee also received evidence in relation to other pests of concern.

5.135 DA Biosecurity indicated that it had investigated bacterial wilt in Fiji and that:

> In conducting the IRA we looked for any signs of bacterial wilt or other pests of concern. There was no evidence that bacterial wilt was in Fiji. To our knowledge there is still no knowledge that bacterial wilt is in Fiji.[119]

5.136 However, the AGIA noted that DA Biosecurity's field report 'claimed that further work was required to ensure bacterial wilt in Fiji is researched appropriately'.[120] Mr David Peasley also argued that there were still some questions to be answered in relation to this particular disease:

> For instance, bacterial wilt—is it there or is it not? That is the basic question and it was highlighted in the trip report. They said there was up to 70 per cent death of rhizomes in Fijian ginger.
>
> They did not know whether it was waterlogging, *Pythium*, bacterial wilt or nematodes. You cannot start a risk analysis until you know what you are looking at.[121]

5.137 The AGIA raised concerns that other pests and diseases – in addition to burrowing nematode – may have different variants in Fiji. The AGIA also raised the possibility that these pests may have different pathogenicity to ginger and other crops:

> The AGIA is also concerned about the risk of importing Fijian strains of the fungal pathogens *Pythium graminicola*, *P. vexans* and *Fusarium oxysporum* f.sp. *zingiberi* on ginger rhizomes and that these may differ from Australian

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119 Mr Rob Schwartz, Senior Director, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 23 October 2012, p. 35.

120 Australia Ginger Growers Association, *Submission 4*, [p. 1].

121 Mr David Peasley, Consultant/Service Provider to the Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 20.

> strains in their pathogenicity and host range. We believe that evidence outlined in our response to the Draft IRA and some preliminary experimental data (pp. 30–3, 76) cast sufficient doubt and support our view that further research is required to compare Australian and Fijian isolates of these pathogens.[122]

5.138 As with the burrowing nematode, submitters raised concerns about risks being assessed at low levels, nut that the assessment was made without reference to relevant information:

> The DAFF Biosecurity position (PFIRA pp. 88–90) is that these species are present in Australia and, therefore, without 'published peer reviewed literature', it will not accept that there is evidence of differences between Australian and Fijian isolates of these fungi. The AGIA finds it difficult to accept that an argument of lack of information implies no risk. We believe therefore that, before the IRA is finalised, there should be research to compare the pathogenicity and host ranges of Australian and Fijian strains of these fungi.
>
> Of particular concern is the fact that, if not for research done by the Australian ginger industry, DAFF Biosecurity would not have known of the threat caused by *R. similis* (it was not discussed as a quarantine pest in the Draft IRA). The AGIA is concerned that other Fijian pests may pose significant threats to the Australian ginger industry and considers that all major pests should be fully investigated before the IRA is finalised.[123]

Committee comment

5.139 The committee has largely focussed its attention on the Fijian burrowing nematode variant in order to demonstrate the inadequacy of the Fiji ginger IRA. Given the various flaws identified in the ginger IRA process, the committee considers that the threat posed by other pests should be also be reassessed.

Recommendation 20

5.140 The committee recommends that when the IRA is recommenced for fresh ginger from Fiji, all relevant pests and diseases should be reassessed.

122 Australian Ginger Industry Association, *Submission 9*, [p. 4].

123 Australian Ginger Industry Association, *Submission 9*, [p. 4].

Chapter 6

The proposed importation of fresh ginger from Fiji

Additional issues raised by stakeholders

6.1 This chapter continues the committee's examination of the issues surrounding the proposed importation of fresh ginger from Fiji. More specifically, this chapter outlines the criticisms raised by industry stakeholders in relation to the evidence relied on by DA Biosecurity in the preparation of the ginger IRA.

6.2 Throughout the inquiry, the committee heard a range of concerns regarding the scientific and other information relied upon by DA Biosecurity in the preparation of the ginger IRA. Concerns were raised about the quality of information used and the Department of Agriculture's powers to obtain additional information by request, or to commission appropriate research.

6.3 Stakeholders also raised concerns about what they perceive as a lack of consultation with industry. The committee received evidence regarding delays in the provision of relevant information to industry, a lack of transparency in relation to IRA processes and a lack of communication about changes made to the IRA.

Evidence relied on by DA Biosecurity

6.4 The quality of the information relied upon in the preparation of the ginger IRA was questioned by industry stakeholders, including the AGIA which submitted that:

> The other significant concern is that the assessment of risk by DAFF Biosecurity at each point in the importation process is based on extremely limited information. There is no doubt that Fijian isolates of *R. similis*, for example, cause damage very rapidly, killing plants and destroying rhizomes.
>
> The AGIA maintains that there is, as yet, not enough information available to use the risk estimation matrix to assess the risk of importation of pests.[1]

6.5 Mr David Peasley, Consultant to the Australian Ginger Association (AGA), expressed a similar view, and argued that the risk assessment had proceeded in the absence of sufficient information:

> I do not believe that you can make any sort of risk estimation until you have proper information to start with. That is the problem. There is just not enough information on which to base a risk analysis. I believe that it should not be conducted until that information is found. A big problem with the IRA, I think, is that where there was a lack of information the risk was decided to be not discernible or negligible.[2]

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1 Australian Ginger Industry Association, *Submission 9*, [p. 5].

2 Mr David Peasley, Consultant/Service Provider, Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 18.

6.6 Stakeholders also argued that where there was an absence of information, it appeared to be left to the industry to conduct the relevant research. For example, the AGIA indicated that:

> It was industry that did the work for *Radopholus similis*. What about all the other pests and diseases that have been put in the risk matrix? What type of strain, biotype and so forth are they? If you do not know that information and it is causing majority rot in Fiji wouldn't you want to have that information about exactly what pests and diseases you have before you start sending fruit to other countries? Would not you like to know those risks?[3]

6.7 Stakeholders indicated that industry's concerns about the approach taken by DA Biosecurity extended back to 2005. The committee was also told that the current issues in relation to the ginger IRA are somewhat different from the IRA on bananas from the Philippines as there was a lot more information available for bananas. However, the AGA told the committee that, in relation to the culture of DA Biosecurity, not much had changed:

> I would like to say that things have changed since then, but I cannot see much evidence of it. I note in your report in 2009 that you were disappointed, as a committee, that you had not seen substantial change since the 2005 inquiry. I presented to both of those inquiries and I just cannot see much change in the culture of DAFF Biosecurity within that time.
>
> At least in the banana one I think we had a lot more technical information on which to do the risk analysis...[4]

The field report

6.8 In 2007, officers from DA Biosecurity conducted a field trip to Fiji to assess the biosecurity arrangements for ginger. The report prepared following the trip was criticised by a number of submitters, including the Australia Ginger Growers Association (AGGA):

> The field report which we obtained showed a clear lack of knowledge about growing and harvesting ginger in Fiji. Our research shows, poor post-harvest practices including top up of consignments, a sincere lack of knowledge about pests and diseases in Fiji, including their strains and taxonomy… DAFF [Biosecurity] consistently claimed that their research into pest and disease had been thorough, yet industry during the course of 2012 has conducted trial experiments into *Radopholus similis* and proved that the Australian burrowing nematode was a completely different strain than that found in Fiji.[5]

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3 Mr Anthony Rehbein, President, Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 19.

4 Mr David Peasley, Consultant/Service Provider, Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 22.

5 Australia Ginger Growers Association, *Submission 4*, [p. 1].

6.9 Templeton Ginger also raised concerns about the robustness of the field report and the extent to which it was relied upon for the ginger IRA:

> The Field Trip Report which as stated in the Draft IRA, provided the information that formed the basis for estimating unrestricted risk in the Import Risk Analysis (page 15), was only 3-4 pages long (without tables and pictures). If this forms the basis of a risk assessment, how can 3 to 4 pages of information be adequate to give proper Risk Assessment?[6]

Need for further research

6.10 Mr David Peasley informed the committee of his view on the field trip report, and the additional information required:

> The initial response is that there is not very rigorous science at all identifying the pests or the distribution of those pests in Fiji. I do not see how you can extrapolate from that poor information base to do a risk analysis. You really have to have a lot of data and information on which to estimate risks.[7]

6.11 Interestingly, the Biosecurity Authority of Fiji also raised concerns about a lack of valid scientific evidence, noting that:

> …Fiji has no desire to compromise Australia's quarantine integrity but there appears to be no valid scientific evidence provided to date, to justify the provisional quarantine status of *Radopholus similis*.
>
> Article 5 of the SPS Agreement also requires that DAFF "…shall seek to obtain the additional information necessary for a more objective assessment of risk and review the sanitary or phytosanitary measure accordingly within a reasonable period of time."[8]

6.12 The AGIA told the committee that it had additional concerns about a range of pests, particularly in relation to the different pathogenicity which could arise if there were different biotypes in Fiji. The AGIA also noted that further work is required to ascertain whether fumigants are effective:

> The AGIA sees that, before the IRA is finalised, further research is also needed to compare the pathogenicity and host ranges of Australian and Fijian isolates of *Pythium graminicola*, *P. vexans* and *Fusarium oxysporum* f.sp. *zingiberi*, and to determine whether the bacterial wilt pathogen is present in Fiji.[9]

6.13 Dr Graham Stirling also highlighted some of the gaps in the information available for the Fijian burrowing nematode variant, and argued that further work is needed to resolve the uncertainties:

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6 Templeton Ginger, *Submission 5*, [p. 6].

7 Mr David Peasley, Consultant/Service Provider, Australian Ginger Association, *Committee Hansard*, 23 October 2012, p. 20.

8 Biosecurity Authority of Fiji, *Submission 11*, p. 5.

9 Australian Ginger Industry Association, *Submission 9*, [p. 6].

> We simply do not find this burrowing nematode in ginger soils. We have bananas, sure, and in the Sunshine Coast hinterland there have been bananas grown for 50, 60 or 70 years; I am not sure. The nematode is there. Right next door we grow ginger, and it is fine. To me that says immediately: 'What's going on? Why?' In Fiji they get problems; we do not. It could be varieties. It could be soil types. There are a whole range of factors that could be involved. But, if we do not have the nematode to do the work, we cannot do that.[10]

6.14 The AGIA told the committee that research is required to develop effective mitigation measures, but there were questions surrounding how that research could be conducted:

> One must question whether mitigation measures require further research before ginger is imported. How long, at what rate and at what temperature will methyl bromide [be] used? Who will be required to conduct this operation and what quality assurance will be used to regulate this system?
>
> Obviously, much research is still required. With many questions unanswered, the Australian ginger industry asks to stop the clock.[11]

Cost of research

6.15 The costs associated with conducting appropriate research was also raised by stakeholders. The AGGA argued that, 'as a relatively small group, the ginger industry is not in a position to fund such research' and indicated that:

> Asking industry to conduct further taxonomic research into this area within 12 months is not a viable option. We have investigated a research project that has been costed at $500,000 over three years and would take industry 3 years to fund.[12]

6.16 A similar view was expressed by Dr Mike Smith, who told the committee that:

> The whole issue about the pathogenicity of the Fijian strain and the Australian strain, I believe there is evidence that has been provided to say that they are different. As I said, that will not change in a year's time. There will still be evidence that is presented. But to do a full taxonomic and pathogenic evaluation of these two *Radopholus* populations will take time and money and the ginger industry does not have that money to put to this sort of research.[13]

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10 Dr Graham Stirling, Independent consultant assisting the Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 24.

11 Mr Anthony Rehbein, President Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 15.

12 Australian Ginger Growers Association, *Submission 4*, [p. 2].

13 Dr Mike Smith, Technical adviser to the ginger industry, *Committee Hansard*, 23 October 2012, p. 23.

6.17 The AGIA indicated that, in order to complete the ginger IRA, there is clearly a need for more scientific information, and argued that 'this can be achieved only with the financial support of the Australian or the Fijian Government'.[14]

Committee comment

6.18 The committee considers that the availability of accurate, current data on the prevalence of pests and diseases in Fiji is a fundamental requirement of the risk analysis for importing fresh ginger. The committee observes that such data is not always available or forthcoming and that DA Biosecurity has proceeded to complete the ginger IRA with the information that it has available.

6.19 DA Biosecurity consistently advocates that its processes are based on the use of rigorous scientific data. However, the committee is concerned that assessments of consequences, likelihoods and risks have been made where there is inadequate information.

6.20 The committee acknowledges that the data that has been used may be scientifically robust, however the assessments being made based on that data do not appear to be scientifically sound. As highlighted in Chapter 5, assessing the likelihood of the Fijian burrowing nematode variant entering Australia without mitigation measures as 'moderate', when it is an event that is almost certain to occur appears to defy logic and does not appear to be scientifically robust. Similarly, as discussed in the previous chapter, assessing the consequence to Australia as 'low' for the Fijian burrowing nematode variant, when the consequences for a large number of important crops are unknown, cannot possibly be credible from a scientific perspective.

DA Biosecurity's powers to gather information and commission research

6.21 In response to some of the concerns raised about the lack of accurate information used in the conduct of the IRA, the committee examined DA Biosecurity's capacity to gather information and commission further research.

6.22 The committee notes for example that while DAFF Biosecurity confirmed that one farm in Fiji had suffered a 70 per cent crop loss due to burrowing nematode, DA Biosecurity were not able to provide information on the extent of losses across other farms in Fiji.[15]

6.23 In describing DA Biosecurity's position, Dr Colin Grant quoted from proceedings of the Federal Court, on appeal from a judge of the Federal Court in Australia about the process associated with DA's assessment of risk:

> The legislation does not suggest that quarantine decisions are to be made on an assumption that every scientific fact is known about every conceivable disease or pest that might be introduced into Australia, or that such decision are to be delayed until all such facts are discovered and accepted. On the contrary, quarantine decisions have to be made in the existing state of

14 Australian Ginger Industry Association, *Submission 9*, [p. 6].

15 Mr Bill Magee, Assistant Secretary, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 23 October 2012, pp 30–31.

> knowledge. Imponderables have to be weighed and value judgements made. No specific criteria are laid down, other than the condition to be established must limit the level of quarantine risk to one which is 'acceptably low'—which necessarily assumes there will be some risk.[16]

6.24 This information would appear to suggest that DA Biosecurity may not be legally required to seek further information or commission research to better inform an IRA. However, it is also noted that the Chief Executive of the Department of Agriculture has the power under paragraph 69G(2) of the Quarantine Regulations 2000 to commission research, or to seek substantial expert advice. While the Chief Executive may not be legally compelled to use that power, the Chief Executive appears not to have done so in the case of Fiji ginger to commission relevant research to resolve the burrowing nematode subspecies issue, among and other issues.

6.25 As indicated previously in this report, Australia has obligations under the World Trade Organisation Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement). In particular for risk management measures, the SPS Agreement requires that:

> Members shall ensure that any sanitary or phytosanitary measure is applied only to the extent necessary to protect human, animal or plant life or health, is based on scientific principles and is not maintained without sufficient scientific evidence, except as provided for in paragraph 7 of Article 5.[17]

6.26 The above requirement has a very important caveat expressed in paragraph seven of article 5 of the SPS agreement, allowing countries to adopt sanitary or phytosanitary measures in circumstances where relevant scientific evidence is insufficient:

> In cases where relevant scientific evidence is insufficient, a Member may provisionally adopt sanitary or phytosanitary measures on the basis of available pertinent information, including that from the relevant international organizations as well as from sanitary or phytosanitary measures applied by other Members. In such circumstances, Members shall seek to obtain the additional information necessary for a more objective assessment of risk and review the sanitary or phytosanitary measure accordingly within a reasonable period of time.[18]

6.27 Australia's international obligations, as set out in the SPS agreement, do not appear to inhibit DA Biosecurity using its powers to gather information and commission research. Rather, the SPS agreement appears to encourage the seeking of such information.

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16 Director of Animal and Plant Quarantine v Australian Pork Limited [2005] FCAFC 260, NSD 994 of 2005, on appeal from a Judge of the Federal Court of Australia, *Reasons of Judgement – Heerey and Lander JJ*, 16 September 2005, pp 18–19.

17 Biosecurity Australia, *Import Risk Analysis Handbook*, 2011, Annex 2, p. 23.

18 Biosecurity Australia, *Import Risk Analysis Handbook*, 2011, Annex 2, p. 25.

6.28 The committee questioned DA Biosecurity about seeking further information or commissioning research to acquire information to better inform the ginger IRA, including whether it would conduct a 16-week controlled test to clarify whether the nematode subspecies were different in Australia and Fiji. The committee notes the following statement made by DA Biosecurity during the inquiry:

> The role of the department is to undertake risk assessments based on available information.
>
> The issue is very simply that risk analysis is made on the available information of the day. As that changes, changes are made to the status of risk.[19]
>
> What we do is we take into account evidence that exists already.[20]

Committee comment

6.29 The committee considers the preceding statements by DA Biosecurity may create a misleading impression, given that Regulation 69 gives DA Biosecurity the power to seek further information, commission research, 'stop the clock' while awaiting the outcome of research, and even terminate an IRA if there is not sufficient information.

6.30 The committee observes that Australia's obligations under the SPS agreement positively encourage the Department of Agriculture to use its information-gathering powers, where there is insufficient scientific evidence available.

6.31 The committee further notes that DA Biosecurity is not legally obliged to exercise its powers under Regulation 69. However, the committee considers that DA Biosecurity should be more open and transparent in justifying why it chooses not to use the powers, particularly when there are significant concerns being raised by stakeholders about the lack of information informing IRAs.

Recommendation 21

6.32 The committee recommends that, before any fresh ginger is imported from Fiji, the Department of Agriculture use its powers under Regulation 69 of the Quarantine Regulations 2000 to resolve the scientific uncertainty surrounding the burrowing nematode and other possible pathogens.

Recommendation 22

6.33 The committee recommends that the proposed merits review process for IRAs also include decisions by the Department of Agriculture on the exercise of information-gathering and other powers under Regulation 69 of the Quarantine Regulations 2000.

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19 Dr Colin Grant, First Assistant Secretary, Plant Division, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 23 October 2012, pp 29–30.

20 Dr Colin Grant, First Assistant Secretary, Plant Division, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 23 October 2012, p. 40.

Consultation with industry during the IRA process

6.34 In addition to concerns about the information DA Biosecurity relied on in the preparation of the ginger IRA, stakeholders also raised concerns about what they described as an inadequate level of consultation. Submitters were critical of delays in providing information to industry, a lack of transparency in relation to processes and a lack of communication with industry.

6.35 The comments made by Mr David Peasley are similar to those made by a number of industry stakeholders:

> The lack of open dialogue has caused unnecessary friction and mistrust of our national Biosecurity organisation. Australian industries need transparency and confidence in the technical capacity of [DAFF Biosecurity] to undertake a rigorous, sound scientific assessment.[21]

Delays in providing information to industry

6.36 Peasley Horticultural Services submitted that, in its view, the industry had been 'kept in the dark' for many years about the Fijian ginger import request. The submission pointed specifically to the length of time between the market access request being received by the Department of Agriculture and this information being provided to the ginger industry:

> DAFF [Biosecurity] received a submission requesting market access for fresh ginger from Fijian Biosecurity Authorities in November 2003. This submission included information on the pests associated with ginger crops in Fiji and further information was provided on the ginger production system in 2004 and 2007, outlining the land preparation, pest management, harvesting and post harvest handling.
>
> It was not until August 2010, some 7 years later, that the Australian Ginger Industry was first advised of this import application request by Fiji for access to the Australian market.
>
> Since August 2010 the Australian Ginger industry contributed scientific information to DAFF [Biosecurity]. From the release of the Draft IRA the industry only had 60 days to respond.[22]

Report on DA Biosecurity's field trip to Fiji

6.37 The committee was also told that the report on the DA Biosecurity field trip to Fiji (dated September 2007) was not provided to the industry until three weeks before the closing date for comments on the ginger IRA – in May 2012. Stakeholders suggested that the report was only provided then because the matter was raised at the Senate's Budget Estimates hearings.[23] Peasley Horticultural Services explained the consequences of the delayed receipt of the trip report:

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21 Peasley Horticultural Services, *Submission 7*, p. 3.

22 Peasley Horticultural Services, *Submission 7*, p. 2.

23 Mr Shane Templeton, Director, Templeton Ginger, *Committee Hansard*, 23 October 2012, p. 2.

> Despite the draft IRA stating (page 15) that the Trip Report undertaken by DAFF Biosecurity Officers in September 2007 "forms the basis for estimating unrestricted risk in this Import Risk Analysis", access to the Trip Report when requested by the AGIA was denied. The report was finally supplied on 25 May 2012, just 3 weeks before the deadline for submission of responses to the draft IRA. This delay seriously restricted the time for the AGIA technical group to respond effectively.[24]

Mitigation measures added without consultation

6.38 Stakeholders raised similar concerns about risk mitigation measures being added to the provisional final IRA, without the industry being given an opportunity to comment on their effectiveness.[25] Templeton Ginger asked:

> How DAFF Biosecurity can place new risk mitigation measures in the Provisional Final IRA for control of Burrowing Nematode and no-one has the opportunity to comment on the science of these risk mitigation measures? To me this seems unjust and shows this process needs change.[26]

6.39 Similarly, the AGIA suggested that the process needs to be reviewed and argued that:

> When we got the provisional IRA, it really needs another process where it can come back to industry to talk about mitigation measures, because to this point, since that, communication from industry had broken down.[27]

Committee comment

6.40 The committee acknowledges that DA Biosecurity interacts with many stakeholders on many different issues. However, the committee considers that the evidence provided demonstrates a need for significant improvement in the openness and transparency with which DA Biosecurity interacts with Australian industry groups.

6.41 The committee is concerned that adequate time for the conduct of research and for industry to respond has not been allowed. In particular, the committee is concerned about apparent instances of the ginger industry receiving information vital to its participation in the IRA process, through sources other than the Department. For example, as a result of questioning at Senate estimates and inquiry hearings; or informally through related industry groups. Relevant industry stakeholders and/or peak bodies should receive such information directly, without delay and with sufficient time to respond to IRA timelines.

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24 Peasley Horticultural Services, *Submission 7*, p. 1.

25 Australian Ginger Industry Association, *Submission 9*, [p. 3]; Templeton Ginger, *Submission 5*, [p. 6].

26 Templeton Ginger, *Submission 5*, [p. 6].

27 Mr Anthony Rehbein, President, Australian Ginger Industry Association, *Committee Hansard*, 23 October 2012, p. 21.

Recommendation 23

6.42 The committee recommends that the Department of Agriculture provide industry stakeholders and/or peak bodies with information relevant to IRA processes directly and without delay (and with sufficient time to respond to IRA timelines).

Chapter 7

The proposed importation of potatoes from New Zealand

7.1 The terms of reference for this inquiry required the committee to examine the validity and supporting scientific evidence underpinning the Pest Risk Analysis included in the 2009 Import Risk Analysis in relation to New Zealand potatoes. The committee was also required to determine the extent of scientific knowledge and understanding of the Tomato/Potato Psyllid (TPP) and other pests identified in the Draft Review of Import Conditions.

Australia's potato industry

7.2 The potato industry is a substantial and important industry across Australia. Potatoes are the highest value horticultural crop grown for consumption in Australia and are grown in all states of Australia except the Northern Territory. The following section provides a brief background on the Australian potato industry to provide context for the later discussion of the *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand.*

7.3 The main growing areas for fresh potatoes are in wet temperate coastal regions in northern Tasmania, Victoria and south-east South Australia. These areas have annual rainfall of 800-1000 mm, cool summers and are relatively free from frost. Despite the cool, wet climate, most crops are grown under irrigation. Seed potatoes are primarily produced in Victoria, Tasmania, New South Wales and South Australia.[1]

7.4 Potatoes represent approximately 20 per cent of all Australian vegetable production, at around 1.25 million tonnes in total, with processing potatoes representing 56 per cent of the value chain, fresh potatoes representing 36 per cent of the value chain and seed potato production the remaining 8 per cent.[2] The total value of Australian potato production is $483 million.[3]

7.5 The potato industry is South Australia's (and Australia's) largest horticultural sector by both value and volume and is rated second in commodities sold at a national level. South Australia has the largest area under crop and is worth $206 million at the farm gate. The state produces 80 per cent of the country's fresh washed potatoes and is also a significant contributor to the processed market. Kangaroo Island, in South Australia, produces some of the purest seed available internationally.[4]

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1 Australian Natural Resources Atlas, www.anra.gov.au/topics/agriculture/pubs/national/potatoes.html, accessed 18 January 2013.

2 Horticulture Australia Limited, Potato Industry Annual Report 2011/12, p. 1.

3 Tasmanian Farmers and Graziers Association, *Submission 6*, p. 2.

4 Ms Robbie Davis, Potatoes South Australia, *Committee Hansard*, 24 October 2012, p. 1 and Potatoes South Australia, *Submission 9*, p. 6.

7.6 Potatoes are the largest vegetable crop grown in New South Wales and the state produces approximately one tenth of the total Australian potato crop. Two crops a year are grown, both for the fresh and crisping potato markets.

7.7 Tasmania produces approximately 425,000 tonnes of potatoes annually with a farm gate value of $127 million. This represents a large proportion of Tasmania's horticultural income. Tasmania has a large processing industry and a significant percentage of potatoes grown in Australia – 360,000 tonnes – are processed in Tasmania.

7.8 Potatoes represent the fourth largest crop globally. It is argued that by 2050, the global population will have increased by two billion people and potatoes will play a significant role in addressing food shortages and food security issues. It is argued that China will require a 50 per cent increase in food production or food supply which will create an enormous export opportunity for Australian producers.[5]

Pests and diseases

7.9 The National Potato Industry Biosecurity Plan (the Potato Biosecurity Plan) was developed by Plant Health Australia (PHA) in collaboration with industry and government stakeholders and was launched in May 2007. The Potato Biosecurity Plan notes that Australia's geographic isolation and lack of shared land borders have, in the past, provided a degree of natural protection from exotic threats. In explaining the need for Biosecurity Plans, it is argued that whilst Australia's national quarantine system helps to prevent the introduction of harmful exotic threats to plant industry:

> Rapid increases in overseas tourism, imports and exports, mail and changing transport procedures (eg. refrigeration and containerisation of produce), as well as the potential for pests to enter via natural routes, mean that relying on quarantine measures is not enough.[6]

7.10 The development of each Biosecurity Plan commences with the production of Threat Summary Tables (TST). These tables identify all the potential exotic pest threats to an industry and with expert consultation, rank their potential threat based on entry, establishment, spread potential, consequences of establishment and eradication potential (where available). From this information, the high priority Emergency Plant Pests can be established (for which diagnostic protocols and contingency plans are created).

7.11 The Potato Biosecurity Plan lists the top-ranked pest threats to the Australian potato industry as:

- **Late blight – A2 mating type** – *Phytophthora infestans*, A2 mating type
- **Bacterial ring rot –** *Clavibacter michiganensis* subsp. *sepedonicus*
- **Potato spindle tuber viroid (PSTVd) –** *Pospiviroidae:* Potato spindle tuber viroid

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5 Potatoes South Australia, *Submission 9*, p. 6.

6 Plant Health Australia, *National Potato Industry Biosecurity Plan*, Version 1, May 2007, p. 5.

- **Potato Wart –** *Synchytrium endobioticum*
- **Potato mop top virus –** Unassigned virus family; Pomovirus; Potato mop-top virus
- **Potato cyst nematode (white or pale) –** *Globodera pallida*
- **Colorado potato beetle –** *Leptinotarsa decemlineata*[7]

7.12 The Potato Biosecurity Plan notes that areas previously declared 'Potato cyst nematode' (PCN) affected areas would not be covered by the Emergency Plant Pest Response Deed (EPPRD) because the EPPRD is not retrospective. However, the Pale cyst nematode (*Globodera pallida*) would be covered because it is exotic to Australia. Exotic strains of PCN (*G. rostochiensis*) would also be covered by the EPPRD if they were demonstrably new strains using appropriate diagnostic techniques.[8]

7.13 The Potato Biosecurity Plan also notes that if there was another outbreak of PCN of the same strain as the one already present in Australia:

- it would not qualify as an EPP if it was linked to the existing outbreak; and
- it could qualify as an Emergency Plant Pest if it was a new incursion.[9]

7.14 In the case of a pest which qualifies as an EPP (and is therefore covered by the EPPRD) eradication would still have to be considered technically feasible and economically justifiable to go ahead. The National Management Group (NMG) in consultation with all Affected Parties would make this decision on advice from the CCEPP (Consultative Committee).[10]

Import conditions for fresh potatoes from New Zealand[11]

7.15 The import of fresh potatoes to Australia (for human consumption and for processing) is currently prohibited from all countries.

7.16 Australia previously allowed imports of potatoes for processing from New Zealand. In 1988, however, trade ceased because New Zealand was unable to certify area freedom for the quarantine pest, Potato Cyst Nematode (PCN).

7.17 In 2008, Zebra Chip disease and the Tomato Potato Psyllid (TPP) – a vector of the disease – were confirmed as being present in New Zealand. Australia then banned trade in all host material, including tomatoes and capsicums. DA Biosecurity

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7 Plant Health Australia, *National Potato Industry Biosecurity Plan*, Version 1, May 2007, p. 6.

8 Plant Health Australia, *National Potato Industry Biosecurity Plan*, Version 1, May 2007, Table 1, p. 7.

9 Plant Health Australia, *National Potato Industry Biosecurity Plan*, Version 1, May 2007, p. 6.

10 Plant Health Australia, *National Potato Industry Biosecurity Plan*, Version 1, May 2007, p. 6.

11 The following section is based on information from Department of Agriculture, Fisheries and Forestry, *New Zealand Potatoes and risk assessment*, Additional information provided by DAFF Biosecurity, 24 October 2012 and Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012.

noted that Australia was entitled to take this action under Article 5.7 of the SPS Agreement. Following the trade ban, Australia was then, however, obliged to consider emergency measures in the short term followed by more permanent measures based on a risk assessment "conducted within a reasonable period of time".[12]

Pest Risk Analysis for *Candidatus* Liberibacter psyllaurous

7.18 In 2009, DA Biosecurity conducted a Pest Risk Assessment (PRA) for *Candidatus* Liberibacter psyllaurous (the bacteria which has since been renamed *Candidatus* Liberibacter solanacearum) in fresh fruit, potato tubers, nursery stock and its vector the tomato-potato psyllid.[13] DA Biosecurity noted that in undertaking the risk assessment, departmental officials attended a number of conferences and workshops to present their findings. DA Biosecurity indicated that no substantive concerns were raised by AUSVEG or other potato representative bodies at the time.[14]

7.19 In 2009, trade in capsicums and tomatoes from New Zealand resumed under the conditions that had been developed during the PRA process. DA Biosecurity stated that since 2009, over '13,000 tonnes of tomatoes and capsicums have been imported and Australia remains free of the psyllid and the zebra chip bacterium'.[15] DA Biosecurity also told the committee that:

> As reported on the DAFF website, the psyllid has been intercepted twice at quarantine inspection. Both consignments were fumigated to kill the psyllid and the companies involved in the exports were suspended from trade and remain so. This is our biosecurity system at work.[16]

Review of import conditions for potatoes

7.20 In June 2006, the New Zealand Ministry for Primary Industries formally requested renewed access for fresh potatoes (*Solanum tuberosum)* for processing to Australia. In applying for renewed access, it was proposed to use quarantine measures similar to those now used to move potatoes domestically between some states within Australia (from PCN control areas) for processing.[17]

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12 Department of Agriculture, Fisheries and Forestry, *New Zealand Potatoes and risk assessment,* Additional information provided by DAFF Biosecurity, 24 October 2012, p. 1.

13 See, *Biosecurity Australia Final pest risk analysis report for '*Candidatus *Liberibacter psyllaurous' in fresh fruit, potato tubers, nursery stock and its vector the tomato-potato psyllid,* September 2009.

14 Department of Agriculture, Fisheries and Forestry, *New Zealand Potatoes and risk assessment,* Additional information provided by DAFF Biosecurity, 24 October 2012, p. 1.

15 DAFF Biosecurity also noted that the psyllid has been intercepted twice at quarantine inspection. Both consignments were fumigated to kill the psyllid and the companies involved in the exports were suspended from trade and remain so.

16 Department of Agriculture Fisheries and Forestry, *New Zealand Potatoes and risk assessment,* Additional information provided by DAFF Biosecurity, 24 October 2012, p. 1.

17 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand,* 3 July 2012, p. 14.

7.21 In support of its request, the New Zealand Government provided DA Biosecurity with its *MAFBZN Export compliance programme for the provision of additional declarations (Potato Cyst Nematode and Potato Wart)*. The MAFBZN Compliance Programme document outlines the operational requirements for growers, packing facility operators, storage facility operators and independent verification agencies to ensure production site freedom from PCN and area freedom from potato black wart.

7.22 As part of its market access request, the New Zealand Ministry for Primary Industries (MPI) proposed that all potatoes exported from New Zealand to Australia be produced under the MAFBZN Programme 'to reduce the risk of PCN and/or black wart being present in consignments of potatoes exported to Australia'.[18]

7.23 In July 2010, Australia's Import Market Access Advisory Group assigned New Zealand's market access request a priority 'A' status and a policy review was prioritised on DA Biosecurity's work plan.

7.24 Table 7.1 below provides a timeline of events in relation to the IRA process for New Zealand potatoes and the Review of import conditions for fresh potatoes for processing from New Zealand (Review of import conditions for potatoes):

Table 7.1 – Timeline of New Zealand potatoes IRA and review

1988	Australia stopped imports of potatoes for processing from New Zealand because New Zealand was unable to certify area freedom from the quarantine pest, potato cyst nematode (PCN).[19]
2006	New Zealand requested market access for potatoes for processing with measures similar to those now used to move potatoes domestically between some states within Australia (from PCN control areas) for processing.[20]
2008	Zebra Chip Disease and the Tomato Potato Psyllid (TPP) confirmed as being present in New Zealand. Australia banned trade in all host material (including tomatoes and capsicums) under Article 5.7 of the SPS Agreement.
2009	DA Biosecurity conducted a PRA for Zebra Chip and TPP for all pathways.

18 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 14.

19 Department of Agriculture, Fisheries and Forestry, *New Zealand Potatoes and risk assessment*, Additional information provided by DAFF Biosecurity, 24 October 2012, p. 1.

20 Department of Agriculture, Fisheries and Forestry, *New Zealand Potatoes and risk assessment*, Additional information provided by DAFF Biosecurity, 24 October 2012, p. 1.

2009	Trade in capsicums and tomatoes from New Zealand recommenced under conditions developed during the IRA process.
2010	Australia's Import Market Access Advisory Group (IMAAG) assigned New Zealand's market access request priority 'A' status. The proposed policy review was prioritised on DA Biosecurity's work plan.
3 July 2012	*Draft report for the review of import conditions for fresh potatoes for processing from New Zealand* was released for stakeholder comment.
3 September 2012	The 60 day comment period for stakeholders closed. 27 submissions were received.
October 2012	DA Biosecurity announced the engagement of an independent plant pathologist to review the *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand* and the latest information on Zebra Chip Disease.

Scope of the review

7.25 In response to the New Zealand Government's request for access to Australia for potatoes for processing, DA Biosecurity commenced a specific review of biosecurity measures for potatoes, assessing all the pests associated with potatoes from New Zealand. In conducting its review, DA Biosecurity assessed New Zealand's proposal for market access and reassessed the risk management measures and import conditions currently recognised for this particular import pathway.[21]

7.26 DA Biosecurity indicated that because conditions for the import of potatoes for processing from New Zealand already existed (and an update to those conditions was delivered as a result of the 2009 assessment undertaken on Zebra Chip and TPP) the purpose of this particular review of import conditions for potatoes was to determine that the already established measures remained current.[22]

7.27 The review of import conditions for potatoes from New Zealand included:

- an assessment of the pests and diseases associated with New Zealand potato production areas;

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21 Department of Agriculture, Fisheries and Forestry, *New Zealand Potatoes and risk assessment,* Additional information provided by DAFF Biosecurity, 24 October 2012, p. 1.

22 Department of Agriculture, Fisheries and Forestry, *New Zealand Potatoes and risk assessment,* Additional information provided by DAFF Biosecurity, 24 October 2012, p. 1.

- a review of both international and domestic policies for the import and movement of potato commodities; and
- verification visits to consider and assess potential risk management measures.[23]

7.28 In conducting the review, DA Biosecurity also took into consideration the following issues:

- previous conditions established for the import of fresh potatoes for processing from New Zealand;
- domestic regulations for the interstate movement of potato commodities in Australia;
- relevant export compliance programs utilised by New Zealand for export of potatoes to other international markets;
- current policies for pests and diseases of quarantine concern to Australia which are relevant to this market access request and the development of final import conditions; and
- any additional information made available through the literature and the consultation process which is relevant to the assessment of the import risks posed.[24]

7.29 DA Biosecurity also reviewed the available literature and conducted an assessment of the pests and diseases associated with potato tubers from New Zealand, including the pests and diseases previously identified by the New Zealand Government in 2007.

Results of the review

7.30 A number of pests and diseases were identified as 'potentially being associated with the import pathway and being of quarantine concern to Australia'[25]. The list of pests and diseases identified in association with fresh potatoes from New Zealand included:

- *Candidatus* Liberibacter solanacearum (zebra chip);[26]
- *Ralstonia solanacearum* (bacterial wilt, brown rot);
- *Synchytrium endobiotcum* (potato black wart),

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23 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 6.

24 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 5.

25 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 7.

26 The name *Candidatus* Liberibacter solanacearum has displaced the earlier name for this pathogen – *Candidatus* Liberibacter psyllaurous.

- *Ditylenchus destructor* (potato rot nematode);
- *Globodera pallida* (pale potato cyst nematode);
- *Globodera rostochiensis* (golden potato cyst nematode);
- *Trichodorus*, spp. (stubby-root nematode); and
- *Bactericera cockerelli* (tomato-potato psyllid).[27]

7.31 DA Biosecurity indicated that some of the pests and diseases included in the list have not been recorded in some regions of Australia, and due to interstate quarantine regulations, are considered pests of 'regional concern'. The review also stated that:

> Where a pest is identified as being of regional concern, any quarantine measures proposed for that pest need only be applied to product destined for that state where regional freedom is recognised.[28]

7.32 DA Biosecurity made particular note of the fact that the disease zebra chip – caused by the bacterium '*Ca.* L. solanacearum' – is actually a disease-vector complex, which means that 'the disease can only be transmitted from plant to plant through its psyllid vector –*Bactericera cockerelli*'.[29]

7.33 DA Biosecurity's review indicated that the *Final pest risk analysis report for* Candidatus *Liberibacter psyllaurous in fresh fruit, potato tubers, nursery stock and its vector the tomato-potato psyllid*, identified two potential pathways to introduce infected psyllids (*Bactericera cockerelli)* into Australia – fresh and nursery stock.[30]

7.34 The review also indicated that *Bactericera cockerelli* may be associated with any aerial part of the plant, and while they feed primarily on leaves, psyllids and their eggs may also be present on stems or aerial fruit of the host plant.

7.35 It was concluded that:

> Based on the findings of the final PRA report for bacterium "*Ca.* L. solanacearum", there is no evidence to suggest that this psyllid feeds on potato tubers.[31]

7.36 In finalising its review, DA Biosecurity suggested that a combination of mitigation measures may be required to manage the risks associated with the import of

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27 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 7.

28 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 8.

29 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 8.

30 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 8.

31 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 8.

fresh potatoes for processing from New Zealand – consistent with Australia's appropriate level of protection (ALOP).

7.37 The measures proposed by DA Biosecurity include requirements which extend from production through to on-arrival processing.[32]

MAFBNZ Export Compliance Programme for the Provision of Additional Declarations (Potato Cyst Nematode and Potato Wart)

7.38 As previously noted, when making its request for market access, the New Zealand Government proposed that all potatoes exported from New Zealand to Australia be produced under the *MAFBNZ Export Compliance Programme for the Provision of Additional Declarations (Potato Cyst Nematode and Potato Wart).*

7.39 DA Biosecurity agreed that the following components of the MAFBZN Compliance Programme are suitable:

- only potatoes grown on production sites that are registered with MPI and comply with the Export Compliance Programme for the Provision of Additional Declarations (Potato Cyst Nematode and Potato Wart) are suitable;
- potato production sites are subject to an annual soil test (pre-planting or pre-harvest) to demonstrate freedom from PCN (this is a mandatory requirement and no exemptions apply);
- soil samples must be analysed by MPI-approved laboratories, and
- potatoes must be produced in areas certified as being free from potato black wart (Synchytrium endobioticum).[33]

Packing house processes

7.40 The review recommended that measures would be required to ensure that potato tubers are practically free from soil. This is consistent with Australian domestic conditions for the management of PCN, and DA Biosecurity argued that this measure would reduce the risk of soil borne pests and diseases of quarantine concern (for example, nematodes) being present in consignments imported into Australia.

7.41 The measures recommended are:

- potatoes must be washed and/or brushed so as to be practically free from soil;

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[32] The following section is based on information from Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand,* 3 July 2012, pp 14-17.

[33] Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 14.

- consignments with cakes of soil adhering to potato tubers will not comply with Australian requirements for the import of New Zealand potatoes for processing;
- all growers, packing houses and/or storage facilities in New Zealand must be registered under the *Export Compliance Programme for the Provision of Additional Declarations (Potato Cyst Nematode and Potato Wart);* and
- phytosanitary inspection and certification must be completed by MPI or Independent Verification Agency (IVA) staff.[34]

Packing and labelling

7.42 DA Biosecurity recommended the following measures to prevent contamination of potatoes by pests or diseases during storage and/or transport, prior to export:

- potatoes are to be transported in bins or bags marked or labelled with the registration number for the designated production site issued by MPI or IVA staff;
- potatoes are to be stored at least one metre from potatoes from non-designated production sites, and potatoes are not to be staked below potatoes from non-designated production sites;
- only potatoes for export to Australia are to be sorted and packed at a given time;
- potatoes are to be packed into new, clean bags (eg polypropylene bags) and packed on clean pallets;
- each bag must be labelled with the words 'not for planting' and provide traceability information (ie production area, packing house registration and packing date); and
- potatoes must be imported in fully sealed shipping containers – Full Container Loads (FCL).[35]

Phytosanitary import requirements

7.43 The phytosanitary import requirements proposed by DA Biosecurity will also require that:

- fresh potato tubers (imported into Australia for processing) be sourced from production sites and packing facilities registered for export under

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34 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, pp 14-15.

35 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 15.

the *MAFBNZ Export Compliance Programme for the Provision of Additional Declarations (Potato Cyst Nematode and Potato Wart);*

- the phytosanitary requirements shall be defined in the phytosanitary certification as 'fresh potatoes produced from production sites/areas in New Zealand free from PCN and potato black wart disease';
- the phytosanitary certificate provide registration information for growers, packing houses and store facilities for traceability purposes, as well as container and seal numbers; and
- DA Biosecurity reserves the right to audit New Zealand's export compliance program prior to the commencement of trade.[36]

Transport to DA Biosecurity quarantine approved premises for inspection and processing

7.44 DA Biosecurity recommended several measures to lessen the risk of pests and diseases entering and establishing in Australia (while consignments are transported from the port of entry to quarantine approved premises for processing) DA Biosecurity recommended that:

- potatoes be transported in sealed containers (FCL);
- Full Container Loads (FCLs) may be vented (door ajar) to allow airing during sea transit to Australia, provided the containers are secured by closing and sealing the doors prior to movement from the wharf to the quarantine approved premises (QAP) for inspection and processing;
- transport must use a direct route to the QAP and must not travel through rural areas (DAFF Biosecurity will verify that containers are secure and seals are intact);
- in the event of spillage of potatoes during transportation to the QAP for inspection and processing, DAFF Biosecurity must be notified and the spillage cleaned up to DAFF Biosecurity's satisfaction;
- all consignments be subject to inspection on arrival by DAFF Biosecurity prior to being directed to a QAP for potato processing; and
- if live quarantine pests, disease symptoms, or contaminants including unidentified plant material, seeds or trash are found, the consignment must be treated (using a DAFF Biosecurity-approved method that suitably addresses the quarantine risk) or re-exported or destroyed.[37]

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[36] Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, pp 15-16.

[37] Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 16.

Processing in quarantine approved premises

7.45 DA Biosecurity recommended that all potatoes imported from New Zealand be required to be processed at a QAP, located in a metropolitan area. It was argued that processing at a QAP will ensure that the quarantine risks associated with the processing of imported potatoes are contained and fully managed.

7.46 DA Biosecurity argued that, in particular, all waste (including soil, peelings, waste water and packaging material) generated during processing operations should be appropriately treated or disposed of. It was also recommended that:

- potatoes must be held under secure conditions as determined by DA Biosecurity until processed to ensure that no imported potatoes are used for any purpose other than processing;
- should a QAP facility handle and/or process potatoes from any other origin (domestic or otherwise) for the period that the New Zealand potatoes and any associated waste products are on site, the QAP must have in place appropriate segregation procedures;
- an approved quarantine waste management program must be in place at the QAP for potato processing. All waste generated during processing will be handled in accordance with the DA Biosecurity waste management policy and guidelines, including the following:
    - all loose soil and sweepings must be treated and disposed of under appropriate quarantine conditions;
    - all waste (including peel, sludge, waste water, packaging, discarded potatoes) generated during processing must be treated and disposed of under appropriate quarantine conditions;
    - the equipment and premises must be cleaned and sanitised after processing imported potatoes from New Zealand;
    - empty shipping containers must be cleaned and all debris must be treated and disposed of under appropriate quarantine conditions prior to next use;
    - if the water generated during processing cannot be treated and/or disposed of under appropriate quarantine conditions at the QAP, a contract must entered into with a waste disposal provider approved by DA Biosecurity, to perform the required treatment and disposal procedures for waste generated during processing.
- a QAP for potato processing be required to record quantities (weight) of potatoes processed and quantity (weight) of waste – this will be audited by DA Biosecurity to ensure that the total quantity of potatoes is accounted for; and

- a QAP for potato processing (and any third parties engaged) would be subject to auditing procedures by DA Biosecurity to ensure compliance with the import conditions.[38]

7.47 As noted in Table 7.1, the *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand* was released for stakeholder comment on 3 July 2012. When the 60 day comment period for stakeholders closed on 3 September 2012, 27 submissions had been received.

Review conducted by plant pathologist

7.48 In October 2012, DA Biosecurity announced the engagement of an independent bacteriologist to review the *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand* and the latest information on zebra chip disease. DA Biosecurity indicated that the plant pathologist's review was being conducted in order to:

> …provide added assurance to stakeholders that the biosecurity measures being developed will appropriately manage the risks for the import of potatoes from New Zealand for processing…[39]

7.49 In May 2013, following a request from the Committee Chair to the Secretary of the Department of Agriculture, the committee was provided with a copy of the bacteriologist's report[40]. The review was conducted by Dr Alan (Chris) Hayward, Consultant, Bacterial Plant Diseases, University of Queensland. Dr Hayward's report (the Hayward report) summarised his review of the current literature on zebra chip disease and provided comment on the entry of the TPP into New Zealand and the possible evolutionary origin of *Candidatus* Liberibacter solanacearum.

7.50 The Hayward report argued that very 'little of the current literature on zebra chip disease of potato affects the import conditions for importation of potatoes for processing from New Zealand.[41] The report did, however, provide comment on four

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38 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 17.

39 Department of Agriculture, Fisheries and Forestry, *Updated Statement regarding the proposal to import potatoes from New Zealand,* 4 October 2012, p. 1.

40 A. Chris Hayward, University of Queensland, Report to DAFF *on the Draft report for the review of import conditions for fresh potatoes for processing from New Zealand* and Recommended quarantine conditions with regard to "*Candidatus* Liberibacter solanacearum", 13 December 2012.

41 A. Chris Hayward, University of Queensland, Report to DAFF *on the Draft report for the review of import conditions for fresh potatoes for processing from New Zealand* and Recommended quarantine conditions with regard to "*Candidatus* Liberibacter solanacearum", 13 December 2012, p. 7.

subjects which related directly to the draft review of import conditions. The following is a summary of the Hayward report's conclusions in relation to each of these issues:[42]

- **Tuber transmission** – The fate of the bacterial pathogen in tubers has implications for the transmission to daughter tubers. This will have most significance for potato tubers used for propagation where the growth of tubers is the primary purpose of the imported material. The pathway considered in the draft report is only for potatoes for processing. Processing will stop potatoes from growing and therefore prevent tuber transmission.
- **Haplotypes of *Candidatus* Liberibacter solanacearum (CLso) and potential vectors** – Recent work in the USA has shown that there are three biotypes of the tomato potato psyllid though only two have been shown to acquire CLso – evidence suggesting a very high level of specificity between pathogen and vector. However, the potential for native psyllid vectors to acquire the pathogen from sprouting shoot material is not ruled out. The pathway considered in the draft report is only for potatoes for processing. Processing will stop tubers from growing and therefore prevent shoot growth that could allow any potential native psyllid vector(s) to feed and acquire the bacterium. No published information has been found indicating that haplotypes C and D are transmissible to potato.
- **Survival of the zebra chip pathogen external to its insect or plant host** – If imported potatoes carrying CLso were accidentally released into the environment and then washed into water courses or crushed, it is likely that the pest population would lose viability and numbers decline to zero, when subjected to environmental stress or in competition with native microbiota, antibiotic-producing bacteria or predatory protozoa, for example. Genetic analysis also shows that CLso has reduced metabolic capabilities reflecting its fastidious and obligate parasitic nature, including a limited capacity to utilise complex carbohydrates. The reduced metabolic capacity of CLso would limit any ability to compete with specialist saprophytes.
- **Impact of improved diagnostic method** – Diagnostic methods of the required sensitivity and specificity are an essential prerequisite for an understanding of the transmission pathway of zebra chip, the epidemiology of the disease as well as for screening of potato germplasm and in seed certification programs to ensure the availability of clean potato seed. Diagnostic methods based on cultural procedures, including the use of selective media are not available because CLso has

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42 A. Chris Hayward, University of Queensland, Report to DAFF *on the Draft report for the review of import conditions for fresh potatoes for processing from New Zealand* and Recommended quarantine conditions with regard to "*Candidatus* Liberibacter solanacearum", 13 December 2012, pp 6-10.

> not been obtained in culture. Accordingly there has been the need for development of DNA-based diagnostic procedures. DNA-based diagnostic procedures enable early detection and monitoring of infective populations of the tomato potato psyllid throughout the growing season. Control of psyllid populations through timely application of insecticides is made possible. The same methodologies have made possible fundamental studies on the acquisition of CLso by its insect vector and its transmission to host plants.

7.51 The Hayward report noted that the import conditions proposed by DA Biosecurity require that New Zealand potatoes be imported in insect proof containers and opened only within quarantine approved premises, and in a metropolitan area. Hayward concluded that when these conditions are applied the risks of importing an exotic pest are minimised[43].

7.52 In its conclusion, the Hayward report quoted an argument put forward by Nunyaneza (2012b) that:

> The main pathway for introducing the disease into potato and other solanaceous crops in regions where ZC is absent would be the introduction of infective potato psyllids, rather than infected seed material or fresh tubers. All life stages of the psyllid can easily be transported on live plant material that serves as hosts to potato psyllid, including produce for sale as well as plants meant for propagation.
>
> Because potato tuners are not a suitable host of the psyllid, exported potato tubers are much less likely to contribute to psyllid movement. Therefore more emphasis should be on developing strategies and phytosanitary measures to effectively exclude the potato/tomato psyllid instead of focusing on preventing export of fresh and seed potatoes.[44]

Response to Hayward report provided by AUSVEG

7.53 Industry peak body AUSVEG provided the committee with additional information which responded to the issues raised the in Hayward report. The response, prepared by AUSVEG Biosecurity Consultant Dr Kevin Clayton-Greene, noted that AUSVEG's submission to the inquiry had covered a number of potential pest and disease introductions that occur in New Zealand but which were not addressed in the potato IRA.

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43 A. Chris Hayward, University of Queensland, Report to DAFF *on the Draft report for the review of import conditions for fresh potatoes for processing from New Zealand* and Recommended quarantine conditions with regard to "*Candidatus* Liberibacter solanacearum", 13 December 2012, pp 9 and 10.

44 Munyaneza JE, Sengoda VG, Buchman JL, Fisher TW (2012b) Effects of temperature on "*Candidatus* Liberibacter solanacearum" and debra chip potato disease symptom development. *Plant Disease* 96: 18-23, quoted in A. Chris Hayward, University of Queensland, Report to DAFF *on the Draft report for the review of import conditions for fresh potatoes for processing from New Zealand* and Recommended quarantine conditions with regard to "*Candidatus* Liberibacter solanacearum", 13 December 2012, p. 10.

7.54 AUSVEG expressed concern that this aspect of its submission had not been dealt with by the Hayward report. AUSVEG also questioned whether the issue of potential disease threats (other than TPP) had been included in the terms of reference for Dr Hayward's review.[45]

7.55 AUSVEG argued that one of the issues that arises when studying the literature in relation to zebra chip is that it is frequently not a matter of comparing 'apples with apples' It is suggested that because of the different degrees of sensitivity between the New Zealand and US molecular tests for Liberibacter, the US data is in some cases misleading. AUSVEG expressed concern that:

> …although there is a discussion about this aspect of research, there is no consideration of this 'problem' in the report by Dr Hayward when presenting data. All papers are treated equally as if they were all derived from the same methodology.[46]

7.56 AUSVEG note that, in considering the role of tuber transmission, the Hayward report does acknowledge that infected tubers can grow. AUSVEG also note, however, that Dr Hayward dismisses this issue based on the assumption that the potatoes for import are solely for processing – therefore there is no risk according to Dr Hayward. It is argued that this 'is an interesting conclusion given the uncertainty surrounding the disease's entry to NZ'.[47]

7.57 It is argued by AUSVEG that Dr Hayward uses the same reasoning when considering the likelihood of native psyllids acquiring the Lso bacteria:

> The potatoes are entering Australia for processing thus there is no risk. This would seem to be a somewhat circular argument. It is, however, conceded by Dr Hayward that native psyllids could potentially acquire the pathogen.[48]

7.58 AUSVEG's response also notes that the Hayward report gives consideration to the likelihood of Lso being acquired from the environment. It is argued however that this is also problematic because:

> …there is currently much scientific discussion/speculation upon the significance of acquisition of the genome through phages. The origin of the

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45 Additional Information, AUSVEG, *Comment on Independent Bacteriologist's report contained in correspondence from former Department Secretary Andrew Metcalf to Senator Heffernan,* undated, p. 3.

46 Additional Information, AUSVEG, *Comment on Independent Bacteriologist's report contained in correspondence from former Department Secretary Andrew Metcalf to Senator Heffernan,* undated, p. 4.

47 Additional Information, AUSVEG, *Comment on Independent Bacteriologist's report contained in correspondence from former Department Secretary Andrew Metcalf to Senator Heffernan,* undated, p. 4.

48 Additional Information, AUSVEG, *Comment on Independent Bacteriologist's report contained in correspondence from former Department Secretary Andrew Metcalf to Senator Heffernan,* undated, p. 4.

> sudden appearance of highly pathogenic Lso strains around 1986 is still unclear. Debate on this issue is at best still speculative.[49]

7.59 AUSVEG also argued that, in assessing the merits of the Hayward report it had concerns about Dr Hayward's independence. AUSVEG point to Dr Hayward having quoted himself in the report and referenced himself in the bibliography.[50]

7.60 AUSVEG argued that this represents a serious conflict of interest, and 'belies any claim about this being an independent report'. It was also suggested that the fact that Dr Hayward had provided input and advice to DA Biosecurity on the potato IRA, undermined any claim of independence. AUSVEG went on to say that:

> Unfortunately, the issues at stake in Biosecurity and the way information is handled mitigate against objective analysis by any government agency, despite the public affirmations to the contrary.[51]

Issues raised by stakeholders

7.61 The committee received submissions and evidence from a number of individual growers, academics, industry organisations and peak bodies which expressed concerns in relation DA Biosecurity's review of import conditions for potatoes from New Zealand. Industry stakeholders in particular, expressed the view that DA Biosecurity had underestimated the risks associated with the importation of potatoes from New Zealand.[52]

7.62 Stakeholders raised concerns about the current lack of scientific evidence in relation to possible disease pathways and reliable diagnostic testing for the zebra chip bacteria. It was also noted that apart from zebra chip disease, only PCN and black wart were given serious consideration.[53]

7.63 Industry representatives were critical of what was described as DA Biosecurity's failure to update the relevant science since the PRA was conducted in 2009.[54] It was also suggested that the risk management measures proposed by DA

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49 Additional Information, AUSVEG, *Comment on Independent Bacteriologist's report contained in correspondence from former Department Secretary Andrew Metcalf to Senator Heffernan*, undated, p. 5.

50 The citation contained in the Hayward report's bibliography reads: Hayward A C (2011) Report to Biosecurity Australia on the draft revised import conditions for entry of potatoes from New Zealand for processing and the position paper for the review of import conditions for fresh potatoes from New Zealand.

51 Additional Information, AUSVEG, *Comment on Independent Bacteriologist's report contained in correspondence from former Department Secretary Andrew Metcalf to Senator Heffernan*, undated, p. 3.

52 See, for example, Potato Processors Association of Australia, *Submission 1,* Appendix 2; Tasmanian Farmers and Graziers Association *Submission 6 and* AUSVEG, *Submission 7*.

53 See, for example, Tasmanian Department of Primary Industries, Parks, Water and Environment, *Submission 4;* Tasmanian Farmers and Graziers Association, *Submission 6* and Potatoes South Australia, *Submission 8.*

54 AUSVEG, *Submission 7,* p. 5.

Biosecurity in its review of import conditions show a lack of understanding of both the industry and of packing shed operations.[55]

Impact of disease on Australia's potato industry

7.64 In his comments on DA Biosecurity's review of import conditions, entomologist Dr Paul Horne noted that TPP and the associated bacterial disease Lso[56] were first recorded in New Zealand in 2006. It was noted that whilst TPP and Lso were initially detected in and around glasshouses in the Auckland area, between 2006 and 2009 they both spread across New Zealand. Dr Horne indicated that in 2011, in addition to the New Zealand potato industry suffering a loss of $120 million, it experienced a loss of around $5 million in the value of tomatoes and capsicums. The number of tamarillo producers has also declined – from 120 in 2007 to 40 in 2011.[57]

7.65 Dr Horne went on to argue that the threat of zebra chip disease to Australian potato production 'cannot be underestimated', and that:

> The cost of dealing with it by the use of insecticides is massive and is likely to cause growers to re-consider whether or not they continue in potato production if such an approach is required.[58]

7.66 Dr Kevin Clayton-Greene, in his response to the review of import conditions, stated that the industry's position is that DA Biosecurity 'has significantly underestimated the risk posed by the import into Australia of Solanaceous crops in general and fresh potatoes in particular'.[59]

7.67 Dr Clayton-Greene also submitted that conservative estimates, based on overseas experience, suggest that potential losses to the potato industry should Australia experience an incursion of TTP and its associated bacterium, would be in the order of $0.25 billion.[60]

7.68 In evidence to the committee, Ms Robbie Davis, Chief Executive Officer, Potatoes South Australia, told the committee that the potato industry is South Australia's (and Australia's) largest horticultural sector by value and volume and is rated second in commodities sold at a national level. Ms Davis also indicated that

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55 Harvest Moon, *Submission 8,* p. 4.

56 *Candidatus* Liberibacter solanacearum (zebra chip)

57 Potatoes Tasmania, *Submission 2,* Appendix 1, *Comments on the Draft Report for the Review of Import Conditions for Fresh Potatoes for Processing from New Zealand, prepared by Dr Paul Horne, August 2012,* [pp 1-2].

58 Potatoes Tasmania, *Submission 2,* Appendix 1, *Comments on the Draft Report for the Review of Import Conditions for Fresh Potatoes for Processing from New Zealand, prepared by Dr Paul Horne, August 2012,* [p. 2].

59 Potato Processors Association of Australia, *Submission 1,* Appendix 2, Dr Kevin Clayton-Greene, *Response to Draft report for the review of import conditions for fresh potatoes from New Zealand, Biosecurity Advice 2012/14, August 2012,* p. i.

60 Potato Processors Association of Australia, *Submission 1,* Appendix 2, Dr Kevin Clayton-Greene, *Response to Draft report for the review of import conditions for fresh potatoes from New Zealand, Biosecurity Advice 2012/14, August 2012,* p. i.

South Australia has the largest area under crop – 11,900 hectares – which is worth $206 million at the farm gate. She went on to stress however that the impacts of disease become a national problem:

> There is little doubt amongst us in South Australia, in the industry, that South Australia has the most to lose if zebra chip enters Australia. Using the New Zealand and USA experiences as a benchmark, we would witness more than $100 million is lost production value due to the effects of the psyllid and the disease. I want to add this though: despite South Australia's dominance in this industry, this is a national issue and we are all here with that in mind. It is why we are sitting with the Tasmanians and Victorians. Collaboration across borders is absolutely critical.[61]

Lack of scientific knowledge

7.69 The committee was told that, in terms of plant diseases, zebra chip is 'relatively new' – having been 'known' for less than twenty years. Whilst zebra chip disease has been studied since 1994 (when symptoms were first described in Mexico) and it was later detected in southern Texas, USA in 2000, the disease was only 'confirmed' as present in New Zealand in 2008.[62]

7.70 Industry representatives in particular argued that, zebra chip being such a new disease means there is still a lack of conclusive scientific information in relation to disease pathways, possible vectors and the practical (non-destructive) means for testing tubers.

7.71 Production and packing company Harvest Moon, for example, noted that at the time the Pest Risk Assessment (PRA) was produced (2009) zebra chip disease had only recently been identified and there was very little known – both about the disease and its vectors. Harvest Moon also expressed concern that there was 'too little information available to provide the degree of certainty that was being advanced in the PRA,'[63] and submitted that:

> Subsequent research has shown that these fears were well founded. It has since been discovered that more than one species of psyllid can carry the bacteria, that the bacteria has been found in non-Solanaceous crops (carrots) and that native Australian psyllids can indeed change feeding habits to feed on introduced commercial crops. In addition, the development of more sensitive testing methods has revealed that tubers can indeed carry the disease. All of these events were dismissed as unlikely in the 2009 PRA. It is also clear that at this stage we still do not understand the spatial and temporal distribution of this disease both within the plant and tubers.[64]

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61 Ms Robbie Davis, Potatoes South Australia Inc., *Committee Hansard,* 24 October 2012, pp. 1-2.

62 Department of Agriculture, Fisheries and Forestry, *New Zealand Potatoes and risk assessment,* Additional information provided by DAFF Biosecurity, 24 October 2012, p. 2.

63 Harvest Moon, *Submission 8,* p. 2.

64 Harvest Moon, *Submission 8,* p. 2.

7.72 In its submission, the Tasmanian Farmers and Graziers Association (TFGA) noted that the PRA conducted in 2009 indicated that 'the only way for potato tubers to become infected by Liberibacter is through its vector the Tomato-potato psyllid'[65]. TFGA went on to argue that:

> This has been known to be incorrect since 2011. Evidence now shows we are seeing different species of psyllids acting as vectors.[66]

7.73 The Potato Processors Association of Australia (PPAA) raised specific concerns about the lack of scientific evidence regarding possible disease pathways. PPAA submitted, for example, that there was a lack of evidence to support DA Biosecurity's statement in the PRA that it had identified two potential pathways to introduce infected psyllids into Australia and referred specifically to its statement that:

> *Bactericera cockerelli* may be associated with any aerial part of the plant, and while they feed primarily on leaves, psyllids and their eggs may also be present on stems or aerial fruit of the host plant. [67]

7.74 PPAA's submission noted that DA Biosecurity's report does not take into account the fact that, according to Graham Walker, Plant and Food Research New Zealand, the lifecycle of the psyllids can range from 30 to 80 days from egg lay to adult stage. PPAA argue, therefore, that:

> It is perfectly feasible for eggs to be transported on the tubers and find their way to Australia only to hatch and find a suitable host plant to colonise.[68]

7.75 PPAA goes on to note that entomologist, Dr Paul Horne, has been asking the question 'can TPP adults lay eggs directly on tubers in the absence of leafy substrate?' It is further argued that Dr Horne's critical scientific question has not yet been tested by trials, and that this work is needed 'to assist in effectively assessing the risks associated with importing fresh potatoes'.[69] PPAA also noted that 'recent work in the USA shows that tubers can test free of *Candidatus Liberibacter solanacearum* and then later will be found to be infected with 'Zebra Chip' after some months in storage',[70] and went on to argue that:

> It is clear that testing for the bacterium in tubers is fraught with difficulty and scientists are still at the early stages of learning and discovering about the life cycle of the pest and the associated pathways for the bacterium.[71]

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65 Tasmanian Farmers and Graziers Association, *Submission 6*, p. 3.

66 Tasmanian Farmers and Graziers Association, *Submission 6*, p. 3.

67 Department of Agriculture, Fisheries and Forestry, *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 8.

68 Potato Processors Association of Australia, *Submission 1*, [p. 2].

69 Potato Processors Association of Australia, *Submission 1*, [p. 2].

70 Potato Processors Association of Australia, *Submission 1*, [p. 2].

71 Potato Processors Association of Australia, *Submission 1*, [p. 2].

Review of import conditions based on 2009 research

7.76 Stakeholders expressed their concerns about DA Biosecurity's review of import conditions not including more up-to-date science. It was argued that whilst there are still numerous 'unknowns' when it comes to zebra chip disease and its vectors, there have been some advances in the science since the PRA that were not included in the review.[72]

7.77 The TFGA, for example was particularly critical of the PRA's lack of up-to-date science and described it as a 'deeply flawed document'.[73] It was also argued that:

> No attempt has been made to keep abreast of the science, some of which contradicts or shows the PRA to be wrong. We would argue that the document be excluded from consideration in the IRA process, as there is simply not enough data available to adequately address the risk.[74]

7.78 Harvest Moon also noted that there were a number of questions which 'merit answers before pest risks can be adequately addressed'[75] and submitted that:

> We also wonder why there were no further scientific findings post 2009 considered when compiling the Draft Review? We would have thought that some consideration would have been given as to why this disease should suddenly appear in potatoes and other Solanaceous crops? [76]

7.79 Dr Kevin Clayton-Greene summarised stakeholders' comments in relation to what was perceived as a lack of up-to-date science, when he submitted that:

> According to senior DAFF staff the approach to biosecurity must be science based (Grant pers. comm.). It is therefore disappointing that the Advice does not provide a required standard of science and rigour. Data is out of date, referencing is selective and on occasions where comments may run counter to what would appear to be the DAFF position, they are ignored.
>
> …
>
> No attempt has been made by DAFF to update their science over the past three years since the "Final pest risk analysis report for '*Candidatus* Liberibacter psyllaurous' in fresh fruit, potato tubers, nursery stock and its vector the tomato-potato psyllid" (PRA) was produced (2009) despite the following statement quoted from p5 of the Advice:

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72 See for example, Potato Processors Association of Australia, *Submission 1;* AUSVEG, *Submission 7;* Potatoes South Australia, *Submission 9* and G A Young and Sons, *Submission 11*.

73 Tasmanian Farmers and Graziers Association, *Submission 6*, p. 3.

74 Tasmanian Farmers and Graziers Association, *Submission 6*, p. 3.

75 Harvest Moon, *Submission 8*, p. 2.

76 Harvest Moon, *Submission 8*, p. 2.

> "*any additional information made available through the literature and the consultation process which is relevant to the assessment of the import risks posed*."[77]

7.80 Whilst in evidence provided to the committee, Dr Colin Grant, DA Biosecurity, acknowledged that 'there has been some additional knowledge gained in the period between 2009 and 2012, and we are aware of that', he also went on to argue that:

> The critical point that we are trying to make here, and it is critical to biosecurity, is that we have in place a set of measures, and we have not spoken about the detail of those at this point in time. But potatoes will come into this country to be processed in a facility and potatoes will be cooked as a result of that, and all the waste will be either incinerated or autoclaved and all water waste will go through proper quarantine treatment. Those measures do not need to be changed in our view. They are sufficient to cover the diseases that we know about, and the state of knowledge that has increased since 2009 to 2012 does not lead us to say that those measures are not sufficient.[78]

7.81 DA Biosecurity was asked by the committee whether any research had been commissioned in relation to Australia's native psyllids and their potential for transmitting zebra chip (or any other disease).

7.82 In response, officers from DA Biosecurity responded by indicating that it had not commissioned any research[79], and explained that:

> **Dr Findlay:**…there is more sophisticated science available than has been presented today around the various haplotypes of the candidatus liberibacter bacterium. ... There is a body of scientific evidence that gives us confidence that there is high specificity of the psyllid association with particular haplotypes of this bacterium.
>
> **Dr Grant:** In other words, there is no evidence that they are likely to be a vector for this bacterium.
>
> **Dr Findlay:** Our native psyllid occurs in New Zealand too, by the way, so if it was going to happen New Zealand would have seen it.
>
> **Senator MADIGAN:** And we rely on New Zealand for our information. We are not proactive about seeking and commissioning our own research. Is that what you are telling me?
>
> **Dr Findlay:** We have not commissioned any research.

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77 Potato Processors Association of Australia, *Submission 1*, Appendix 2, Dr Kevin Clayton-Greene, *Response to Draft report for the review of import conditions for fresh potatoes from New Zealand, Biosecurity Advice 2012/14, August 2012*, p. 1.

78 Dr Colin Grant, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 24 October 2012, p. 40.

79 Dr Vanessa Findlay, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 24 October 2012, p. 49.

> **Senator MADIGAN:** So the international research that the department continually refers to as your body of evidence, so to speak: has the department conducted any research of their own, at all, of any of the research that you rely on, to check the voracity of that research – as a check and balance?
>
> **Dr Findlay:** We give various weights to the information we rely on, depending on the credibility of that information. We use a system whereby we look at the weight of evidence from the least valid information, or that that you can apply the least amount of weight to, which would include things like unsubstantiated statements, specialist literature, government reports et cetera, right through to peer reviewed experimental data that is undertaken according to scientific principles and internationally recognised practices. So we weight that evidence according to the validity that you can apply to it.[80]

Pests and diseases considered by DA Biosecurity

7.83 Stakeholders were critical of the review's assessment of pests and diseases associated with potato tubers in New Zealand. It was noted, for example, that DA Biosecurity's review contains a list of twenty one 'pests and diseases identified in association with fresh potatoes from New Zealand'.[81] It was argued that from a list of twenty one, the review only discusses a small number of pests and diseases in any detail.

7.84 In its submission, the McCain Grower Group – Ballarat stated, for example, that the review discussed *Candidatus* Liberibacter solanacearum (zebra chip), potato cyst nematode (PCN) and potato black wart (PBW). However, the pests and diseases known to occur in New Zealand in 2007 include three bacteria, three fungi, four nematodes, seven arthropods and four viruses – many of which are of significant concern to Australian potato producers.[82]

7.85 AUSVEG also raised concerns about the supporting documentation supplied by the New Zealand Ministry for Primary Industries (quoted in DA's review of import conditions). AUSVEG expressed the view that:

> The MAFBNZ document considers only two pests/diseases: PCN and Black wart. There are a considerable number of other pests and diseases in NZ not found in Australia, yet these have been ignored.[83]

7.86 PPAA noted that its members were concerned about the risk of entry of further potato cyst nematode (PCN) species into Australia. It was submitted that the *Globodera pallida* species of PCN is known to occur in New Zealand as well as a

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80 Dr Vanessa Findlay and Dr Colin Grant, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 24 October 2012, p. 49.

81 Department of Agriculture, Fisheries and Forestry, *Draft Report for the review of import conditions for fresh potatoes for processing from New Zealand*, 3 July 2012, p. 7.

82 McCain Grower Group – Ballarat, *Submission 5*, p. 1.

83 AUSVEG, *Submission 7*, pp. 11-12.

second race of *Globodera rostochiensis* – neither of which have been found to occur in Australia. PPAA also submitted that it is widely accepted that, once established, *Globodera pallida* is extremely difficult to control.[84] PPAA also urged caution, particularly given that Australia is one of the only regions in the world where known PCN infections are limited to just one species, and submitted that:

> PPAA believes the existing protocol conducted by New Zealand for PCN testing of land and crops to be very inadequate when compared to other testing standards for trade. We believe that this testing protocol needs to be far more robust before further consideration is given for export of fresh potatoes to Australia.[85]

7.87 Associate Professor Calum Wilson referred specifically to viruses and virus-like agents such as PVS-A and PVM. Professor Wilson indicated that New Zealand currently has the Andean strain of potato virus S (PV-A) and submitted that this particular strain of virus has greater capacity for aphid transmission and induces greater impacts on yield than the strains present in Australia.[86]

7.88 Professor Wilson added that all strains of the virus are difficult to manage (because of inconspicuous symptoms and its ability to present at high incidence) and went on to explain that:

> Because of this difficulty the virus is not included within a seed certification system. The virus is efficiently transmitted from mother plant to daughter tuber. There is a reasonable chance of PVS-A could enter Australia within infected tubers. Several aphid species in Australia would have the capacity to spread the virus to other potatoes or alternate hosts (which could easily be present in metropolitan regions). Viruses could spread from discarded tubers, or even from sprouts on tubers in storage prior to processing.
>
> ...Potato virus M belongs to the same genus as PVS, and similarly produces inconspicuous symptoms. It would not be observed (nor tested for within crop certification processes). As with PVS-A it would be readily spread by aphids present within Australia to other potatoes and alternate hosts.[87]

7.89 The committee raised stakeholders' concerns with DA Biosecurity when officers were asked questions in relation to the 'hierarchy of diseases' and the perception that the review's primary focus was on zebra chip, PCN and black wart:

> **Senator COLBECK:** What I am trying to deal with is the discussion that we have had. You have three headline diseases that we are talking about – there is zebra chip, PCN and black wart – but the discussion seems to be focused around particularly zebra chip. There is some concern around PCN and an acceptance that area-free sourcing from New Zealand can deal with

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84 Potato Processors Association of Australia, *Submission 1,* [p. 3].

85 Potato Processors Association of Australia, *Submission 1,* [p. 3].

86 Associate Professor Calum Wilson, *Submission 10,* [p. 3].

87 Associate Professor Calum Wilson, *Submission 10,* [p. 3].

black wart. I am just trying to give you the opportunity to deal with the issue that we have talked about. There is not a lot of mention of the other diseases within the document. Dealing with those key disease risks actually mitigates for the other ones that are being considered as part of the process. That is what I am trying to get at. Am I on the right wavelength?

Dr Findlay: The goal of risk mitigation and risk management measures is to make sure that you have safety nets – I guess you could describe them as that. It is not just one mechanism in place. What we try to do is provide layers of biosecurity management. If you add them all together, you would have a mechanism that provides the best protection against failure. So, if one safety net fails, we have another one that sits underneath it and then another one again.

Senator COLBECK: So why not mention all the other diseases in the document?

Dr Findlay: It is probably a good time to describe the difference between the process we have undertaken for potatoes and the risk assessment process which we undertook for, say, ginger or pineapples. This is a very different process because we had measures in place, trade was occurring and we updated those measures to take account of the occurrence of zebra chip in New Zealand with the 2009 document. When New Zealand approached us for market access we took the previous information we had, the previous measures we have in place, the assessment we did in 2009, plus any science that had developed in those three years, to look at whether the measures that we had in place remained appropriate. That is the process we have undertaken here. It is not redoing the risk assessment that was done to establish the previous measures.[88]

Proposed risk management measures - protocols

7.90 Criticism in relation to DA Biosecurity's proposed risk management measures focused on the definition of 'practically free of soil', import potatoes being 'stored one metre' from potatoes from non-designated production sites and container loads being vented 'door ajar' to allow airing.[89]

7.91 In its submission, Harvest Moon suggested that DA Biosecurity's review revealed a 'lack of understanding of packing shed operations and the supply chain in making what appear to be completely unreferenced suggestions for disease control', for example in relation to the 'one metre separation' protocol.[90]

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88 Dr Colin Grant, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 24 October 2012, p. 39.

89 See, for example, Potato Processors Association of Australia, *Submission 1;* Tasmanian Department of Primary Industries, Parks, Water and Environment, *Submission 4;* Tasmanian Farmers and Graziers Association, *Submission 6* and AUSVEG, *Submission 7.*

90 Harvest Moon, *Submission 8,* p. 4.

Packing house processes

7.92 The McCain Grower Group – Ballarat, noted that the review of import conditions contains reference to tubers being washed or brushed so as to be 'practically free' from soil. The group argue that this protocol is clearly problematic as the word 'practically' is open to interpretation and the protocol also:

> ...fails to outline the pests and diseases that are contained in the soil that require removal. Furthermore, there is a risk of flying inspects and larger animals that may be involved in the transmission of pest and disease. Clear assessment of the risks, transmission vectors and control points has not been presented; the risk remains.[91]

7.93 The Tasmanian Department of Primary Industries, Parks, Water and Environment also submitted that the term 'practically free from soil' is not robust and argued that there is 'no guarantee that a tuber that appears visibly free of eggs actually is free of eggs'.[92]

7.94 In responding to questions in relation to this protocol, Dr Colin Grant, DA Biosecurity, told the committee that in the case of potatoes for import, 'practically' 'means that it will be almost, virtually, nearly free of soil, to a sensible level but not completely free'.[93] When DA Biosecurity was further questioned about how, in practical terms, packers would comply with these regulations, the following discussion took place:

> **Dr Findlay:** This is an important point about our being able to apply the measures to the importation of goods only to the extent that we have measures applied domestically. I refer you to ICA 44, which controls the movement of potatoes from PCN infected areas in Australia to other areas. The measure that we have used to inform our work refers to:
>
> *Potatoes shall be washed so as to be practically free of soil ….:*
>
> *1. remove soil clods, oversize and reject potatoes;*
>
> We have used that information to inform the establishment of measures for the importation of –
>
> **CHAIR:** Does that mean that there are no clods allowed in the pallet?
>
> **Dr Findlay:** So that you cannot see soil.
>
> **CHAIR:** What size is a clod?
>
> **Dr Grant:** It says, 'practically free'. A clod would not be 'practically free', in our view.

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91 McCain Grower Group – Ballarat, *Submission 5,* p. 2.

92 Tasmanian Department of Primary Industries, Parks, Water and Environment, *Submission 4*, [p. 6].

93 Dr Colin Grant, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 24 October 2012, p. 52.

> **CHAIR:** But that would allow any inspector a fair bit of licence to do whatever he liked and get away with it. Because he could say, 'I thought that was practical', even if it was not. What the bloody hell?
>
> **Dr Grant:** If I can answer that question, yes, there is judgement involved in this. The point we would make is that, if you go to the New Zealand apple issues, inspectors were finding small pieces of leaf two millimetres by two millimetres, which were considered not acceptable and consignments were rejected.[94]

Packing and labelling

7.95 The TFGA noted that DA Biosecurity's review refers to packing and labelling requirements and states that potatoes must have a 'one metre separation between them' in the packing house. The Association questioned this protocol and submitted that:

> Presumably there would be some scientific basis to claim that one metre is a critical distance to prevent the spread of any pest or disease, which is of quarantine concern. Currently, this section goes unreferenced citing no evidence to substantiate it and the opinion that this would somehow function is ill-informed.[95]

7.96 AUSVEG also questioned the basis for the proposed one metre separation and asked whether DA Biosecurity is basing this protocol on scientific evidence which has not been cited, and:

> Is this distance appropriate for flying insects? What is to stop TPP entering containers or packing units during the loading process? Dust in potato stores and sheds is well documented as a means of spreading spores and propagules (Crump pers comm.). It is noted that this risk is not addressed in the Advice.[96]

7.97 DA Biosecurity officers explained that the one-metre separation is a standard arrangement for the control of contaminating pests across the world and in trade:

> **Senator NASH:** Specifically on this for potatoes, what will that one-metre rule mean? What is the idea of one metre when it comes to potatoes?
>
> **Dr Grant:** It is a physical separation.
>
> **Senator NASH:** I understand that, but what is it stopping?
>
> **Dr Findlay:** Anything that can occur if you leave potatoes sitting side by side.
>
> **Senator NASH**: That is exactly my question: what would those things be? I understand that you are saying that it is the standard.
>
> **Dr Findlay**: It stops soils being transferred.

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94 Dr Colin Grant and Dr Vanessa Findlay, Department of Agriculture, Fisheries and Forestry, *Committee Hansard,* 24 October 2012, pp. 52-53.

95 Tasmanian Farmers and Graziers Association, *Submission 6*, p. 4.

96 AUSVEG, *Submission 7*, p. 17.

> Senator NASH: What else does it do?
>
> …
>
> **Dr Findlay:** As an example of what the one metre does as a standard quarantine control. It is not specifically related to any particular pest or disease. It is a safety net to give us added assurance.
>
> **Senator NASH:** I understand that. But in the case of potatoes, what would those things be?
>
> **Dr Findlay:** Transfer of soil, making sure that when you get other beetles or insects in the storage area they are not about to transfer straight across. It is just standard practice.
>
> **Senator NASH:** Why not? If they are flying around the storage area, how can they not go across?
>
> **CHAIR:** How does the beetle not make it across the one metre? Is it barbed wire?
>
> **Dr Grant:** No the point to make is that we have a tiered approach. We are saying in general quarantine we like to keep things separated. That is a standard procedure. It is not the reliance that we place totally and wholly on quarantine. We are saying it is a standard operating procedure. It facilitates control at some level.[97]

Transport to quarantine approved premises for inspection and processing

7.98 Professor of Plant Pathology, David Guest noted that DA Biosecurity's PRA and the review identified potential points of escape of pathogens (and their vectors) and recommended appropriate quarantine measures be implemented. Professor Guest also noted however, the recommendation that 'shipping containers may be opened for ventilation at the port of entry, and argued that:

> This makes no sense and poses a real threat that any psyllids contaminating the shipment may escape. Any host plants in the vicinity could become infected with the zebra stripe pathogen and provide a source of inoculums for the further spread of the disease.[98]

7.99 PPAA also questioned the protocol, and referred to Dr Andrew Pitman's observations at the Psyllid Conference held in Auckland in July 2012. Dr Pitman's observations are based on crops in the Canterbury district of New Zealand (an area where zebra chip is not at epidemic levels) that were ready for harvest. PPAA noted that Dr Pitman found:

> ...on some 'bolter' plants with significant 'regrowth' of green tissue there was heavy infection with all life stages of the Psyllid. When tested for LSO, these plants were found to be at levels he described as 'seriously infected', far higher levels than those from infected psyllids tested from the North

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97 Dr Colin Grant and Dr Vanessa Findlay, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 24 October 2012, pp 42-43.

98 Professor David Guest, *Submission 14*, [p. 1].

> Island infections. It would only take an infected adult Psyllid/s to fly from a 'door ajar' container and find a suitable host plant species such as *Solanum nigrum,* Black Nightshade.[99]

7.100 GA Young and Sons was also critical of the risk management measures contained in DA Biosecurity's review:

> The review states that the containers will be sealed to prevent pests entering Australia. The following paragraph however states that the container doors can be opened to vent the load but that the doors must be shut prior to being moved off the wharf. However we consider the assumption that this would prevent potential pests or pathogens from entering Australia to be incorrect, as vectors such as insect, rodents and people may access the potatoes and subsequently access Australia, potentially carrying pests or pathogens ashore. This section also provides no evidence as to how these measures would be effective in preventing pests and diseases from entering Australia.[100]

Committee comment

7.101 A range of potato industry stakeholders provided evidence to the committee's inquiry, including individual growers, academics, industry organisations and peak industry bodies. In reviewing the evidence received, the committee notes that stakeholder groups share common concerns about DA Biosecurity's review of import conditions for potatoes from New Zealand. The committee shares a number of their concerns.

7.102 Specifically, the committee agrees with the view put forward by stakeholders that DA Biosecurity has underestimated the risks associated with the importation of potatoes from New Zealand. The committee also agrees with stakeholders' concerns in relation to both the current lack of scientific evidence in relation to possible disease pathways, and reliable diagnostic testing for the zebra chip bacteria.

7.103 The committee shares industry representatives' disappointment that DA Biosecurity failed to update the relevant science (since the PRA was conducted in 2009), particularly when the Department continues to assert that the approach to biosecurity must be science-based.

7.104 The committee also agrees with the concerns raised by a number of stakeholders who suggested that the risk management measures proposed by DA Biosecurity (in its review of import conditions) show a lack of understanding – both of the industry and of packing shed operations.

7.105 The committee notes the concerns raised about the limited number of pests and diseases considered by DA Biosecurity's review. The committee acknowledges that the review considered – and provided detailed comment in relation to – a small number of pests and diseases. However, the committee notes that there are a variety of

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99 Potato Processors Association of Australia, *Submission 1,* p. 2.

100 G A Young and Sons, *Submission 11,* [p. 2].

bacteria, fungi, nematodes, arthropods and viruses which are known to occur in New Zealand, and which are of concern to Australian potato producers.

7.106 The committee also notes that the supporting documentation supplied by the New Zealand Government (the MAFBNZ document) considers only PCN and black wart. The committee shares the concerns of stakeholders who argued that there are a considerable number of other pests and diseases found in New Zealand (and not found in Australia) that appear to have been discounted in this context.

7.107 The committee acknowledges DA Biosecurity's decision to engage an independent bacteriologist to review its report on import conditions for potatoes from New Zealand (and the latest information on zebra chip disease). The committee notes, that in engaging Dr Hayward, DA Biosecurity was seeking to provide assurance to stakeholders that the biosecurity measures it is proposing will appropriately manage the risks associated with the import of potatoes from New Zealand.

7.108 The committee further notes the information provided in the Hayward report – specifically, Dr Hayward's comments in relation to the four issues he described as relating directly to the draft review of import conditions including: tuber transmission; haplotypes of *Candidatus* Liberibacter solanacearum (CLso) (and potential vectors); survival of the zebra chip pathogen external to its insect or plant host; and the impact of improved diagnostic methods.

7.109 In its response to the Hayward report, AUSVEG raised the point that its submission to the inquiry covered a number of potential pest and diseases that occur in New Zealand (but which were not addressed in the potato IRA). The committee shares AUSVEG's concern that these aspects of its submission were not dealt with by the Hayward report. The committee also questions whether the issue of potential disease threats (other than TPP) were included in the terms of reference for Dr Hayward's review.

7.110 The committee also shares the concerns raised by AUSVEG regarding Dr Hayward's consideration of the role of tuber transmission. Whilst the Hayward report does acknowledge that infected tubers can grow, Dr Hayward dismisses this issue based on the assumption that the potatoes for import are solely for processing – and therefore concludes that they do not pose a serious risk. The committee agrees with AUSVEG's suggestion that Dr Hayward's conclusion is interesting, particularly given the uncertainty surrounding the disease's entry into New Zealand.

7.111 The committee notes Dr Hayward's conclusion that very little of the current literature (on zebra chip disease of potato) affects the import conditions for importation of potatoes for processing from New Zealand. However, the committee also notes the concerns expressed by AUSVEG in relation to Dr Hayward's treatment of the current zebra chip literature.

7.112 AUSVEG argued that there is a need to be aware of (and take account of) the varying degrees of sensitivity between the New Zealand and US molecular tests for Liberibacter – particularly because the US data can, in some cases, be misleading. AUSVEG argued that whilst Dr Hayward does discuss this aspect of research, there is no consideration given in his report to this being a possible problem. The committee

shares AUSVEG's concern that Dr Hayward treats all papers equally – and as if they were all derived from the same methodology.

7.113 The committee also has concerns about Dr Hayward's independence and agrees that – having provided input and advice to DA Biosecurity on the potato IRA – Dr Hayward is not able to provide an independent, unbiased review.

7.114 The committee notes that, in his submission to the inquiry, Associate Professor Calum Wilson argued that 'lack of evidence of risk does not equate to evidence of lack of risk'. Professor Wilson also argued that he would have 'expected greater detailed studies to prove beyond reasonable doubt the lack of risk of transhipment of pests and pathogens of quarantine significance'.[101]

7.115 Professor of Plant Pathology, David Guest also argued that the PRA assumes perfect knowledge and compliance, and challenges DA Biosecurity to 'identify one instance of perfect compliance to biosecurity conditions regulating the importation of plant material in recent years'.[102] Professor Guest went on to argue that:

> The recent incursions of eucalyptus rust, chestnut blight and stripe rust of wheat demonstrate the catastrophic failure of Australia's risk assessment-based plant biosecurity system. In each case biosecurity measures and incursion management plans failed because of modelling based on imperfect knowledge and flawed assumptions, followed by human error and regulatory failure.[103]

7.116 Professor Guest then urged the committee to:

> Apply the precautionary principle and reject the application to import processing potatoes from New Zealand until it is possible to absolutely guarantee the exclusion of zebra stripe, the tomato/potato psyllid and other pathogens and pests. The potential benefit to Australia of importing processing potatoes from sources where these pests and diseases are present is overwhelmed by the potential damage an incursion would cause.[104]

7.117 The committee would argue that Professor Wilson's comments are a reflection of the concerns held by Australia's potato industry stakeholders. The committee also acknowledges the argument put forward by Professor Guest and repeats the comment made in Chapter 4 – that it has, over the years, observed a number of examples of blatant biosecurity risks, none of which were either predicted or anticipated.

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101 Associate Professor Calum Wilson, *Submission 10,* [p. 1].

102 Professor David Guest, *Submission 14,* [p. 1].

103 Professor David Guest, *Submission 14,* [p. 1].

104 Professor David Guest, *Submission 14,* [p. 1].

Recommendation 24

7.118 The committee recommends that, before commencing the importation of fresh potatoes from New Zealand, a formal Import Risk Analysis be conducted for fresh potatoes for processing from New Zealand. In conducting the IRA, DA Biosecurity should ensure that particular attention is paid to:

- **the conduct, or commissioning, of scientific research in relation to possible disease pathways for the *Candidatus* Liberibacter solanacearum pathogen;**
- **the lack of reliable diagnostic testing for the zebra chip bacteria;**
- **the large number of bacteria, fungi, nematodes, arthropods and viruses which are known to occur in New Zealand, and which are of concern to Australian potato producers.**

Senator Glenn Sterle
Chair

Additional comments by Independent Senator Nick Xenophon and DLP Senator John Madigan

The (Zebra) Chips are down

1.1 The fresh potato industry in South Australia and Victoria, and indeed throughout Australia, is one of the most important agricultural assets we own. This industry needs and deserves protection from the introduction of pests and diseases that will threaten its very livelihood.

1.2 Importing fresh potatoes from New Zealand exposes Australia's potato industry to an unacceptable level of risk of exposure to Zebra Chip Disease (and its vector the Tomato Potato Psyllid), a condition that causes infected potatoes to exhibit black stripes and a burnt taste which renders the potato inedible. The livelihoods of hundreds of Australian producers, as well as Australia's international reputation as a high quality potato producer, will be put at risk should Zebra Chip Disease enter Australian borders.

Effect of Zebra Chip Disease in Australia

1.3 South Australia produces more potatoes than any other state or territory in Australia and makes up approximately 80 per cent of production of fresh washed potatoes. South Australia also has the largest land area under crop, valued at $206 million at the farm gate.[1] The farm gate value of potatoes in Australia in 2011-12 was $557 million. Victoria accounted for approximately 18.6% of this output with $108 million.[2]

1.4 The importation of potentially diseased potatoes from New Zealand will have devastating flow on effects throughout Australia should SA's and Victoria's potato industry be put at risk. As explained by Ms Robbie Davis, CEO of Potatoes South Australia:

> There is little doubt amongst us in South Australia, in the industry, that South Australia has the most to lose if zebra chip enters Australia. Using the New Zealand and USA experiences as a benchmark, we would witness more than $100 million in lost production value due to the effects of the psyllid and the disease. I want to add this though: despite South Australia's dominance in this industry, this is a national issue and we are all here with that in mind. It is why we are sitting with the Tasmanians and Victorians. Collaboration across borders is absolutely critical. At a national level we produce 1.2 million tonnes; New Zealand's is 300,000 tonnes. In South Australia, and in Australia, we can only compete on quality. Premium quality is our competitive advantage. If the Australian potato crop is contaminated by zebra chip alone, without considering the other pests and

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1 Ms Robbie Davis, Potatoes South Australia Inc., *Committee Hansard*, 24 October 2012, p. 1.

2 Australian Bureau of Statistics (ABS) in Agricultural Commodities Australia, Cat No.7121.0 (quantities) and, ABS Value of Agricultural Commodities Produced, Cat No.7503.0 (values).

> diseases, the industry's farm gate value and the value all the way down the value chain to the consumer could potentially halve. Just at farm gate this is a quarter of a billion dollars.[3]

1.5 AUSVEG, the national peak industry body representing the interests of Australian vegetable and potato growers, echoed these concerns:

> The risk to the Australian potato industry posed by diseases associated with fresh potatoes from New Zealand is far too large to take. In 2009-10, the production value of our industry was over $600 million, with around 2,000 growers contributing to this. Yet the Department of Agriculture, Fisheries and Forestry seems willing to risk it all based on out-of-date and poorly examined science.[4]

1.6 How then have we arrived at this position where imports of fresh potato from New Zealand are even being considered?

New Zealand's market access request

1.7 Currently Australia does not import fresh potato from any country. Previously fresh potato imports from New Zealand were accepted, however imports ceased in 1988 after New Zealand were unable to guarantee the absence of the quarantine pest Potato Cyst Nematode. In 2006 the New Zealand Government requested market access to Australia for fresh potatoes for processing. This discovery of Zebra Chip disease and its vector, the Tomato Potato Physllid, in New Zealand in 2008 resulted in an outright ban on imports of potatoes and other host materials. The World Trade Organisation (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures ('SPS Agreement') required Australia to conduct a risk assessment in order to put in place permanent measures surrounding the possible importation of potatoes in the long term.[5]

1.8 What followed was a Pest Risk Assessment ('PRA') of Zebra Chip Disease and the Tomato Potato Psyllid conducted by DA Biosecurity in 2009 resulting in the *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand* ('draft report'). The draft report was released for stakeholder comment in July 2012, with 27 submissions received in total by September 2012. In October 2012, DA Biosecurity appointed Dr Alan (Chris) Hayward to conduct a review of the draft report and summarise the current literature on zebra chip disease.

Concerns about the draft report and Dr Hayward's review

1.9 The committee detailed the wide spread criticism levelled at both the draft report and Dr Hayward's review by many in the industry, including AUSVEG and the Potato Processors Association of Australia Inc. In their submission to the inquiry the Potato Processors Association of Australia Inc supplied the committee with advice

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3 Ibid, pp. 1-2.

4 Mr Richard Mulcahy, AUSVEG, *Committee Hansard,* 24 October 2012, p. 22.

5 Department of Agriculture, Fisheries and Forestry, *New Zealand Potatoes and risk assessment,* Additional information provided by DAFF Biosecurity, 24 October 2012, p. 1.

received from one of Australia's leading entomologists, Dr Paul Horne, in response to the draft report:

> It is regrettable that the Advice does not provide the standard of science and rigour that one would expect from such a document. Statements of opinion are expressed as fact and referencing other than to Government publications is minimal. One can only assume therefore that most of what is written is therefore opinion and does not qualify as science. This is unfortunate as we are lead to believe that the approach to biosecurity must be science based (C Grant pers Comm.) Based on what is presented in the Advice Australia can have little confidence in either the ability of DAFF to assess risk and to manage the subsequent consequences should this proposal for imports go ahead as presented.[6]

1.10 Other criticism included the lack of scientific knowledge regarding Zebra Chip disease, partly because this is a relatively 'new' disease in scientific terms, having only been reported for the first time 20 years ago. Concerns were also raised that the draft review released by DA Biosecurity in 2012 relied entirely on literature published in or before 2009 despite the emergence of new information. Dr Kevin Clayton-Green wrote:

> No attempt has been made by DAFF to update their science of the past three years since the "Final pest risk analysis report for 'Candidatus Liberibacter psyllaurous' in fresh fruit, potato tubers, nursery stock and its vector the tomato potato psyllid (PRA) was produced (2009) despite the following statement quoted from p5 of the Advice:
>
> "any additional information made available through the literature and the consultation process which is relevant to the assessment of the import risks posed."[7]

1.11 DAFF's complacency in relation to the need for inclusion of more up to date scientific information was made abundantly clear during the committee's public hearing in October 2012:

> **Senator XENOPHON:** Can we go to the issue of risk assessments though. I guess risk assessments are valid at the time that they are done. Why hasn't there been an update? There is a lot of new evidence that has come to light in terms of tuber transmission, the fact that other psyllids are found to carry the disease, the fact that it can infect other crops. Why wasn't that included in a proper scientific and legal assessment as to whether to accept or reject New Zealand potatoes? Isn't that reasonable? If you are to have a robust system in place, surely you need to update it because there has been a significant new amount of knowledge that has come into play?

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6 Potato Processors Association of Australia, Submission 1, Appendix 1, Dr Paul Horne, *Response to Draft report for the review of import conditions for fresh potatoes from New Zealand, Biosecurity Advice 2012/14*, August 2012, p. 1.

7 Potato Processors Association of Australia, Submission 1, Appendix 2, Dr Kevin Clayton-Greene, *Response to Draft report for the review of import conditions for fresh potatoes from New Zealand, Biosecurity Advice 2012/14*, August 2012, p. 1.

> **Dr Findlay:** If we were considering the importation of fresh potatoes for retail sale in Australia, we would update the risk assessment. In this instance, we are considering established measures and taking account of the measures that were established as a result of the 2009 assessment only for potatoes for processing. So there is no new information that changes those measures that were established.[8]

1.12 We share the committee's concerns that the risk management measures proposed by DA biosecurity (including packing house processes, packaging and labelling requirements and transport and quarantine arrangements) show a demonstrated lack of understanding of the potato industry and the real world operation of packing sheds.

1.13 The committee has recommended that before commencing the importation of fresh potatoes from New Zealand a formal Import Risk Analysis be conducted for fresh potatoes, with particular attention paid to:

- the conduct or commissioning of scientific research in relation to possible disease pathways for the Candidatus Liberibacter solanancearum pathogen;
- the lack of reliable diagnostic testing for the zebra chip bacteria; and
- the large number of bacteria, fungi, nematodes, arthropods and viruses which are known to occur in New Zealand, and which are of concern to Australian potato producers.

1.14 Whilst we welcome the committee's in depth analysis of the issues and risks associated with the importation of fresh potatoes from New Zealand, we believe a formal Import Risk Analysis will not go far enough to protect Australia's potato industry from Zebra Chip Disease as well as other possible bacteria and viruses. In order to achieve a greater level of protection our whole biosecurity system needs to be rejigged.

1.15 In 2011, Senator Xenophon introduced the *Quarantine Amendment (Disallowing Permits) Bill 2011*, which effectively made Biosecurity Policy Determinations and permits to import, introduce or bring an animal, plant, substance or thing into Australia disallowable instruments. This would mean that the decision to allow (or disallow) imports would be open to much greater scrutiny and transparency than is currently the case. Parliament would have the ultimate say, based on the science and all the available evidence. Strong and effective biosecurity regulations are needed in order to shore up our food security, and ensure that our agricultural sector has a fair go and is able to fight to survive on a level playing field.

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8 Dr Vanessa Findlay, Chief Plant Protection Officer, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 24 October 2012, p. 46.

Recommendation

1.16 That in addition to the majority report's recommendations, the provisions in the Quarantine Amendment (Disallowing Permits) Bill 2011 be implemented.

Senator Nick Xenophon **Senator John Madigan**

Appendix 1

Inquiry into the effect on Australian pineapple growers of importing fresh pineapples from Malaysia

Submissions received

Submission Number	Submitter
1	Mr Leslie Williams
2	N.Q. Paradise Pines
3	Mr Chris Fullerton
4	Tropical Pines Pty Ltd
5	Growcom
6	Pinata Farms
7	Golden Circle
8	Department of Agriculture, Fisheries and Forestry (DAFF Queensland)
9	Hon Bob Katter
10	Mr Glenn Taniguchi

Additional information received

- Received on 22 August 2012, from Growcom. Answers to Questions taken on Notice on 6 August 2012.
- Received on 23 August 2012, from the Department of Agriculture, Fisheries and Forestry (DAFF). Answers to Questions taken on Notice on 6 August 2012.
- Received on 31 August 2012, from Biosecurity Australia. Correction to evidence given at Brisbane public hearing 6 August 2012.
- Received on 4 September 2012, from Dole Australia. Response to supplementary submission from Tropical Pines.
- Received on 12 September 2012, from the Department of Agriculture, Fisheries and Forestry (DAFF). Answers to written Questions taken on Notice on 28 August 2012.
- Received on 13 September 2012, from the Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence.
- Received on 18 September 2012, from Mr Tony Cox. Correspondence.
- Received on 14 November 2012, from the Department of Agriculture, Fisheries and Forestry (DAFF). Answers to Questions taken on Notice on 23 October 2012.
- Received on 18 December 2012, from the Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence.
- Received on 8 March 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF). Comments on Mr Chris Peace's report.
- Received on 1 May 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence.
- Received on 25 March 2013, from Senator Heffernan. Correspondence to the Department of Agriculture, Fisheries and Forestry (DAFF), seeking further clarification regarding the REM used by DAFF Biosecurity.
- Received on 22 May 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF) to Senator Heffernan. Correspondence regarding the progress of the pineapple IRA process.
- Received on 24 May 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF) to Senator Heffernan. Correspondence conveying ACERA's review of the Peace report.
- Received on 13 June 2013, from Senator Heffernan to the Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence regarding the progress of the pineapple IRA process.
- Received on 19 June 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF) to Senator Heffernan. Correspondence regarding the progress of the pineapple IRA process.
- Received on 9 July 2013, from Mr Chris Peace. Correspondence regarding a meeting with representatives from the Department of Agriculture, Fisheries and Forestry.

- Received on 12 July 2013, from the Department of Agriculture, Fisheries and Forestry. Correspondence regarding a meeting with Mr Chris Peace

Appendix 2

Inquiry into the effect on Australian pineapple growers of importing fresh pineapples from Malaysia

Public hearings and witnesses

6 August 2012, Brisbane, Qld

- BARBOUR, Mr Darryl Andrew, Director, Horticulture, Plant Biosecurity (Horticulture), Department of Agriculture, Fisheries and Forestry
- CRANNY, Mr Mick, Chairman,
  Tropical Pines
- FULLERTON, Mr Chris, Chairman,
  Pineapple Growers Advancement Group
- GAMBLEY, Dr Cherie, Pineapple Industry Development Officer,
  Growcom
- GARDNER, Ms Anne, Director, Horticulture, Plant Biosecurity (Horticulture), Department of Agriculture, Fisheries and Forestry
- GRANT, Dr Colin, First Assistant Secretary, Biosecurity Plant,
  Department of Agriculture, Fisheries and Forestry
- LIGHTFOOT, Mr Derek, Managing Director,
  Tropical Pines
- LIVINGSTONE, Mr Alex, Chief Executive Officer,
  Growcom
- NEWETT, Dr Simon, Extension Officer,
  Department of Agriculture, Fisheries and Forestry, Queensland
- PANITZ, Mr Mark James, General Manager, Plant Biosecurity and Product Integrity, Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry, Queensland
- PUTLAND, Mr David, Policy Manager,
  Growcom
- SANEWSKI, Dr Garth, Horticulturalist,
  Department of Agriculture, Fisheries and Forestry, Queensland
- SCOTT, Mr Col, Agronomist,
  Tropical Pines
- WILLIAMS, Mr Les, Research and Development Representative,
  Pineapple Growers Advancement Group

23 October 2012, Canberra, ACT

- BARBOUR, Mr Darryl Andrew, Director, Australian Chief Plant Protection Office, Department of Agriculture, Fisheries and Forestry
- GRANT, Dr Colin James, First Assistant Secretary, Plant Division, Department of Agriculture, Fisheries and Forestry
- MELLOR, Ms Rona, Deputy Secretary, Department of Agriculture, Fisheries and Forestry

12 March 2013, Canberra, ACT

- BARBOUR, Mr Darryl, Director, Australian Chief Plant Protection Office, Department of Agriculture, Fisheries and Forestry
- CUPIT, Dr Andrew Allan, Assistant Secretary, Animal Biosecurity Branch, Animal Division, Department of Agriculture Fisheries and Forestry
- FINDLAY, Dr Vanessa, Australian Chief Plant Protection Officer, Department of Agriculture, Fisheries and Forestry
- MELLOR, Ms Rona, Deputy Secretary, Department of Agriculture, Fisheries and Forestry
- PEACE, Mr Christopher Paul, Principal Consultant, Risk Management Ltd

Appendix 3

Inquiry into the effect on Australian ginger growers of importing fresh ginger from Fiji

Submissions received

Submission Number	Submitter
1	Buderim Ginger Limited
2	Mr John Allen
3	Mr Barry Gill
4	Australian Ginger Growers Association
5	Templeton Ginger
6	Office of the Mayor, Gympie Regional Council
7	Peasley Horticultural Services
8	Sunshine Coast Council
9	Australian Ginger Industry Association
10	Landmark
11	Biosecurity Authority of Fiji
12	Botanical Food Company Pty Ltd
13	Mr David Gibson MP
14	Murray Bros.
15	Dr Graham Stirling

Additional information received

- Received on 14 November 2012, from Department of Agriculture, Fisheries and Forestry (DAFF). Answers to Questions taken on Notice on 23 October 2012.
- Received on 14 January 2013, from Dr Graham Stirling. Answers to written Questions taken on Notice on 11 January 2013 from public hearing on 23 October 2012.
- Received on 24 January 2013, from Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence.
- Received on 6 February 2013, from Department of Agriculture, Fisheries and Forestry (DAFF). Answers to written Questions taken on Notice on 20 December 2012 from public hearing on 23 October 2012.
- Received on 19 February 2013, from Department of Agriculture, Fisheries and Forestry (DAFF). Answers to written Questions taken on Notice on 11 January 2013 from public hearing on 23 October 2012.
- Received on 25 March 2013, from Senator Heffernan to the Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence seeking further clarification regarding the REM used by DAFF Biosecurity.
- Received on 1 May 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence.
- Received on 22 May 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF) to Senator Heffernan. Correspondence regarding the progress of the ginger IRA process.
- Received on 24 May 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF) to Senator Heffernan. Correspondence conveying ACERA's review of the Peace report.
- Received on 13 June 2013, from Senator Heffernan to the Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence regarding the progress of the ginger IRA process.
- Received on 19 June 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF) to Senator Heffernan. Correspondence regarding the progress of the ginger IRA process.
- Received on 9 July 2013, from Mr Chris Peace. Correspondence regarding a meeting with representatives from the Department of Agriculture, Fisheries and Forestry (DAFF).
- Received on 12 July 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence regarding a meeting with Mr Chris Peace.

Appendix 4

Inquiry into the effect on Australian ginger growers of importing fresh ginger from Fiji

Public hearings and witnesses

23 October 2012, Canberra, ACT

- ALLEN, Mr John, Owner/Manager,
  Oakland Farms
- BONSALL, Mrs Jann, Secretary,
  Australian Ginger Industry Association
- FINDLAY, Dr Vanessa Louise, Chief Plant Protection Officer,
  Department of Agriculture, Fisheries and Forestry
- GILL, Mr Ashley, Director,
  Gill Logging
- GRANT, Dr Colin James, First Assistant Secretary, Plant Division,
  Department of Agriculture, Fisheries and Forestry
- MAGEE, Mr Bill, Assistant Secretary,
  Department of Agriculture, Fisheries and Forestry
- MELLOR, Ms Rona, Deputy Secretary,
  Department of Agriculture, Fisheries and Forestry
- PEASLEY, Mr David Laurence, Consultant/Service Provider,
  Australian Ginger Industry Association
- REHBEIN, Mr Anthony, President,
  Australian Ginger Industry Association
- SCHWARTZ, Mr Rob, Senior Director,
  Department of Agriculture, Fisheries and Forestry
- SMITH, Dr Mike, Technical adviser,
  ginger industry
- STIRLING, Dr Graham, Consultant,
  Australian Ginger Industry Association
- TEMPLETON, Mr Shane, Director,
  Templeton Ginger

Appendix 5

Inquiry into the proposed importation of potatoes from New Zealand

Submissions received

Submission Number	Submitter
1	Potato Processors Association of Australia Inc
2	Potatoes Tasmania
3	Woolworths Limited
4	Department of Primary Industries, Parks, Water and Environment
5	McCain grower group Ballarat
6	Tasmanian Farmers and Graziers Association (TFGA)
7	AUSVEG
8	Harvest Moon
9	Potatoes South Australia
10	Dr Calum Wilson
11	GA Young and Sons
12	South Australian Farmers Federation
13	National Farmers' Federation
14	Professor David Guest

Additional information received

- Received on 24 October 2012, from Department of Agriculture, Fisheries and Forestry (DAFF). Additional Information.
- Received on 29 October 2012, from Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence.
- Received on 9 November 2012, from AUSVEG. Answers to Questions taken on Notice on 24 October 2012.
- Received on 9 November 2012, from AUSVEG. Answers to written Questions taken on Notice on 24 October 2012.
- Received on 14 November 2012, from Department of Agriculture, Fisheries and Forestry (DAFF). Answers to Questions taken on Notice on 24 October 2012.
- Received on 14 November 2012, from Department of Agriculture, Fisheries and Forestry (DAFF). Answers to written Questions taken on Notice on 24 October 2012.
- Received on 7 December 2012, from Potatoes Tasmania. Answers to Questions taken on Notice on 24 October 2012.
- Received on 25 March 2013, from Senator Heffernan to the Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence seeking further clarification regarding the REM used by DAFF Biosecurity.
- Received on 1 May 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence.
- Received on 22 May 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF) to Senator Heffernan. Correspondence including the independent bacteriologists report.
- Received on 24 May 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF) to Senator Heffernan. Correspondence conveying ACERA's review of the Peace report, received 24 May 2013.
- Received on 13 June 2013, from Senator Heffernan to the Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence regarding the progress of the potatoes REM process.
- Received on 19 June 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF) to Senator Heffernan. Correspondence regarding the progress of the potatoes REM process.
- Received on 9 July 2013, from Mr Chris Peace. Correspondence regarding a meeting with representatives from the Department of Agriculture, Fisheries and Forestry (DAFF).
- Received on 12 July 2013, from the Department of Agriculture, Fisheries and Forestry (DAFF). Correspondence regarding a meeting with Mr Chris Peace.
- Received on 4 March 2014, from AUSVEG. Additional Information.

Tabled documents

- Tabled by Mr Robbie Davis, Chief Executive Officer, Potatoes South Australia on 24 October 2012 in Canberra. Correspondence to Potatoes South Australia from South East Local Government Association Inc., dated 23 October 2012.

Appendix 6

Inquiry into the proposed importation of potatoes from New Zealand

Public hearings and witnesses

24 October 2012. Canberra, ACT

- CHAPMAN, Mr Tim, First Assistant Secretary, Border Compliance Division, Department of Agriculture, Fisheries and Forestry
- CLAYTON-GREENE, Dr Kevin, Biosecurity Consultant, AUSVEG
- COBURN, Mr Simon, Public Affairs Manager, AUSVEG
- DAVIS, Ms Robbie Anne, Chief Executive Officer, Potatoes South Australia Inc.
- FINDLAY, Dr Vanessa, Chief Plant Protection Officer, Department of Agriculture, Fisheries and Forestry
- GRANT, Dr Colin James, First Assistant Secretary, Plant Division, Department of Agriculture, Fisheries and Forestry
- HARDMAN, Mr Peter Rodney, Agricultural Manager, Potatoes Tasmania
- MELLOR, Ms Rona, Deputy Secretary, Department of Agriculture, Fisheries and Forestry
- MOAR, Mr Geoff, Deputy Chair, AUSVEG
- MULCAHY, Mr Richard, Chief Executive Officer, AUSVEG
- MURPHY, Mr Greg, Committee Member, McCain Grower Group
- ROVERS, Mr Frank, Chairman, Victorian Potato Growers Council
- SUCKLING, Mr Norman, Chairman, McCain Grower Group

- TERPSTRA, Mr Wayne, Assistant Secretary, Industry Arrangements and Performance, Border Compliance Division, Department of Agriculture, Fisheries and Forestry

Appendix 7

Previous Committee Inquiries

Incursions of pests and diseases into Australia

The committee conducted the following inquiries which relate to the management of particular incursions of pests and diseases into Australia:

- June 2006 – inquiry into the administration by the Department of Agriculture, Fisheries and Forestry (DAFF) of the citrus canker outbreak;
- August and November 2010 – inquiry into the Australian horse industry and an Emergency Animal Response Agreement (EARA); and
- June 2011 – inquiry into the science underpinning the inability to eradicate the Asian honey bee.

Biosecurity and quarantine

In June 2010, the Senate referred to the committee an inquiry into the adequacy of Australia's biosecurity and quarantine arrangements, including the issue of resourcing.

As part of the terms of reference, the committee examined progress toward reform of the Australian Quarantine and Inspection Service (AQIS) export fees and charges regime. Given the timing of reforms, the committee resolved to inquire and report on this particular issue separately. The committee tabled *Biosecurity and quarantine arrangements – Interim report: the management of the removal of the fee rebate for AQIS export certification functions* on 12 December 2011. The committee's report on the remaining terms of reference – *Australia's biosecurity and quarantine arrangements* – was tabled in April 2012.

Appendix 8

The Peace Report – Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process

RISKMANAGEMENTLTD

Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process

Prepared for Senate Rural and Regional Affairs and Transport Committee

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Date: 31 March 2014

File name: e08_doc.docx

Full citation for report:

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Disclaimer

This is not a legal interpretation of the law generally or the of the law duty of care, the statutory duties of employers and related standards: only the courts can provide such an interpretation. Rather this is a plain English description intended to help readers understand what the courts might expect.

If any reader needs to rely on an interpretation of the law they must consult a competent legal adviser.

Limitations

This report is based on a review of Australian Government reports and international organisations documents. We have not interviewed any DAFF risk analysts or other stakeholders.

Terms of reference

In preparing this report we have followed the terms of reference in our engagement letter and used due diligence and our professional skills to gather information that appeared to be necessary to fulfil our terms of reference. The information in this report is based on:

- conditions observed; or
- information provided by you; or
- information provided to us independently by third parties.

Although we believe the information is accurate we have not independently verified it. We cannot, therefore, give any warranty as to the accuracy or currency of such information and must disclaim any liability for any actions based on such information.

We do not guarantee compliance with statutes or relevant recognized standards nor do we guarantee we have identified all risks and hazards.

This report is current to the date of publication unless otherwise specified. Readers should bear in mind that subsequent events might affect our conclusions or recommendations given.

About Risk Management Limited

Risk Management Limited is an independent risk management consultancy established in 2003 to help clients identify, analyse, assess and manage their major risks and to monitor their critical controls over those risks.

Further information about Risk Management Limited is available at www.riskmgmt.co.nz.

About the author of the report

This report was prepared by Chris Peace, the managing director of Risk Management Limited who worked for NGC Holdings Ltd as their risk manager (2000-2003) and who had previously worked for Jardine Lloyd Thompson in New Zealand (1995-2000) and the UK (1990-1995), Marsh & McLennan in New Zealand (1985-1990) and CIGNA (NZ) Ltd (1982-1985). Between 1974 and 1980 he enforced the UK Health and Safety at Work Act 1974 in a wide range of premises.

Chris holds an MSc in Risk Management and Safety Technology and other qualifications in environmental health, air pollution control and occupational safety and health. Chris is also a Chartered Fellow of the Institution of Occupational Safety and Health (UK); details of the charter and fellowship are available from http://www.iosh.co.uk.

Between 2005-2012 Chris was part-time Lecturer in Risk Management Studies at Massey University and represented the university on the joint standards committee that wrote AS/NZS 4360: 2004 *Risk Management* (now replaced by AS/NZS ISO 31000: 2009 *Risk Management – Principles and guidelines*). He is a member of the New Zealand Society for Risk Management (www.risksociety.org.nz) and contributes to the Society's newsletter and activities.

Table of contents

Executive Summary

Existing risk estimation matrix

The existing Australian biosecurity risk estimation matrix does not meet best practice in that:

- it combines likelihoods with events and consequences
- it is opaque in describing how to combine likelihoods
- probability and likelihood seem to be confused even though they are distinct concepts
- sources for the indicative probabilities used in recent reports are not given
- the labels on the consequence and likelihood scales and risk level cells are very similar.

Recommendations

We **recommend** the Federal Department of Agriculture, Fisheries and Forestry matrix be redesigned as a simple consequence/likelihood matrix to overcome these deficiencies.

We further **recommend** the Senate Rural and Regional Affairs and Transport Committee encourages the Department of Agriculture, Fisheries and Forestry (DAFF) to develop the use of fault tree, event tree and bow-tie analyses and other techniques to help understand and show the nature of import risks. This should be done in combination with a redesigned consequence/likelihood matrix to help determine the level of risk.

In particular, use of bow-tie analysis will help demonstrate to stakeholders that all significant causes, consequences and controls have been considered before any decision is made to:

- reject a proposal
- accept a proposal subject to treatment of the risk at source, in transport or on arrival
- accept the proposal unconditionally.

Bow-ties might be supported by quantified fault tree or event tree analyses if the data is reliable but should be supported by a consequence/likelihood matrix to show the level of risk.

We believe this combination will give the “objective and defensible method of assessing the disease risks associated with the importation of animals, animal products, animal genetic material, feedstuffs, biological products and pathological material” sought by the Senate Rural and Regional Affairs and Transport Committee and other stakeholders and recommended by the World Trade Organization.

To aid transparency in import risk analysis and decision-making we **recommend** DAFF revises the *Import Risk Analysis Handbook* to include full details of techniques available to DAFF risk analysts and any underlying data or research validating those techniques.

We also **recommend** the revised *Import Risk Analysis Handbook* includes our draft *Import risk analysis effectiveness checklist* (Table 6 on page 25) developed to be an assurance tool demonstrating each import risk analysis meets the World Trade Organization criterion of a “objective and defensible” import risk analysis. This might be combined with the DAFF import risk analysis template that now seems to be in use.

Acknowledgements

Feedback on the first draft of this report has been provided by Senators and staff of RRAT. We have responded to all comments. We thank all who have provided responses and trust this report will contribute to improved biosecurity in Australia.

Research for this report has reinforced our belief there are conflicts and inconsistencies between key international biosecurity treaties and agreements. Some of those conflicts and inconsistencies have contributed to the problems highlighted by this report. DAFF may wish to raise those conflicts and inconsistencies with the relevant international agencies.

Abbreviations and definitions

In this report:

- “ALOP” means appropriate level of sanitary and phytosanitary protection
- “RRAT”, “you” and “your” means the Senate Rural and Regional Affairs and Transport Committee
- “CBG” means the Convention on Biological Diversity

- "DAFF" means the Australian Federal Department of Agriculture, Fisheries and Forestry
- "FAO" means the Food and Agriculture Organization of the United Nations
- "IPPC" means the International Plant Protection Convention
- "IRA" means import risk assessment
- "ISO" means the International Standards Organization
- "We", "our" and "us" means Risk Management Ltd
- "WOAH" means the World Organization for Animal Health
- "WTO" means the World Trade Organization.

Vocabulary of risk terminology

The meanings and definitions of risk terminology vary between treaties, agreements and standards. To help overcome this "Tower of Babel" problem we have appended at pages 33 to 37 definitions and their sources for terms used or referred to in this report.

Project method

Terms of reference

Our terms of reference were agreed to be to:

- Conduct a literature review covering:
  - earlier DAFF Biosecurity IRA documents published on the DAFF website or elsewhere;
  - any comparable Risk Estimation Matrices developed or used elsewhere;
  - published academic literature critiquing the design and use of matrices.
- Critique the DAFF Biosecurity Risk Estimation Matrix from an informed position.
- Develop and test alternative approaches to quantitative or semi-quantitative risk analysis, some using alternative matrices.
- Suggest risk analysis techniques that would enable DAFF Biosecurity to report more effectively on the nature of the risk.
- Report to the committee by an agreed date and attend a teleconference meeting/hearing at an agreed time.

To effect this we reviewed the following documents:

- the biosecurity risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process and as set out in four import risk analysis reports (Biosecurity Australia, 2006a, 2006b; DAFF, 2012a, 2012b)
- *Import Risk Analysis Handbook* (DAFF, 2011)
- international standard ISO 31000:2009. *Risk management – Principles and guidelines* (adopted in Australia and New Zealand as AS/NZS ISO 31000: 2009 SA/SNZ ISO, 2009)
- international standard ISO 31010: 2009 *Risk Management – Risk Assessment Techniques* (ISO, 2009a)
- draft joint handbook HB 89 *Risk management – Guidelines on risk assessment techniques* (SA/SNZ, 2011)
- Handbook HB 436 *Risk Management Guidelines: a companion to AS/SNZ 4360:2004* (SA/SNZ, 2004)
- World Trade Organization *Agreement on the application of sanitary and phytosanitary measures* (WTO, 1997)
- Food and Agriculture Organisation documents on food safety risk analysis (FAO, 1999, 2006, 2007)
- Terrestrial Animal Health Code (WOAH, 2012)
- academic journal articles sourced from the academic *Web of Science* and *Business Source Complete* databases used to better understand origins and applications of the risk matrix, common problems with risk matrices, and alternative approaches to quantitative or semi-quantitative risk analysis.

Arising from the reviews we developed graphical summaries of the:

- AS/NZS ISO 31000 risk management process
- WTO approach to risk analysis of sanitary and phytosanitary risks
- FAO approach to risk analysis
- WOAH approach to risk analysis.

This enabled a high-level critique of the overall DAFF approach to risk assessments and then a detailed critique of the DAFF biosecurity risk estimation matrix.

The detailed matrix critique included comparison of the matrix with guidance in the joint Australia/New Zealand Standards handbook HB 436 and handbook HB 89. This approach placed the DAFF biosecurity risk estimation matrix in the overall context of international treaties, codes, agreements and standards together with critical comment and guidance on the use of consequence/likelihood matrices used for risk analyses.

Processes for assessing or analysing risks

This report straddles two broad approaches and vocabularies for risk, how it is understood and how it is controlled.

The first broad area is the scientific and technical area of risk analysis as defined and described in a range of documents supporting the WTO *Agreement on the application of sanitary and phytosanitary measures*. Documents and risk analyses in this area are often used by biosecurity agencies considering a proposal to import some plant or animal product that may be exotic.

The second broad area covers organisations wishing to implement a risk management framework and a process for the management of risks. Documents and risk assessments in this area (AS/NZS ISO 31000 and ISO 31010:2009) are likely to be used by a wide range of organisations, including exporters and corporate functions in biosecurity agencies and to aid assessment and management of risks generally.

WTO requirements

Article 5 of the WTO *Agreement on the application of sanitary and phytosanitary measures* requires:

> "1. Members shall ensure that their sanitary or phytosanitary measures are based on an assessment, as appropriate to the circumstances, of the risks to human, animal or plant life or health, taking into account risk assessment techniques developed by the relevant international organizations.
>
> 2. In the assessment of risks, Members shall take into account available scientific evidence; relevant processes and production methods; relevant inspection, sampling and testing methods; prevalence of specific diseases or pests; existence of pest- or disease-free areas; relevant ecological and environmental conditions; and quarantine or other treatment.
>
> 3. In assessing the risk to animal or plant life or health and determining the measure to be applied for achieving the appropriate level of sanitary or phytosanitary protection from such risk, Members shall take into account as relevant economic factors: the potential damage in terms of loss of production or sales in the event of the entry, establishment or spread of a pest or disease; the costs of control or eradication in the territory of the importing Member; and the relative cost-effectiveness of alternative approaches to limiting risks.
>
> 4. Members should, when determining the appropriate level of sanitary or phytosanitary protection, take into account the objective of minimizing negative trade effects" (WTO, 1997).

The WTO gives no definition of risk but does define risk assessment as "the evaluation of the likelihood of entry, establishment or spread of a pest or disease within the territory of an importing Member according to the sanitary or phytosanitary measures which might be applied, and of the associated potential biological and economic consequences; or the evaluation of the potential for adverse effects on human or animal health arising from the presence of additives, contaminants, toxins or disease-causing organisms in food, beverages or feedstuffs" (WTO, 1997, p. 78). The disjunctive OR in line four has been emphasised to show the definition has two meanings.

Annex A of the WTO Agreement sets out definitions including the following reference.

> **"Annex A 3. International standards, guidelines and recommendations**
>
> (a) for food safety, the standards, guidelines and recommendations established by the Codex Alimentarius Commission relating to food additives, veterinary drug and pesticide residues, contaminants, methods of analysis and sampling, and codes and guidelines of hygienic practice;
>
> (b) for animal health and zoonoses, the standards, guidelines and recommendations developed under the auspices of the International Office of Epizootics;
>
> (c) for plant health, the international standards, guidelines and recommendations developed under the auspices of the Secretariat of the International Plant Protection Convention in cooperation with regional organizations operating within the framework of the International Plant Protection Convention; and

(d) for matters not covered by the above organizations, appropriate standards, guidelines and recommendations promulgated by other relevant international organizations open for membership to all Members, as identified by the Committee. [emphasis added]" (WTO, 1997, pp. 77-78).

Clause 3(d) seems to allow the International Standards Organization to be deemed to be "relevant" and its standards to be regarded as "appropriate". A brief review of the three specified sources and ISO 31000 (as AS/NZS ISO 31000) follows.

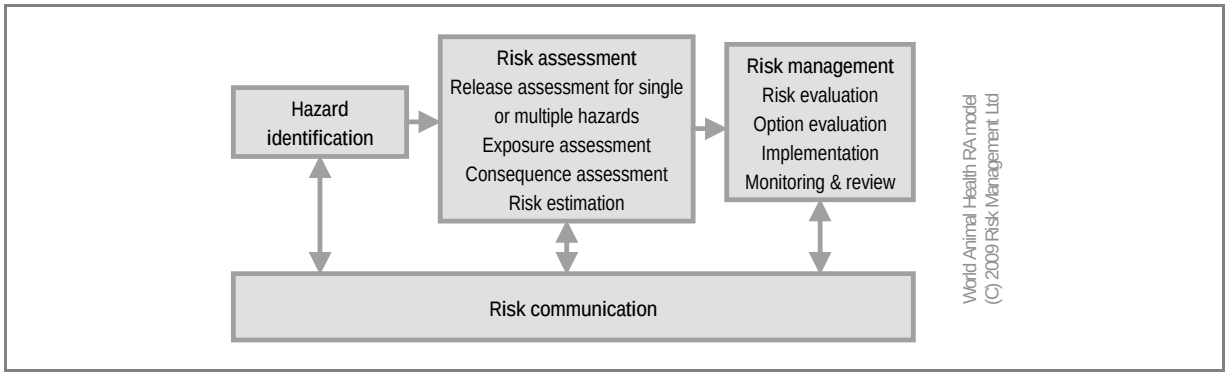
International Office of Epizootics

Chapter 2.1 of the *Terrestrial Animal Health Code* (WOAH, 2012) sets out an approach to risk analysis broadly compatible with the FAO *Food Safety Risk Analysis* with the following exceptions:

- hazard, risk, risk analysis and risk assessment are not defined
- the construction of paragraph 2.1.4 (risk assessment steps) is strongly aligned with the AS/NZS ISO 31000 risk management process (see Figure 1 below) but uses different language.

Figure 1 is adapted from WOAH figure 1 to show the relationship between the four components of WOAH-related risk analyses.

Figure 1. Graphical portrayal of the Terrestrial Animal Health Code risk analysis process



Adapted from *Terrestrial Animal Health Code* (WOAH, 2012)

International Plant Protection Convention

In the *International Plant Protection Convention* training documents risk is defined as the:

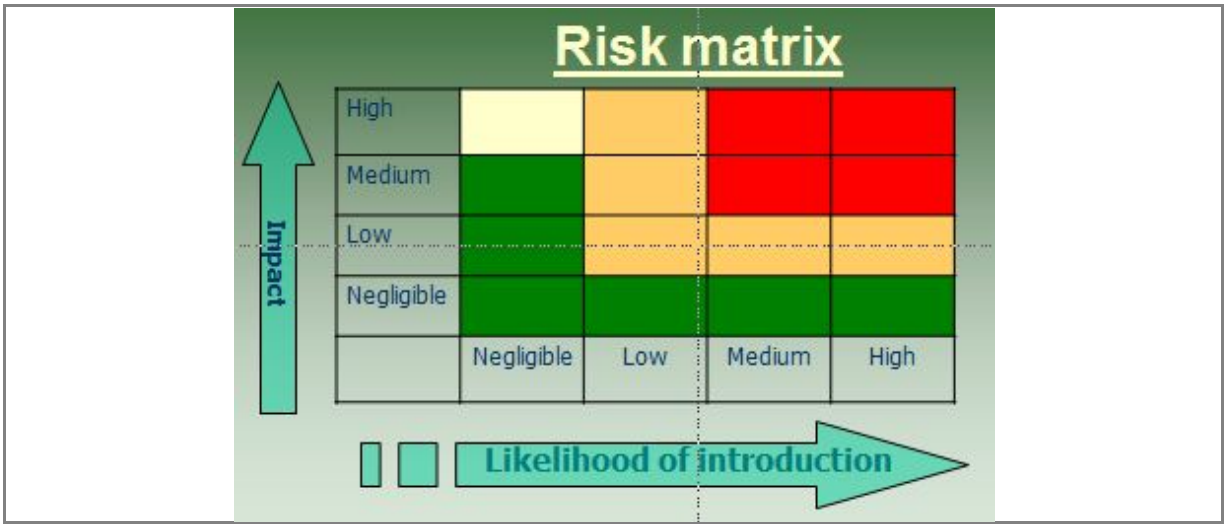
- likelihood of a stated impact
- likelihood of introduction of a pest and its consequences.

These are two distinct definitions of risk. The second definition mixes the likelihood of an event and the consequences of that event; this is not generally accepted usage.

These definitions also conflict with those in the IPPC *Glossary of phytosanitary terms* (IPPC, 2012) which defines pest risk (for quarantine pests) as the "probability of introduction and spread of a pest and the magnitude of the associated potential economic consequences" and (for non-quarantine regulated pests) as "the probability that a pest in plants for planting affects the intended use of those plants with an economically unacceptable impact". The glossary also provides definitions for other risk-related terms.

The IPPC training material was developed in 1998 and refers to qualitative risk descriptions using free text, standardised language and word scales. It also shows a 4x4 semi-quantitative matrix (shown in Figure 2 on the next page) combining likelihood and impact. Such a symmetrical matrix may not properly represent risk (which often is asymmetrical). Also, it uses identical labels on the X and Y scales potentially causing confusion for users.

Figure 2. IPPC risk matrix



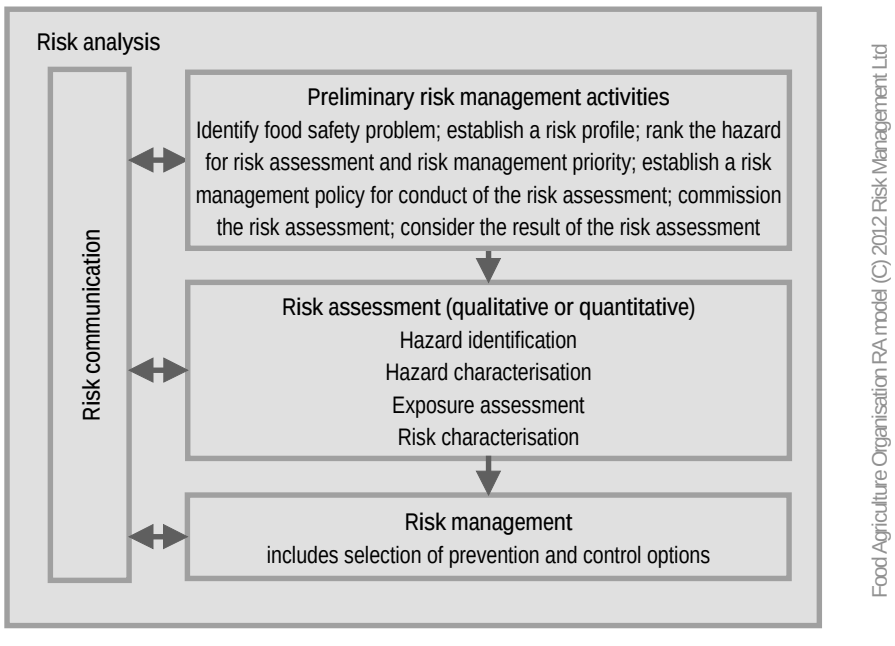
Codex Alimentarius Commission guidance

In the FAO *Food Safety Risk Analysis: A Guide for National Food Safety Authorities* (FAO, 2006) risk is defined as "a function of the probability of an adverse health effect and the severity of that effect, consequential to a hazard(s) in food".

> *"Preliminary risk management activities are taken to include: identification of a food safety problem; establishment of a risk profile; ranking of the hazard for risk assessment and risk management priority; establishment of risk assessment policy for the conduct of the risk assessment; commissioning of the risk assessment; and consideration of the result of the risk assessment" (FAO, 2007, p. 6 footnote 4,).*

Risk analysis is defined as "a process consisting of three components: risk assessment, risk management and risk communication" preceded by preliminary risk management activities. These stages are summarised in Figure 3 below.

Figure 3. Graphical portrayal of the FAO risk analysis process



Developed from *Food Safety Risk Analysis: A Guide for National Food Safety Authorities* (FAO, 2006)

Risk assessment is "a scientifically based process consisting of the following steps: (i) hazard identification, (ii) hazard characterization, (iii) exposure assessment, and (iv) risk characterization".

Risk characterization is “the process of determining the qualitative and/or quantitative estimation, including attendant uncertainties, of the probability of occurrence and severity of known or potential adverse health effects in a given population based on hazard identification, hazard characterization and exposure assessment”.

Risk management is “the process of weighing policy alternatives in the light of the results of risk assessment and, if required, selecting and implementing appropriate control options, including regulatory measures”.

Risk communication is “the interactive exchange of information and opinions concerning risk and risk management among risk assessors, risk managers, consumers and other interested parties”.

AS/NZS ISO 31000

ISO 31000:2009. *Risk management – Principles and guidelines* was adapted from the earlier joint Australia and New Zealand standard AS/NZS 4360:2004 *Risk management* which was developed from earlier editions in 1995 and 1999. On its publication, ISO 31000 was adopted in Australia and New Zealand and AS/NZS 4360 was withdrawn. ISO 31000 was recently recommended as the basis for regulatory frameworks by the United Nations Economic Commission for Europe, (UNECE, 2012).

Scope

The scope to AS/NZS ISO 31000 states it “provides principles and generic guidelines on risk management” that “can be used by any public, private or community enterprise, association, group or individual” and “is not specific to any industry or group”. The standard further states it can be applied to any type of risk, whatever its nature, whether having positive or negative consequences.

Definition of risk

The standard defines risk as the “effect of uncertainty on objectives”. It expands on this through five notes. One states risk is “often expressed in terms of a combination of the consequences of an event or a change in circumstances, and the associated likelihood of occurrence”. This is in contrast to the definition of risk sometimes used in import risk analysis (the likelihood or, sometimes, the probability of an event).

This difference is not one of semantics: a rare event may have very high consequences that are almost certain should the risk eventuate. Conversely, a frequent event might have low consequences that are rarely felt. Understanding the risk assessor’s definition of risk and whether it follows generally accepted practice is crucial to understanding the risk.

Another of the notes states that objectives “can have different aspects such as financial, health and safety, and environmental goals and can apply at different levels such as strategic, organisation-wide, project, product, and process”. This note strongly suggests the need to establish clear objectives for (in this case) risks associated with the control of exotic animal and plant imports.

A further note states risk “is often characterised by reference to potential events, consequences, or a combination of these and how they can affect the achievement of objectives”.

The fifth note explicitly refers to uncertainty as “the state, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequence, or likelihood”. This is a key issue in relation to risks associated with exotic animal and plant imports and also is found in each of the FAO, WOAH and IPPC documents.

Risk management process

The standard defines the risk management process (see Figure 4) as the “systematic application of management policies, procedures and practices to the tasks of communicating, establishing the context, identifying, analysing, evaluating, treating, monitoring and reviewing risk”.

This definition encompasses by explicit reference the tasks implicit in FAO, WOAH and IPPC documents on risk analysis/assessment.

Finally, it is noted the definition of risk assessment is “the overall process of risk identification, risk analysis and risk evaluation”. That is, risk assessment includes the risk analysis stage. This is in contrast to the FAO, WOAH and IPCC documents where risk analysis includes risk assessment. The WTO appears to define risk assessment to include risk analysis.

Figure 4. Main elements of the risk management process

Communication and consultation

Communicate and consult with internal and external stakeholders as appropriate at each stage of the risk management process and concerning the process as a whole.

Establishing the context

Establish the external, internal and risk management context in which the rest of the process will take place. Criteria against which risk will be evaluated should be established and the structure of the analysis defined.

Risk identification

Identify what, where, when, why and how something could happen.

Risk analysis

Identify and evaluate existing controls. Determine consequences and likelihood and hence the level of risk. The analysis should consider the range of potential consequences and how these could occur.

Risk evaluation

Compare estimated levels of risk against the pre-established criteria and consider the balance between potential benefits and adverse outcomes. This enables decisions to be made about the extent and nature of treatments required and about priorities.

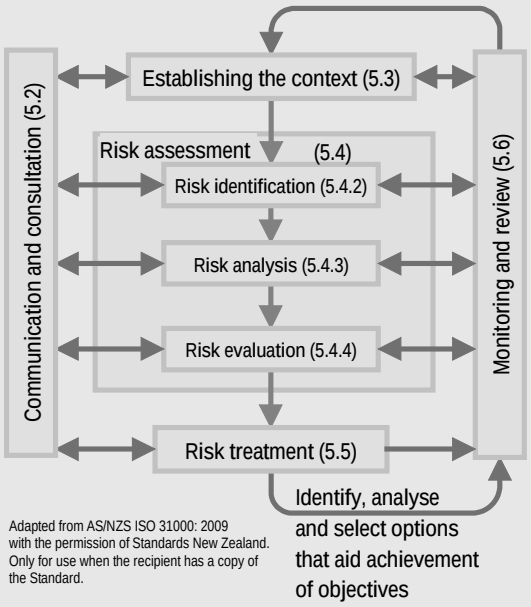
Risk treatment

Develop and implement specific cost-effective strategies and action plans for increasing potential benefits and reducing potential costs.

Monitoring and review

It is necessary to monitor the effectiveness of all steps of the risk management process. This is important for continuous improvement.

Risks and the effectiveness of control and treatment measures need to be monitored to ensure changing circumstances do not alter priorities.



Note: the numbers in the graphic refer to the paragraph numbers in AS/NZS ISO 31000:2009

Comparison of the documents

We have attempted to summarise the above review and other information in the following Table 1.

Table 1. Analysis of risk assessment documents		AS/NZS ISO 31000:2009	WTO Sanitary and phytosanitary measures	FAO Codex Alimentarius	Terrestrial Animal Health Code	International Plant Protection Convention
Planning step	Communicate and consult	✓	✓ Only refers to communication	✓ Only refers to communication	✓ Only refers to communication	✓ Only refers to communication
	Context • Internal	✓	(✓)	(✓)	(✓)	(✓)
	• External	✓	(✓)	(✓)	(✓)	(✓)
	• Risk management	✓			(✓)	
	• Criteria	✓			(✓)	
Risk assessment step	Identify	✓	✓	(✓)	✓	(✓)
	Analyse	✓ Places risk analysis in risk assessment Includes consideration of existing controls	✓ Places risk analysis in risk assessment	(✓) Places risk assessment and risk management in risk analysis	(✓) Places risk assessment and risk management in risk analysis	(✓) Places risk assessment and risk management in risk analysis
	Evaluate	✓	✓	(✓)	(✓)	(✓)
Risk control step	Treat unacceptable risks	✓	✓	✓	✓	(✓)
	Monitor and review	✓	✓		✓	
	Documentation	✓	✓	(✓)	✓	(✓)
Other comments		Places the risk management process in a risk management framework		Places risk analysis in an overarching framework for management of risk		
		Complemented by techniques set out in HB 89		Risk assessment covers hazard identification, hazard characterisation, exposure assessment and risk characterisation		

Notes to the table

Source: original table from Raz & Hillson (2005) with amendments by author 2008-2012. NB: the table is subject to review and revision to take account of recent versions of standards.

(✓) = implied or partial or different term used

HB 89: 2012 *Risk management – Risk assessment techniques* is a Standards Australia publication based on ISO 31010: 2009

Key differences

The main differences between AS/NZS ISO 31000 and the FAO, WOAH and IPPC documents are in the:

- definitions of risk, risk assessment and risk analysis, including use of the likelihood or probability of events or consequences
- reversal of use of risk assessment and risk analysis
- consultation is explicit in AS/NZS ISO 31000, and implicit in the FAO, WOAH and IPPC documents.

Common features

All the documents broadly follow the same process but only AS/NZS ISO 31000 makes this process explicit.

All the documents emphasise uncertainty and randomness in relation to causes, events, consequences and the likelihood of the consequences.

A common feature in the documents is the absence of any requirement for quantified risk analysis. The UK Health and Safety Executive has, for many years, been a leading agency for industrial risk assessments. In 1989 it published *Quantified risk assessment: its input to decision making*, giving a review of 16 case studies where quantified risk assessment had been used.

> "10. The Health and Safety Executive draws a number of conclusions from this paper. First, QRA is an element that cannot be ignored in decision making about risk since it is the only discipline capable, however imperfectly, of enabling a number to be applied and comparisons of a sort to be made, other than of a purely qualitative kind. This said, the numerical element must be viewed with great caution and treated as only one parameter in an essentially judgemental exercise. Moreover, since any judgement on risk is distributional, risks being caused to some, as an outcome of the activity of others, it is therefore essentially political in the widest sense of the word" [Emphasis added] (HSE, 1989, p. iv)

This succinctly summarises the care needed in developing and using a quantified risk matrix or any other quantitative risk analysis technique.

The definition of risk analysis

Only AS/NZS ISO 31000 defines risk analysis as a "process to comprehend the nature of risk and to determine the level of risk" and that "risk analysis provides the basis for risk evaluation and decisions about risk treatment". That is, the level of risk can only be determined if the nature of a risk is understood. While the FAO, WOAH and IPPC (and, possibly, WTO) documents call risk analysis risk assessment, they lack this clear requirement for understanding the nature of a risk before determining the level of risk.

For RRATC and DAFF it is critical this distinction, sequence and process for understanding the nature and then the level of risk are followed, a point we return to when reviewing a selection of DAFF import risk analyses.

Distinguishing the nature of risk and level of risk

AS/NZS ISO 31000 defines the level of risk as the "magnitude of a risk expressed in terms of the combination of consequences and their likelihood" but gives no definition for the "nature of risk". The word "nature" is defined in the Concise Oxford Dictionary (Soanes & Stevenson, 2009) as "the basic or inherent features, qualities, or character of a person or thing". Some simplified examples of the distinction between nature of risk and level of risk follow.

Driving on roads

A prudent driver will analyse the nature of risk and then determine the level of risk associated with driving under the prevailing conditions. Analysis of the nature of risks associated with driving would include local speed limits; time of day or night; weather conditions (clear visibility or fog; rain or dry weather); traffic density; uncertainty about hazards ahead; likelihood of pedestrians crossing the road; age and condition of the vehicle; condition of the road surface; age and experience of the driver. The combination of such factors will give an understanding of how uncertainty might affect the objectives of the driver, any passengers, the Police and other regulatory agencies and society generally.

Depending on the stakeholder, the nature of risk might be seen as:

- life safety (stakeholders are drivers and passengers)
- regulatory (stakeholders are the Police)
- road safety policy (stakeholders are politicians)
- economic (stakeholders are motor vehicle insurers).

Each stakeholder will analyse the level of risk differently in terms of the types of consequences that might be felt and the likelihood of those consequences.

Adequacy of river catchments to supply water users

Risks associated with the adequacy of water supplies abstracted from river systems and associated catchments are of increasing concern. Analysis of the nature of risks would include: minimum flows to preserve future supplies and protect natural ecosystems; flooding following exceptional rainfall; quality of water required for public health, agricultural and horticultural purposes; current and likely demand for public health, agricultural and horticultural purposes; rainfall trends and patterns under current and credible climatic conditions; societal preferences. The combination of such factors will give an understanding of how uncertainty might affect the objectives of all stakeholders in river systems.

Depending on the stakeholder, the nature of risk might be seen as:

- economic (stakeholders are farmers and others whose livelihoods depend on irrigation)
- recreational (stakeholders are “boaties” and anglers)
- environmental (stakeholders are environmentalists)
- engineering (stakeholders are drainage engineers).

Each stakeholder will analyse the level of risk differently in terms of the types of consequences that might be felt and the likelihood of those consequences.

Biosecurity controls at airports

Travellers arriving at Australian airports may carry with them biological materials posing biosecurity risks. Analysis of the nature of risks would include: countries visited; nature of places visited in each country (eg, farms or forests); pests or pathogens credibly present in those places; credible impact on species and ecosystems in Australia; materials declared by the traveller; materials detected by scanning. The combination of such factors will give an understanding of how uncertainty might affect the objectives of all stakeholders in border biosecurity.

Depending on the stakeholder, the nature of risk might be seen as:

- biosecurity (stakeholders are biosecurity officials, environmentalists, and those whose livelihoods depend on the absence of imported pests)
- cultural (stakeholders are travellers wishing to bring with them materials from their home countries)
- recreational (stakeholders are Australian residents returning from an overseas trip).

Each stakeholder will analyse the level of risk differently in terms of the types of consequences that might be felt and the likelihood of those consequences.

In the above examples, each stakeholder may be satisfied with the description of the nature of risk but will be concerned to know appropriate emphasis is placed on the quantitative or semi-quantitative analysis of the level of risk.

When developing a consequence/likelihood matrix it is most important to show consequence ranges with points that map against each other. This is far easier said than done.

Data for the nature and level of risk

It is important to keep clear the distinction and background information used for the nature of risk and level of risk.

The nature of risk may be highly qualitative but informed by some quantitative data whereas the level of risk may be more quantitative with some qualitative data. For an import risk analysis we would

expect DAFF to use a report template constructed to at least consider relevant information to be used in describing the nature of the risk. This template should form part of the DAFF *Import Risk Analysis Handbook*. This qualitative data might also provide quantitative data to be used in determining the level of risk.

Our review of the most recent import risk analyses suggests DAFF is indeed using such a template or model. If this is the case, it is likely DAFF import risk analyses are providing the "best available information" [1] for the nature of import risks. However, they do not "explicitly address uncertainty" [2] in the development and use of the matrix.

We have been asked if the import risk analyses are adequately addressing risks for species or crops other than the subject of the import risk analysis. We are unable to answer this question as it is outside our competence and the terms of reference for this report but do recognise this is an important question meriting further investigation.

[1] Principle (f), page 7, AS/NZS ISO 31000. "Risk management is based on the best available information".
[2] Principle (d), page 7, AS/NZS ISO 31000. "Risk management explicitly addresses uncertainty"

Risk matrix literature review

Origins and applications of the risk matrix

The risk matrix has been in use for many years and in many forms. Ale (2007) credited Napoleon with the first use of a risk matrix based on the likelihood of consequences; Witt (1973) used a form of two-dimensional risk matrix to analyse motor vehicle premium setting; while Hussey (1978) described a two-dimensional directional policy matrix to aid decision-making.

The consequence/likelihood risk matrix appears to have been applied in the safety sciences in the late 1980s in the UK with simple versions being described in 1991 in a UK Institution of Occupational Health and Safety conference in Belfast[3] and by Moore (1997) and others in the 1990s.

An approach to three-dimensional risk matrices with consequences, probability and time was developed by Antoniadis & Thorpe (2003). Their approach was not well-described but offers an alternative way of developing import risk assessment matrices to show the speed with which an unwanted organism might spread from a point of escape.

Advantages, disadvantages and errors

The main advantages of risk matrices are that they (Cox, 2008; Franks, Whitehead, Crossthwaite, & Smail, 2002; Julian, 2011; Middleton & Franks, 2001; SA, 2012):

- enable the combination of likelihood and consequences to be represented graphically (eg, bubble charts)
- are an easily understood representation of different levels of risk
- enable decision-makers to focus on the highest priority risks with some consistency
- enable quick ranking and comparison of risks for attention
- can be compiled relatively quickly
- promote discussion in risk workshops.

However, the disadvantages of matrices include that they:

- lack granularity (eg, a five-point scale cannot represent a wide range of consequences and their likelihoods)
- often are designed without reference to the risk profile of the organisation or risks being reviewed
- often use uncertain, opaque or obscure design data
- may tempt users to under- or over-state the consequences or their likelihood, resulting in incorrect analysis of the level of risk.

Bahill & Smith (2009) discussed use of a frequency/severity graph and showed how it could portray curved graphs using linear scales or straight lines using log scales. They also showed how care needed to be taken to use appropriate risk frequency and severity scales to avoid misrepresenting the level of risk or giving a false picture to decision-makers. Bahill & Smith also argued:

> "The data used in a risk analysis have different degrees of uncertainty: some of the values are known with precision, others are wild guesses; however, in addition to uncertainty, all data have opportunity for errors".

This is a key criticism of risk matrices: they are often portrayed or interpreted as a scientific tool because they contain numbers, even though the input numbers contain unstated uncertainties – even "wild guesses". Some of those uncertainties may be back-of-an-envelope calculations, estimates or guesses made when the matrix was being developed. It therefore is crucial the designer of a matrix states the assumptions and uncertainties in a matrix, especially if a matrix is to be used in regulatory work.

Cox (2008), in an exhaustive review of matrices, concluded his theoretical results generally showed quantitative and semi-quantitative risk matrices have limited ability to correctly reproduce the risk

[3] Personal communication, Hani Raffart, 1991

ratings implied by quantitative models. This is a key theoretical finding that strongly supports our empirical finding – risk matrices are an overrated way of analysing the level of risk.

Errors in design

While a risk matrix apparently provides a simple mechanism for analysing the level of individual risks, the design is prone to error and the application may give rise to false certainties. Figure 5 shows an example of a consequence/likelihood matrix used in the following discussion.

Figure 5. Example of a consequence/likelihood matrix

Likelihood →					
	Medium	High	High	Extreme	Extreme
	Medium	Medium	High	Extreme	Extreme
	Low	Medium	Medium	High	Extreme
	Low	Low	Medium	High	Extreme
	Negligible	Low	Medium	High	Extreme
	Consequences →				

Cox (2008) demonstrated why a matrix should not use too many colours or labels to represent levels of risk. Three colours (eg, red, yellow and green) or levels seemed a minimum and five a maximum. Thus, Figure 5 is at the limits of reliable matrix design.

Smith, Siefert, & Drain (2009) carried out a cross-disciplinary examination of the risk matrix and showed it is prone to design errors arising from cognitive biases in designers. They used Prospect Theory (Kahneman & Tversky, 1979) to show how framing effects can distort placement of matrix reference points (boundaries between cells).

They also showed matrix-users will tend to place consequence/likelihood combinations on a line drawn diagonally from bottom left to top right. This results in the bottom right cell (high consequences, low likelihood) being under-used.

Smith, Siefert, & Drain also referred to the problem of underrating probabilities in the design and use of matrices. Records may show a specified type of event has a known frequency but matrix designers are unaware of it. This results in misjudgement of the consequence and likelihood scales. Similarly, matrix users may lack necessary knowledge of events, their consequences and the likelihood of the consequences.

Inappropriate use of the matrix

The granularity of the consequence and likelihood scales may be inadequate to do more than give an indication of the level of a risk. For example:

- the boundary between two financial consequences might be $100,000; inexperienced risk assessors may be tempted to analyse a negative consequence as less than $100,000 or estimate a positive consequence as greater than $100,000
- when considering the likelihood of such consequences, inexperienced risk assessors may misremember or never have heard of such a negative consequence or be anxious that a project goes ahead.

Such inaccuracies might place a risk in any group of four contiguous cells in Figure 5. Depending on the selected consequence and likelihood points, this could give a levels of risk of:

- extreme, high, or medium
- high or medium
- medium or low
- low or negligible.

Evans (2012) argued that individual people have different risk tolerances. This can further distort how a matrix is used: people with low risk tolerance will over-rate a risk having negative consequences while those with higher risk tolerance will under-rate it.

Guidance in HB 89: 2012 *Risk management – Risk assessment techniques* (SA, 2012) describes the matrix as a screening tool and Donoghue (2001) describes the design of qualitative and semi-quantitative matrices to aid operational decision-making after walk-through inspections. Other authors of the articles reviewed for this paper consistently refer to the use of the matrix as a tool for ranking risks for urgency of attention.

Inappropriate quantification

Often, attempts are made to quantify a matrix by allocating scores to the consequence and likelihood scales. This might be done in Figure 5 using a linear scale (1, 2, 3, 4, 5) resulting in a range of scores from 1 (1 x 1 = 1) to 25 (5 x 5 = 25). However, these results would not match the descriptions used for the cells: the cell in the bottom right-hand corner scores 1 x 5 = 5 but is rated as extreme.

A matrix designer might try to avoid this issue by inserting a numeric risk score in each cell, resulting in a perfectly symmetrical matrix. Risk is rarely symmetrical and such a matrix would conceal events resulting in high-consequence, low-likelihood outcomes.

A matrix designer might attempt to apply asymmetrical consequence and likelihood values. For this to be a valid approach the designer would need a substantial body of data on which to base the chosen values. Such a database would take time to build and might use, for example:

- historical data related to an environment that has changed, and so give false results
- incomplete data, giving rise to uncertainty
- data under-reported by those responsible for an adverse loss, giving rise to uncertainty about “washed” data
- data reported by people on the “winning team”, giving rise to uncertainty due to over-stated results
- use of data from the context of one risk that is not relevant to the context of another.

“Layering “

Further problems arise when designers attempt to reduce the apparent uncertainties in a matrix by “layering” either qualitative or quantitative pre-test questions leading to the use of a matrix. These also are subject to framing errors and designer bias, so introducing hidden uncertainties including the “probability of a probability”.

Summary

Matrices are too often poorly designed and incorrectly interpreted. If they are to be used, they must be simple, based on relevant data, used following a clear understanding of the nature of a risk, and with their limitations understood by risk assessors and decision-makers.

Review of the DAFF matrix

We note the *Import Risk Analysis Handbook* does not mention, let alone describe the use of, the DAFF risk estimation matrix. If the matrix is to be seen as a valid risk technique, capable of withstanding legal scrutiny, its development and application ought to be the subject of a detailed description.

To conduct the following review of the DAFF risk matrix we needed to see its use in the context of the overall import risk analysis. That in turn needed to be set in the context of the language and requirements in WTO, FAO, WOAH and IPPC documents.

The context of the WTO, FAO, WOAH and IPPC documents was covered earlier in this report. We now briefly review the DAFF import risk analysis process using published documents setting out the intended approach and the approach used in some examples.

DAFF risk estimation matrix

The matrix

We took account of the findings of our literature review and the ALOP statement above when reviewing the DAFF risk estimation matrix shown in the New Zealand apples report (Biosecurity Australia, 2006a), Taiwan Fresh Mangoes report (Biosecurity Australia, 2006b), provisional final import report for fresh ginger from Fiji (DAFF, 2012a) and Malaysian pineapples report (DAFF, 2012b).

The Malaysian pineapples report was the most recent finalised report available to review (DAFF, 2012b) and an extract showing the application of the DAFF matrix has been reproduced in appendix 2 of this report.

We have reproduced below the standard DAFF matrix as used in each of the import risk analysis reports reviewed by us (Biosecurity Australia, 2006a, 2006b; DAFF, 2012a, 2012b). The one shown in our Figure 6 is table 2.5 extracted from the Malaysian pineapples report.

Figure 6. DAFF risk estimation matrix

Table 1: Risk estimation matrix

Likelihood of entry, establishment or spread	*Negligible impact*	*Very low*	*Low*	*Moderate*	*High*	*Extreme impact*
High likelihood	Negligible risk	Very low risk	Low risk	Moderate risk	High risk	Extreme risk
Moderate	Negligible risk	Very low risk	Low risk	Moderate risk	High risk	Extreme risk
Low	Negligible risk	Negligible risk	Very low risk	Low risk	Moderate risk	High risk
Very low	Negligible risk	Negligible risk	Negligible risk	Very low risk	Low risk	Moderate risk
Extremely low	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

Consequences of entry, establishment or spread

Source: Biosecurity Australia (2006a, 2006b) & DAFF (2012a, 2012b)

Overall design of the matrix

The matrix is a 6x6 matrix. This is a little unusual but quite acceptable for risks with an especially wide range of consequences and associated likelihoods. However, and while we are not specialists in biosecurity, we feel intuitively a 6x6 matrix is larger than might be needed for import risk analyses. It may be possible to redesign and simplify the DAFF matrix to a 5x5 matrix. On page 23 we have suggested what this might look like.

Labelling of the matrix

In the matrix the X axis is for the consequences of entry, establishment or spread whereas the Y axis is labelled likelihood of entry, establishment or spread. While this difference may seem subtle and of small importance it is actually of considerable importance. For example:

- there is a negligible likelihood of foot and mouth disease entering Australia
- there is a high likelihood that extreme consequences would follow foot and mouth disease entering Australia.

Both statements are true and, confusingly, each could be made by using the DAFF matrix.

Unreliability of qualitative descriptors

Since presenting the first draft of this report we have located further evidence of the unreliability of qualitative descriptors for likelihood such as those used in table 2.1 of the Malaysian pineapples report, table 2.1 of the Fiji ginger report and table 12 of the New Zealand apples report (reproduced below as Table 2).

We note table 2.1 in the Fiji ginger report and table 12 of the NZ apples report include probability ranges; these were not given in other reports. The NZ apples also report gave midpoints of the ranges; these were not included other report. The indicative probability ranges and midpoint probabilities are shown in Table 2.

Table 2. Nomenclature for qualitative likelihoods

Column 1	Column 2	Column 3	Column 4
Likelihood	**Descriptive definition**	**Indicative probability (P) range**	**Midpoint (if uniform distribution used)**
High	The event would be very likely to occur	$0.7 < P \leq 1$	0.85
Moderate	The event would occur with an even probability	$0.3 < P \leq 0.7$	0.5
Low	The event would be unlikely to occur	$0.05 < P \leq 0.3$	0.175
Very low	The event would be very unlikely to occur	$0.001 < P \leq 0.05$	0.026
Extremely low	The event would be extremely unlikely to occur	$0.000001 < P \leq 0.001$	0.0005
Negligible	The event would almost certainly not occur	$0 \leq P \leq 0.000001$	0.0000005

Source: table 2.1, DAFF (2012a) and column 4 from Biosecurity Australia (2006a)

As described by a then-senior Central Intelligence Agency officer, Sherman Kent, (Kent, 2007), qualitative likelihood descriptors and definitions are prone to wide interpretation. Kent wrote the following in a now-declassified 1964 article, available on the CIA website.

> "A few days after the estimate appeared, I was in informal conversation with the Policy Planning Staff's chairman. We spoke of Yugoslavia and the estimate. Suddenly he said, "By the way, what did you people mean by the expression `serious possibility'? What kind of odds did you have in mind?" I told him that my personal estimate was on the dark side, namely, that the odds were around 65 to 35 in favor of an attack. He was somewhat jolted by this; he and his colleagues had read "serious possibility" to mean odds very considerably lower. Understandably troubled by this want of communication, I began asking my own colleagues on the Board of National Estimates what odds they had had in mind when they agreed to that wording. It was another jolt to find that each Board member had had somewhat different odds in mind and the low man was thinking of about 20 to 80, the high of 80 to 20. The rest ranged in between".

The same issues arose following publication of the 2004 draft New Zealand apples report.

> "The approach used in the 2004 draft was to assign descriptive terms to quantitative ranges, ('high', 'moderate', 'low', etc). These terms were used throughout the text to represent these quantitative ranges. However, this caused some confusion with some stakeholders applying their own interpretation to the terms rather than the meanings set out in the methodology. In order to overcome this problem, in the revised draft and this final IRA, the descriptive terms are only used for qualitative values. Numbers are given for quantitative values" (Biosecurity Australia, 2006a, p. 42).

Such variations in interpretation have led to a body of research on judgement indicating there are large differences in the way people understand phrases such as those in Table 2 above and that may lead to confusion and errors in communication. Research by Budescu, Broomell, & Por (2009) examined interpretations of likelihood terms used by the Intergovernmental Panel on Climate Change (IPCC) to communicate uncertainty. The terms use a set of probabilities accompanied by global interpretational guidelines. The research found respondents' judgments deviated significantly from the IPCC guidelines, even when the respondents had access to these guidelines.

From this research and our experience we find it likely that DAFF risk analysts may place their own interpretations on the words used in table 2.1 of the Malaysian pineapple report (DAFF, 2012b) and other DAFF/Biosecurity reports. In making this statement we are aware the word *likely* is, itself, open to interpretation. We therefore suggest there is an 80% probability of idiosyncratic [4] interpretation of the DAFF nomenclature for qualitative likelihoods. This probability might be revised following research within DAFF.

Entry, establishment and spread as causes of an event

The methodology described in the Malaysian pineapples report sets out the matrix methodology including the probability of entry (broken into import and distribution), establishment and spread. These are referred to as "events" in table 2.1 *Nomenclature for qualitative likelihoods* in the DAFF report (see Table 2 on the previous page) but the term event is not defined in relevant WTO, FAO, WOAH and IPPC documents.

AS/NZS ISO 31000 defines event as an "occurrence or change of a particular set of circumstances.

> Note 1 An event can be one or more occurrences, and can have several causes.
>
> Note 2 An event can consist of something not happening.
>
> Note 3 An event can sometimes be referred to as an 'incident' or 'accident'.
>
> Note 4 An event without consequences can also be referred to as a 'near miss', 'incident', 'near hit' or 'close call'".

We believe establishment is better thought of as an *occurrence* or *change in specific circumstances* while entry, import and distribution are *causes* of establishment. This then enables more clarity in describing the nature of risk.

Consequence is defined in AS/NZS ISO 31000 as the "outcome of an event affecting objectives.

> Note 1 An event can lead to a range of consequences.
>
> Note 2 A consequence can be certain or uncertain and can have positive or negative effects on objectives.
>
> Note 3 Consequences can be expressed qualitatively or quantitatively.
>
> Note 4 Initial consequences can escalate through knock-on effects".

Event or consequence?

The construction of the DAFF matrix method seems to suggest it is based on the likelihood of an event. If this is so, the approach is wrong. Risk is the likelihood of the consequences of an event, not likelihood of an event. It is important to try to understand both the causes of an event and the event giving rise to the consequences, but it is essential to keep these distinctions clear.

[4] Idiosyncratic: a mode of behaviour or way of thought peculiar to an individual (Soanes & Stevenson, 2009).

Probability and likelihood

The methodology refers to qualitative likelihoods for the probabilities. The terms probability and likelihood are often used interchangeably but they are not the same. Probability is a "measure of the chance of occurrence expressed as a number between 0 and 1, where 0 is impossibility and 1 is absolute certainty" (ISO, 2009b) whereas likelihood is the "chance of something happening". That said, likelihood may be "defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically (such as a probability or a frequency over a given time period)" (SA/SNZ ISO, 2009).

If the term probability is used it should be expressed numerically, with uncertainty about the accuracy of the numbers clearly stated. If the term likelihood is used, it should be described in terms such as "almost certain" or "almost incredible" leaving no doubt there is uncertainty.

Combination of qualitative likelihood terms

Table 2.2 in the Malaysian pineapples report (and other DAFF reports) sets out rules for combining descriptive likelihoods. No rationale or source for these rules is given, making the rules opaque and difficult to comment on. They appear to be the result of combining probabilities and so may be based on logic. If this is the case, DAFF officials should be able to explain it.

However, the need for that table 2.2 only exists if a risk analyst needs to estimate the qualitative likelihood of three events giving rise to the likelihood of a specified consequence. This is not good risk analysis practice and is not necessary if *establishment* of a pest is seen as an *event* or *change in specific circumstances* while *entry*, *import* and *distribution* are *causes* of *establishment*.

The Fijian ginger report includes indicative probabilities (see our Table 2 above) so it is possible DAFF has been using probabilities in earlier reports but without disclosing them. We therefore used the indicative probability ranges from the Fijian ginger report and combined the highest numerical probabilities indicated in Table 2 and show the results in Table 3 below. The calculations were repeated for the lowest numerical probabilities and the results are shown in Table 4.

The results from Table 3 tend to support the earlier use of probabilities by DAFF in that most of the highest probabilities combine to support the likelihood labels (18/21). However, somewhat less of the lowest probabilities combine to support the likelihood labels (15/21). Overall, it is likely the rules for combining qualitative likelihoods are based on probabilities. This leaves unanswered the question:

> "What is the source of the probability ranges?"

It is good practice to cite a source for such probability ranges. The best source would be peer reviewed published in a scientific journal but in-house research might also give assurance to decision-makers and provide a defensible position.

Table 3. Combination of highest probabilities for events

		High	Moderate	Low	Very low	Extremely low	Negligible
		≤1	≤0.7	≤0.3	≤0.05	≤0.001	≤0.000001
High	≤1	≤1	≤0.7	≤0.3	≤0.05	≤0.001	≤0.000001
Moderate	≤0.7	-	≤0.49	≤0.21	≤0.035	≤0.0007	≤0.0000007
Low	≤0.3	-	-	≤0.09	≤0.0015	≤0.00003	≤0.00000003
Very low	≤0.05	-	-	-	≤0.0025	≤0.00005	≤0.0.00000005
Extremely low	≤0.001	-	-	-	-	≤0.000001	≤0.000000001
Negligible	≤0.000001	-	-	-	-	-	≤0.0000000000001

Table 4. Combination of lowest probabilities for events

		High	Moderate	Low	Very low	Extremely low	Negligible
		0.7	0.3	0.05	0.001	0.000001	0
High	0.7	0.49	0.21	0.035	0.0007	0.0000007	0
Moderate	0.3	-	0.09	0.015	0.0003	0.0000003	0
Low	0.05	-	-	0.0025	0.00005	0.00000005	0
Very low	0.001	-	-	-	0.000001	0.000000001	0
Extremely low	0.000001	-	-	-	-	0.0000000000001	0
Negligible	0	-	-	-	-	-	0

Use of the matrix in practice

Applying the rules for combining qualitative likelihoods can give some apparently strange results. For example, combining two qualitative *low* likelihoods gives a *very low* likelihood. However, *low* has a maximum indicative probability of 0.3 in the Malaysian pineapples report and 0.3 x 0.3 = 0.09. The resulting 0.09 is within the *low* range of indicative probabilities: should a risk analyst determine the probability is *low* (based on the indicative probabilities) or *very low* (based on the rules for combining qualitative likelihoods)?

This is of some importance as *very low* is the Australian Government ALOP and a *low* risk would not be acceptable whereas a *very low* risk would be acceptable.

This has the potential to lead to litigation following refusal to allow entry of a *low risk* commodity when a slightly different analysis might have shown it to be a *very low* risk commodity.

A further problem is that 0.3 is the top of the *low* range and bottom of the *moderate* range. If a risk analyst determined the probability of an event was 0.3 should they name it *low* or *moderate*?

It also is evident consequence scale labels cause confusion because they either are the same as the likelihood scale labels or very similar. See our Figure 6 above; in that graphic, a person using the matrix finds the words:

- extreme (impact, consequence or level of risk?)
- high (consequence, level of risk or likelihood?)
- moderate (consequence, level of risk or likelihood?)
- low (consequence, level of risk or likelihood?)
- very low (consequence, level of risk or likelihood?)
- negligible (consequence, level of risk or likelihood?).

This has the potential to be confusing for discussions between risk analysts, decision-makers and other stakeholders and does not meet good matrix design practice. Distinctive words or letter/number combinations should be used. See, for example HB 436 (SA/SNZ, 2004) and HB 89 (SA, 2012) published by Standards Australia.

Changes in trade following import approval

Any import risk analysis should consider the foreseeable volume and duration of trade. In the Fijian ginger report DAFF considered “if all other conditions remain the same, the overall likelihood of entry will increase as time passes and the overall volume of trade increases” and “DAFF Biosecurity assumed that a substantial volume of trade will occur” (DAFF, 2012a, p. 9 and 10). This may not always be true for a number of reasons, including changes in consumer preferences, “buy-Australia” campaigns and natural disasters in the exporting country.

However, assuming the DAFF view to be correct, no risk matrix can do more than reflect the level of risk for specified circumstances arising from analysis of the nature of risk at one point in time.

An import risk analysis might use several matrices representing the likely level of risk at future times. Each would be based on the assumptions stated in the description of the nature of the risk. For example, DAFF might report as follows:

> *Our IRA for the first 12 months of import shows the nature of risk to be XXX [the body of evidence inserted here]. Arising from this and using risk matrix X the level of risk is estimated to be [insert label or number].*
>
> *However, to the end of year 5, trade is likely to have increased by Z% changing the nature of risk to YYY [the additional body of evidence inserted here]. Arising from this and using risk matrix Y the level of risk is estimated to be [insert label or number].*

The analysed levels of risk shown in each of a series of matrices might in turn be graphed to show change over time within ranges. This might be of value to decision-makers assuming the context of the proposed export remains the same over that time. Given the uncertainties around the matrix such a graph would need to be clearly tagged with assumptions and uncertainties.

Appropriate level of sanitary and phytosanitary protection (ALOP) and risk criteria

When deciding if a risk is acceptable it is necessary to have some way of evaluating the risk, after analysis, to decide if the level of risk is above or below pre-determined criteria.

In the NZ apples report (Biosecurity Australia, 2006a, p. 4) the matrix is introduced by the phrase

> "ALOP can be illustrated using a 'risk estimation matrix' (see Table 1)".

This is followed by a copy of the matrix. There is a brief discussion in the report of a claim by a stakeholder that the matrix did not represent government policy on ALOP, but this was rejected by Biosecurity Australia. As the matrix was not supported by any description of the underlying analytical work that precedes use of the matrix this might not have been a defensible rejection.

To try to compare the generic management of risk described in AS/NZS ISO 31000 and the WTO, FAO, WOAH and IPPC documents we have considered what ALOP can be equated with, and believe it is close to the concept of "risk criteria".

The term risk criteria is defined in AS/NZS ISO 31000 as the "terms of reference by which the significance of risk is assessed.

> Note 1 Risk criteria are based on organizational objectives, and external and internal context.
>
> Note 2 Risk criteria can be derived from standards, laws, policies and other requirements".

For import risk analysis, organisational objectives will be the objectives of the Australian Government, as expressed in legislation and standards, laws, policies and other requirements.

The Biosecurity Australia *Import Risk Analysis Handbook* states:

> "Like many other WTO Members, Australia expresses its ALOP in qualitative terms.
>
> The Australian Government, with the agreement of all state and territory governments, has expressed Australia's ALOP as providing a high level of sanitary and phytosanitary protection aimed at reducing risk to a very low level, but not to zero" (DAFF, 2011, p. 33).

This strongly suggests import risk analysis should also be in qualitative terms, although some quantification may be possible and useful if the data is reliable.

It also allows for an "ALOP line" to be drawn across a matrix to indicate acceptable and unacceptable levels of risk. Such a line may be straight or curved; in the DAFF matrix it is a straight line.

Consequence scales – geographical impacts

The methodology in the DAFF matrix describes the assessment of consequences. Four levels of consequence are considered for four levels of Australian community, *viz*:

> *"Local: an aggregate of households or enterprises (a rural community, a town or a local government area).*
>
> *District: a geographically or geopolitically associated collection of aggregates (generally a recognised section of a state or territory, such as 'Far North Queensland').*
>
> *Regional: a geographically or geopolitically associated collection of districts in a geographic area (generally a state or territory, although there may be exceptions with larger states such as Western Australia).*

National: Australia wide (Australian mainland states and territories and Tasmania)" (DAFF, 2012a).

The four levels of consequence are, as shown, reasonable but may apply to any size of community. For example, a small community might be a major contributor to the regional or national economy. As shown, such a contribution might be understated. The reverse might be true with a pest having trivial national impacts felt catastrophically at a local level.

This problem can be overcome by developing consequence scales based on, for example, national GDP, percentage of national crop at risk, or viable planting area at risk.

Does the matrix overstate or understate the level of risk?

It is possible the rules for combining qualitative likelihoods either overstate or understate the level of risk in some cases. As noted, the rules are opaque with no source cited and therefore leave in doubt their reliability.

Two of the reports provide indicative probability ranges. These would be most helpful if their sources were cited; we are again left with doubt about the provenance and reliability of the indicative probabilities. Furthermore, our calculations (Table 3 and Table 4 above) suggest that some indicative probability range combinations may give results that breach the DAFF rules for combining qualitative likelihoods.

Overall, combining the likelihoods and/or their indicative probabilities may either overstate or understate the level of import risk.

Is there increased biosecurity risk arising from use of the matrix?

From our response to the previous question, the simple answer might be yes. However, we have re-read the four IRA reports and been impressed with the qualitative analyses and their summary risk evaluations. In the Fijian ginger report there is a very clear link between the qualitative nature of risk descriptions and selected likelihood description. We also specifically note the 2006 NZ apples report used a more quantitative approach making more transparent the analysed levels of risk for each pest.

Thus, it seems likely the DAFF IRA approach is sound up to the use of the matrix and rules for the combination of qualitative likelihoods. In this part of the risk analysis there is the possibility of increased biosecurity risk.

The converse may also be true: the matrix may be overstating the level of biosecurity risk.

DAFF matrix design solutions

Can the DAFF matrix be improved? The answer is a guarded "yes" as the matrix requires major redesign to be a true consequence/likelihood matrix.

Risk perception

To improve the design of the matrix DAFF risk analysts need to know and understand the perception of risk in DAFF and external stakeholders, including RRAT.

Risk perception is defined in the ISO *Risk Management Vocabulary* (ISO, 2009b) as "the stakeholder's view on a risk" and "reflects the stakeholder's needs, issues, knowledge, belief and values".

Risk perceptions of external stakeholders may be intuitive feelings, based on media reports (Slovic, 2000). Some stakeholders may believe that levels of risk are increasing whereas the reverse may be the case. DAFF risk analysts need to understand the risk perceptions of external stakeholders as distinct from their professional perception of risk.

In Australia, public perceptions of biosecurity risks may be shaded by, for example, environmental damage caused by the release of wild rabbits in the 1800s and the harm caused by cane toads. Or there may be a proposal to import from overseas an exotic species or a species already in Australia that can carry some disease or pest (for example, the recent change to allow imports of European rabbits that might carry epizootic rabbit enteropathy).

Such risk perceptions should be incorporated into risk criteria used to analyse the consequences of a given import risk.

Generic scales

Scales relevant to the consequences of the risk event and the likelihood of those consequences should be developed by DAFF. The best source of unbiased guidance on this is the now out-of-date joint Standards Australia/Standards New Zealand handbook HB 436 (SA/SNZ, 2004, pp. 50-57) [5].

DAFF risk analysts should submit their proposed consequence and likelihood scales and matrix to senior managers (and possibly politicians) for independent approval. This "governance" level should not have been party to the development of the scales.

The levels of risk allocated to the cells in the matrix might be labelled:

- acceptable, indiscernible level of risk, no further action required
- tolerable level of risk, some action required to modify the risk
- unacceptable level of risk, prohibit entry.

These align with the comments by Cox (2008) who suggested a limited number of defined levels of risk.

An example of a partially developed consequence/likelihood import risk analysis matrix is shown in Table 5 below. The grey shaded cells show the level of risk; empty cells need to be completed by DAFF.

Table 5. Indicative revised risk estimation matrix

Note 2	Almost certain Expected to occur in most circumstances					Unacceptable level of risk, prohibit entry
Likelihood →	Likely Would probably occur in most circumstances			Note 3		
	Possible Could occur at some time					
	Unlikely Not expected to occur		Tolerable level of risk, some action required to modify the risk			
	Rare May occur only in exceptional circumstances	Acceptable indiscernible level of risk, no further action required				
	Consequence →	**Insignificant**	**Minor**	**Moderate**	**Major**	**Catastrophic**
	Economic consequences	Note 1	Note 1	Note 1	Note 1	Note 1
	Impact on ecosystems	Note 1	Note 1	Note 1	Note 1	Note 1
	Mortality/morbidity	Note 1	Note 1	Note 1	Note 1	Note 1

Note 1. Enter relevant information in each cell to show the consequences expressed in terms of economic consequences (dollars, percentage of GDP, etc), mortality/morbidity, native species and ecosystems, reversibility, etc.

Note 2. Substitute likelihood terms and descriptions relevant to Australian biosecurity requirements.

Note 3. The level of risk cells need to be completed. For convenience they could be coloured suggesting the level (eg, red, amber, green).

The revised matrix and a description of how it was developed should form part of each import risk analysis report.

[5] HB 436 was under revision at the time of writing this report.

Alternative risk techniques

WTO and stakeholder expectations

If matrices have so many deficiencies, are there alternative risk techniques that are less error-prone or less likely to mislead? To help answer this question we have used international standards and handbooks giving more guidance than is available in FAO, WOAH and IPPC documents.

In AS/NZS ISO 31000 risk analysis is the "process to comprehend the nature of risk and to determine the level of risk [our emphasis added].

> Note 1: Risk analysis provides the basis for risk evaluation and decisions about risk treatment.
>
> Note 2: Risk analysis includes risk estimation".

(The FAO, WOAH and IPPC documents – but not the WTO agreement on SPS measures – call this risk assessment, not risk analysis.) The risk analysis definition aligns with the requirements of the WTO for an importing country to have "an objective and defensible method of assessing the disease risks associated with the importation of animals, animal products, animal genetic material, feedstuffs, biological products and pathological material". To satisfy the WTO, a risk assessment must go beyond:

> *"… mere 'possibilities' of invasion, while allowing that the actual probabilities it required instead need not be numerical but could be based on substantial but qualitative evidence. In effect, it imposes on those arguing for a restriction on imports an onus to establish some substantial (but not necessarily numerical) probability of the establishment of a pest in the importing country" [emphasis added] (Franklin, Sisson, Burgman, & Martin, 2008).*

While this mentions the use of non-mathematical probabilities it specifically refers to "substantial but qualitative evidence".

How that evidence is gathered and presented is a matter for best practice risk analysis involving stakeholders and recognised risk assessment techniques.

Risk naming

We believe a risk name should be a short risk description giving a "structured statement of risk usually containing four elements: sources, events, causes and consequences" (ISO, 2009b). The term "risk source" means an "element which alone or in combination has the intrinsic potential to give rise to risk" and "a risk source can be tangible or intangible" (ISO, 2009c); it might be a family of pest species or the food item proposed to be imported. The terms "event" and "consequences" have already been discussed. With these points in mind, we review possible risk techniques.

Sources of information

We reviewed techniques set out in international standard ISO 31010: 2009 *Risk management – Risk assessment techniques* (published in Australia with amendments as HB 89: 2012 *Risk management – Risk assessment techniques*) and identified the following as possible alternative techniques for understanding the level of risk. Some techniques are qualitative, some are quantitative, while others can be either qualitative or quantitative:

- consequence/likelihood matrix (as distinct from the likelihood/event/consequence matrix used by DAFF)
- decision tree analysis
- Delphi techniques
- failure mode and effect analysis (FMEA)
- failure mode, effects and criticality analysis (FMECA)
- fault tree analysis
- event tree analysis
- bow-tie analysis

- FN curves
- HAZard and OPerability (HAZOP) studies
- layers of protection analysis (LOPA)
- Monte Carlo simulation
- root cause analysis
- scenario analysis
- structured what-if-then (SWIFT).

From our professional experience and understanding of biosecurity risks, we believe DAFF should explore the combination of fault tree analysis, event tree analysis, bow-tie analysis and consequence/likelihood matrix. These will help decision-makers visualise the nature of a given risk associated with a proposed importation and then see how the level of risk maps onto a revised qualitative DAFF consequence/likelihood matrix.

Fault tree analysis and event tree analysis are the left- and right-hand sides respectively of a bow-tie analysis and can be qualitative or quantitative. They therefore may help determine the level of risk and validate the use of a revised consequence/likelihood matrix.

This combination would demonstrate a rigorous approach to understanding the causes of an event, the consequences resulting from the event and how the consequences might impact on the Australian Government's biosecurity objectives as set out in ALOP.

We discuss each technique and present some simple examples of these techniques below.

Establishing the nature of risk

While we have been impressed with the scientific information in three import risk analyses, a detailed review of these is outside our terms of reference. The narrative reports describe the nature of each risk and form the basis for any determination of the level of risk. It therefore is crucial they contain the best available information. In the time available for this project, we have assumed the DAFF import risk analyses do provide best practice information on the nature of import risks. However, to help decision-makers determine if that is the case we have compiled the following draft checklist. It should help ensure import risk analyses are "objective and defensible".

The following table was developed using the guidance set out in AS/NZS ISO 31000. In particular, it follows the principles for effective risk management (including risk assessment) in section 3 of the standard.

DAFF officials may wish to develop it further to help ensure import risk analyses do, in fact, meet best practice and provide an assurance statement as part of each import risk analysis report.

Table 6. Import risk analysis effectiveness checklist

Questions	Findings
Does the report summarise relevant quarantine and other relevant Australian Government legislation or international treaties?	
Are the sanitary and phytosanitary objectives of the Australian Government clearly identified in the import risk analysis report?	
Arising from the sanitary and phytosanitary objectives, quarantine and other legislation and international treaties, have clear sanitary and phytosanitary criteria been established for risk evaluation? Criteria are the appropriate level of protection (ALOP) set by the Australian Government.	
Is there a clear description of the context of the export country?	
Does this description include the maturity and ethics of state sector regulatory agencies and the degree of self-regulation?	
Is there a clear description of the context of harvesting, processing and transporting the product before export?	
Does this description include relevant sanitary or similar controls and their reliability?	

Questions	Findings
Which stakeholders did the risk analysts communicate with before, during and on completion of risk analysis?	
Which stakeholders did the risk analysts consult with before, during and on completion of risk analysis?	
Does the report clearly identify the stakeholders' concerns about the proposal and associated risks?	
Did the risk analysts follow a consistent process meeting best practice to identify risks, understand the nature of each risk and then determine the level of each risk?	
Which techniques were used to identify the risks associated with the proposed import?	
Does each risk name set out the: • risk source • possible causes of the risk event • the risk event • possible consequences • impacts on the sanitary and phytosanitary objectives	
Which risk analysis techniques did the risk analysts use?	
Did those techniques enable "triangulation" to show the different characteristics of each risk and so build a comprehensive picture of each risk?	
Is the description of the nature of each risk clear and unambiguous?	
Has uncertainty been discussed in relation to the nature of each risk and how did this inform the use of any quantitative risk analysis?	
How was the level of each risk determined?	
Has the level of each risk been compared with other, similar risks that have been accepted or rejected by the Australian Government?	
Has the import risk analysis been adapted to any unusual features of the proposal and is any such adaptation clearly identified?	
Overall, is the import risk analysis systematic and structured?	
Does the risk assessment process provide the best available information to decision-makers in a useful and usable way?	

Uncertainty

Risk is not defined in the WTO, FAO, WOAH or IPPC documents but it is defined in AS/NZS ISO AS/NZS ISO 31000 as "the effect of uncertainty on objectives". Note 5 to that definition further defines uncertainty as "the state, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequence, or likelihood".

AS/NZS ISO 31000 also sets out 11 principles for effective risk management, including risk assessment and risk analysis. Principle (d) states:

> ***"Risk management explicitly addresses uncertainty.***
>
> *Risk management explicitly takes account of uncertainty, the nature of that uncertainty, and how it can be addressed".*

It therefore is essential any import risk analysis openly addresses uncertainty. As will be seen, uncertainty about numerical data may make any quantitative import risk analysis of doubtful value.

Consequence/likelihood matrix

A consequence/likelihood matrix is a qualitative or semi-quantitative risk analysis "tool for ranking and displaying risks by defining ranges for consequence and likelihood" (ISO, 2009b). It is one way of

combining qualitative or semi-quantitative estimates of the consequences of a risk and the likelihood of the specified consequence occurring. This tells something about the level of risk – that is, the "magnitude of a risk expressed in terms of the combination of consequences and their likelihood" (ISO, 2009b).

Risks with multiple consequences can be plotted on a matrix to show risk levels for each combination of consequence and likelihood. If designed to take account of the context of an organisation or a specific risk assessment, a matrix can aid risk ranking to help a risk assessor evaluate risks or decide on priorities for further risk analysis or for risk treatment.

It also is possible to plot three levels of risk on a matrix:

- the level of risk with no controls in place or assuming controls have failed
- the level of risk with current controls in place, taking account of their individual or collective effectiveness
- the level of risk that might be achieved after any treatments have been implemented to modify an otherwise unacceptable level of risk.

This helps identify controls that, individually or collectively, are key controls because they have some major effects on the level of risk. This in turn would guide DAFF biosecurity staff in their decisions about auditing and checking on import controls.

Fault tree analysis

Fault tree analysis (FTA) is a "top down", logic-based analysis tool for identifying "events" that can combine through AND or OR gates to result in a specified "top event". The events may be initiating events, changes in circumstances or failure of controls (IEC, 1990; ISO, 2009a). A fault tree can be used as the left-hand side in bow-tie analysis, in which case the causal events flow from left to right resulting in the top event.

A well-constructed qualitative FTA can give very good information about how the top event might occur. A large FTA can be time-consuming to develop but can help identify where there is complexity in a system.

Four basic symbols commonly used in fault tree analysis are shown in Table 7.

Table 7. Symbols for use in fault tree analysis

Symbol	Function	Description
	Event description block	Name or description of the event, the event code, and probability of occurrence (as required) are included within the symbol Alternatively a general gate symbol whose function is defined within the symbol
	AND gate	The output event occurs only if all input events occur at the same time
	OR gate	The output event occurs if any of the input events occur, either alone or in combination
	Basic event	Event described by a basic component or part failure which cannot be subdivided. It marks the lowest level of development in the tree

Quantitative output

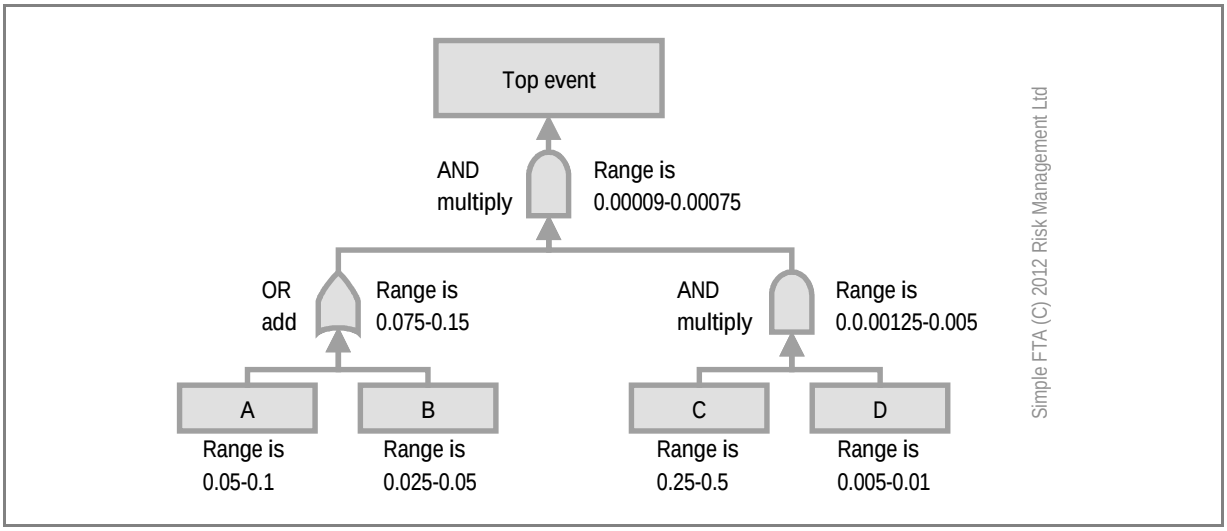
A fault tree analysis can be quantified by assigning probabilities to initiating events or faults. These are then combined through AND and OR logic gates. In an AND gate, the probabilities are multiplied. In an OR gate, the probabilities are added.

Event probabilities mostly depend on historical data. If there has been a change in that data or in the conditions of use or operation of the system, a quantified FTA may be very inaccurate.

Figure 7 below is a simple quantified fault tree with a "top down" layout. The input data is uncertain and is shown as ranges of probabilities of occurrence per year. Therefore, the harmful top event carries considerable uncertainty with a wide range of probabilities from $9x10^{-5}$ to $75x10^{-5}$.

We note this hypothetical fault tree uses ranges in a similar way to the DAFF indicative probabilities and so results in an almost meaningless range of probabilities for the top event. In such a case a risk analyst would either research better input data or make the fault tree qualitative.

Figure 7. Simple quantified fault tree with ranges of input and output data



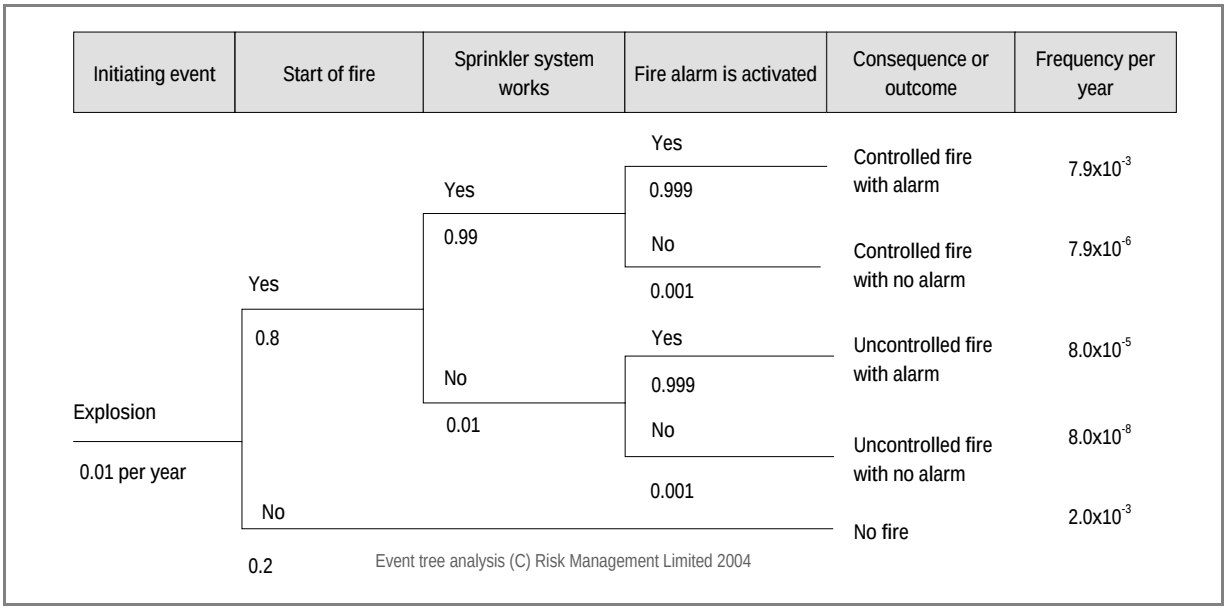
Event tree analysis

Event tree analysis (ETA) is a graphical technique that can be used quantitatively or qualitatively to logically identify the possible consequences of events (ISO, 2009a; ISO/IEC, 2009).

The event tree below is for the consequences of a dust explosion in a sprinkler-protected building. The diagram flows from left to right showing the initiating event, the effect of barriers (current controls or proposed treatments) and finally the range of outcomes. Operation of the sprinkler and fire alarm systems is assessed on their probable condition after an explosion has occurred. The most probable outcome is "controlled fire with alarm" with a frequency of $7.9x10^{-3}$.

The initiating event for this event tree might be the top event in a fault tree. If that event acts to tie together the two trees the result is bow-tie analysis.

Figure 8. Event tree analysis example

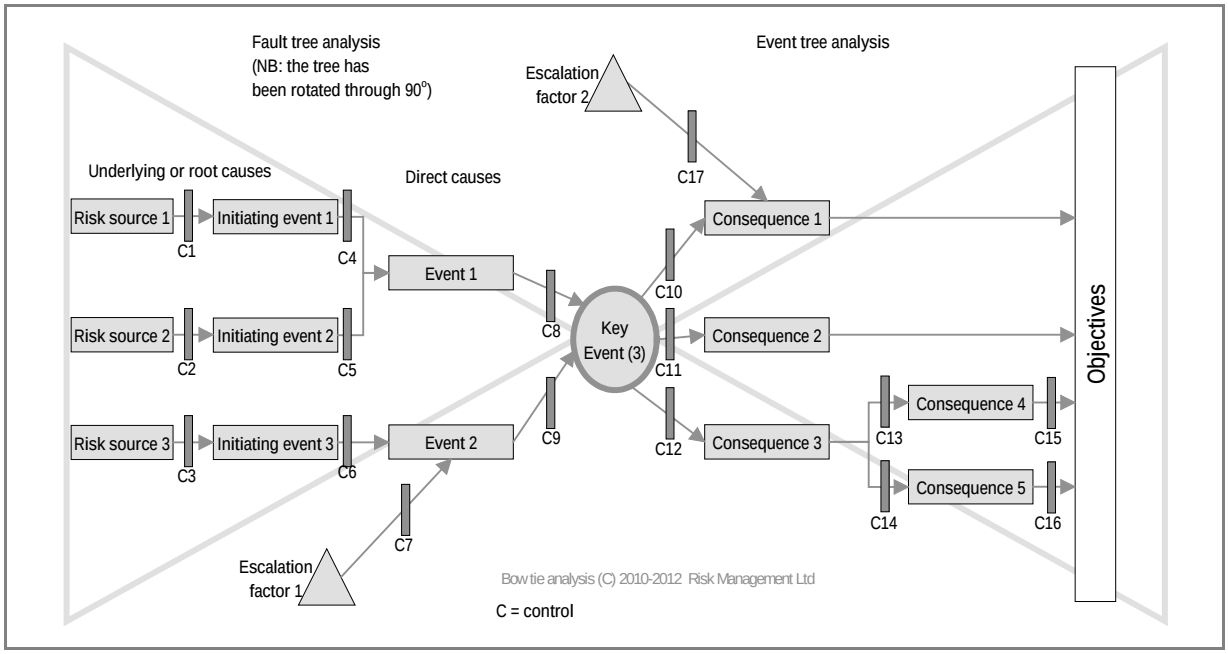


Bow-tie analysis

Bow-ties graphically display the relationship between initiating events, events, controls, consequences and impacts on objectives using a combination of fault tree analysis and event-tree analysis to convey information about controls for prevention, detection, halting or recovering from an event (Cockshott, 2005; Franks et al., 2002).

Bow-ties are often easier to understand than fault trees and event trees, as they show how causes flow to consequences. An example of a generic bow-tie is shown below.

Figure 9. A generic bow-tie



This bow-tie has three risk sources and is for negative impacts on objectives (ALOP in an import risk analysis). Each risk source gives rise to an initiating event but for event 1 to occur, initiating events 1 and 2 must combine. On the right-hand side, consequence 3 gives rise to two knock-on consequences. The bow-tie also shows:

- controls C1-3 are intended to modify the risk sources
- controls C4-6 and C8 and C9 are intended to change the nature and magnitude of likelihood
- event 3 is the key event (the top event of a fault tree)
- controls C10-16 are intended to change the nature and magnitude of likelihood or change the consequences
- controls C15 and C16 might also share the consequences with another party (eg, through insurance)
- escalation factor 1 (eg, public outrage about event 2) is modified by control C7 (eg, spare capacity) and escalation factor 2 (eg, public outrage about consequence 1) is modified by control C17 (eg, a crisis communications plan).

In summary, bow-tie analysis enables the display of many causes of an event, the many possible consequences of that event and, for an import risk analysis, where the sanitary or phytosanitary controls act.

In the time available and with the information at our disposal, we have not been able to develop a bow-tie for an import risk analysis. However, Figure 10 suggests how one might be used in conjunction with a revised consequence/likelihood matrix and quantified fault tree and event tree analyses.

Please note: Figure 10 shows one risk source (the origin of pest X) and no controls or escalation factors have been included in the bow-tie. Using bow-tie analysis for the New Zealand apple import risk analysis might have required lines of analysis for each pest organism.

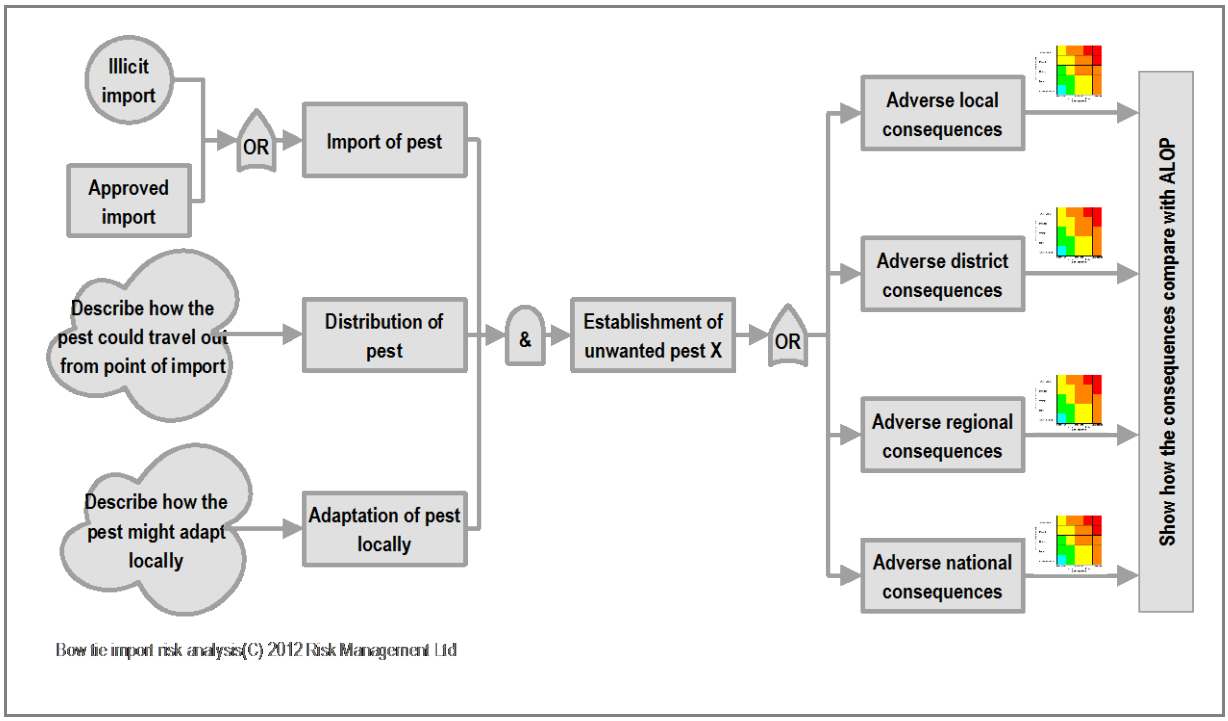
At top left in the fault tree analysis side either illicit import or approved import of pest X occurs combining through an OR gate. That is, either or both causal events will result in import. This causal event must combine with distribution and adaptation of the pest through an AND gate. Illicit import is shown as a basic event that is not explored further.

Distribution of pest X would need to be explored in more detail, as indicated by the cloud symbol. Similarly, adaptation of pest X would need to be explored in more detail.

Resulting from the combination of import, distribution and adaptation, pest X becomes established and consequences are felt either locally OR in the district OR regionally OR nationally. That is, all three causal events must happen for the top event to occur. Any or all of the consequences can then result and a consequence/likelihood matrix is used to determine the level of risk for each of the consequences.

The overall description of the nature of the risk of importing pest X and the level(s) of risk then form the basis for the import risk analysis report. If other pests could also be imported the process is repeated for each.

Figure 10. Indicative bow-tie analysis for import risk analysis



Conclusions

A fully developed bow-tie will show stakeholders that all significant causes, consequences and controls have been considered before any decision is made to:

- reject a proposal
- accept a proposal subject to treatment of the risk at source, in transport or on arrival
- accept the proposal unconditionally.

The bow-tie might be supported by quantified fault tree or event tree analyses if the data is reliable, but should be supported by a consequence/likelihood matrix.

We believe this combination will give the “objective and defensible method of assessing the disease risks associated with the importation of animals, animal products, animal genetic material, feedstuffs, biological products and pathological material” sought by RRAT and other stakeholders and recommended by the World Trade Organization.

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Appendix 1. Comparative vocabulary

The following risk-related terms are used in the treaties, agreements and standards documents cited in this report. Each term is listed alphabetically and the source document referenced.

Appropriate level of sanitary or phytosanitary protection is “the level of protection deemed appropriate by the Member establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory.

> Note: Many Members otherwise refer to this concept as the ‘acceptable level of risk’".
>
> (WTO, 1997)

Communication and consultation are “continual and iterative processes that an organisation conducts to provide, share or obtain information and to engage in dialogue with stakeholders regarding the management of risk

> Note 1. The information can relate to the existence, nature, form, likelihood, significance, evaluation, acceptability and treatment of the management of risk.
>
> Note 2. Consultation is a two-way process of informed communication between an organization and its stakeholders on an issue prior to making a decision or determining a direction on that issue. Consultation is:
>
> - a process which impacts on a decision through influence rather than power; and
> - an input to decision making, not joint decision making.
>
> (SA/SNZ ISO, 2009).

Consequence is the “outcome of an event affecting objectives.

> Note 1 An event can lead to a range of consequences.
>
> Note 2 A consequence can be certain or uncertain and can have positive or negative effects on objectives.
>
> Note 3 Consequences can be expressed qualitatively or quantitatively.
>
> Note 4 Initial consequences can escalate through knock-on effects”.
>
> (SA/SNZ ISO, 2009)

Control is a “measure that is modifying risk.

> Note 1 Controls include any process, policy, device, practice, or other actions which modify risk.
>
> Note 2 Controls may not always exert the intended or assumed modifying effect” .
>
> (SA/SNZ ISO, 2009)

Control means “prevention, elimination, or reduction of hazards and/or minimization of risks”.

> (FAO, 1999)

Effectiveness is the extent to which planned activities are realised and planned results achieved (ISO 9000

> (ISO, 2005).

Event is an “occurrence or change of a particular set of circumstances.

> Note 1 An event can be one or more occurrences, and can have several causes.
>
> Note 2 An event can consist of something not happening.
>
> Note 3 An event can sometimes be referred to as an “incident” or “accident”.
>
> Note 4 An event without consequences can also be referred to as a ‘near miss’, ‘incident’, ‘near hit’ or ‘close call’"

(SA/SNZ ISO, 2009)

External context is the “external environment in which the organisation seeks to achieve its objectives.

Note: External context can include:

- the cultural, social, political, legal, regulatory, financial, technological, economic, natural and competitive environment, whether international, national, regional or local;
- key drivers and trends having impact on the objectives of the organization; and relationships with, and perceptions and values of external stakeholders”

(SA/SNZ ISO, 2009).

Frequency is a “measure of the likelihood of an event expressed as a number of events or outcomes per defined unit of time”.

(ISO, 2009b)

Hazard is a “source of potential harm.

Note: Hazard can be a risk source”.

(ISO, 2009b).

Hazard is “a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect”

(FAO, 1999)

Hazard characterization is “the qualitative and/or quantitative evaluation of the nature of the adverse health effects associated with the hazard. For the purpose of Microbiological Risk Assessment the concerns relate to microorganisms and/or their toxins”.

(FAO, 1999)

Hazard identification is “the identification of biological, chemical, and physical agents capable of causing adverse health effects and which may be present in a particular food or group of foods.

(FAO, 1999)

Internal context is the “internal environment in which the organization seeks to achieve its objectives

Note: Internal context can include:

- governance, organizational structure, roles and accountabilities;
- policies, objectives, and the strategies that are in place to achieve them;
- the capabilities, understood in terms of resources and knowledge (e.g. capital, time, people, processes, systems and technologies);
- information systems, information flows and decision-making processes (both formal and informal);
- relationships with, and perceptions and values of, internal stakeholders;
- the organization's culture;
- standards, guidelines and models adopted by the organization; and form and extent of contractual relationships”.

(SA/SNZ ISO, 2009)

Level of risk is the “magnitude of a risk expressed in terms of the combination of consequences and their likelihood”.

(SA/SNZ ISO, 2009)

Likelihood is the “chance of something happening.

Note 1: In risk management terminology, the word “likelihood” is used to refer to the chance of something happening, whether defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically (such as a probability or a frequency over a given time period).

> Note 2: The English term “likelihood” does not have a direct equivalent in some languages; instead, the equivalent of the term “probability” is often used. However, in English, “probability” is often narrowly interpreted as a mathematical term. Therefore, in risk management terminology, “likelihood” is used with the intent that it should have the same broad interpretation as the term “probability” has in many languages other than English”.
>
> (SA/SNZ ISO, 2009)

Probability is a “measure of the chance of occurrence expressed as a number between 0 and 1, where 0 is impossibility and 1 is absolute certainty”.

> (ISO, 2009b)

Quantitative risk assessment is a “risk assessment that provides numerical expressions of risk and indication of the attendant uncertainties (stated in the 1995 Expert Consultation definition on Risk Analysis)”.

> (FAO, 1999)

Qualitative risk assessment is a “risk assessment based on data which, while forming an inadequate basis for numerical risk estimations, nonetheless, when conditioned by prior expert knowledge and identification of attendant uncertainties permits risk ranking or separation into descriptive categories of risk.

> (FAO, 1999)

Risk is “the effect of uncertainty on objectives.

> Note 1: An effect is a deviation from the expected – positive or negative.
>
> Note 2: Objectives can have different aspects such as financial, health and safety, and environmental goals and can apply at different levels such as strategic, organisation-wide, project, product, and process.
>
> Note 3: Risk is often characterised by reference to potential events, consequences, or a combination of these and how they can affect the achievement of objectives.
>
> Note 4: Risk is often expressed in terms of a combination of the consequences of an event or a change in circumstances, and the associated likelihood of occurrence.
>
> Note 5: Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequence, or likelihood”.
>
> (SA/SNZ ISO, 2009)

Risk is “a function of the probability of an adverse health effect and the severity of that effect, consequential to a hazard(s) in food”.

> (FAO, 1999)

Risk analysis is “a process consisting of three components: risk assessment, risk management and risk communication”.

> (FAO, 1999)

Risk assessment is “a scientifically based process consisting of the following steps: (i) hazard identification, (ii) hazard characterization, (iii) exposure assessment, and (iv) risk characterization.

> (FAO, 1999)

Risk characterization is “the process of determining the qualitative and/or quantitative estimation, including attendant uncertainties, of the probability of occurrence and severity of known or potential adverse health effects in a given population based on hazard identification, hazard characterization and exposure assessment”.

> (FAO, 1999)

Risk communication is “the interactive exchange of information and opinions concerning risk and risk management among risk assessors, risk managers, consumers and other interested parties.

> (FAO, 1999)

Risk estimate is the “output of risk characterization”.

(FAO, 1999)

Risk appetite is the “amount and type of risk an organisation is prepared to pursue, retain or take”.

(ISO, 2009b)

Risk assessment is “the overall process of risk identification, risk analysis and risk evaluation”.

(SA/SNZ ISO, 2009)

Risk assessment: “the evaluation of the likelihood of entry, establishment or spread of a pest or disease within the territory of an importing Member according to the sanitary or phytosanitary measures which might be applied, and of the associated potential biological and economic consequences; or the evaluation of the potential for adverse effects on human or animal health arising from the presence of additives, contaminants, toxins or disease-causing organisms in food, beverages or feedstuffs”.

(WTO, 1997, p. 78)

Risk criteria are the “terms of reference by which the significance of risk is assessed.

Note 1 Risk criteria are based on organizational objectives, and external and internal context.

Note 2 Risk criteria can be derived from standards, laws, policies and other requirements”.

(SA/SNZ ISO, 2009)

Risk description is a “structured statement of risk usually containing four elements: sources, events, causes and consequences”.

(ISO, 2009b)

Risk evaluation is the “process of comparing the results of risk analysis against risk criteria to determine whether the level of risk is acceptable or tolerable.

Note: Risk evaluation assists in the decision about risk treatment”.

(SA/SNZ ISO, 2009)

Risk identification is the “process of finding, recognising and describing risks”.

(SA/SNZ ISO, 2009)

Risk management is “the coordinated activities to direct and control an organisation with regard to risk”.

(SA/SNZ ISO, 2009)

Risk management is “the process of weighing policy alternatives in the light of the results of risk assessment and, if required, selecting and implementing appropriate control[1] options, including regulatory measures”.

(FAO, 1999)

Risk management context is described in paragraph 5.3.4 of AS/NZS ISO 31000.

(SA/SNZ ISO, 2009)

Risk management framework is a “set of components that provide the foundations and organisational arrangements for designing, implementing, monitoring, reviewing and continually improving risk management throughout the organisation”.

(SA/SNZ ISO, 2009)

Risk management plan is a “scheme within the risk management framework specifying the approach, the management components and resources to be applied to the management of risk.

Note 1 Management components typically include procedures, practices, assignment of responsibilities, sequence and timing of activities.

Note 2 The risk management plan can be applied to a particular product, process and project, and part or whole of the organisation.

(SA/SNZ ISO, 2009)

Risk management process is the “systematic application of management policies, procedures and practices to the tasks of communicating, establishing the context, identifying, analysing, evaluating, treating, monitoring and reviewing risk”.

(SA/SNZ ISO, 2009)

Risk matrix is a “tool for ranking and displaying risks by defining ranges for consequences and likelihood”.

(ISO, 2009b)

Risk perception is “the stakeholder’s view on a risk.

Note: Risk perception reflects the stakeholder’s needs, issues, knowledge, belief and values”.

(ISO, 2009b)

Risk profile is a “description of any set of risks.

Note: The set of risks can contain those that relate to the whole organisation, part of the organisation, or as otherwise defined”.

(SA/SNZ ISO, 2009)

Risk profile is the “description of the food safety problem and its context”.

(FAO, 1999)

Risk source is an “element which alone or in combination has the intrinsic potential to give rise to risk.

Note: A risk source can be tangible or intangible”.

(SA/SNZ ISO, 2009)

Transparent means the “characteristics of a process where the rationale, the logic of development, constraints, assumptions, value judgements, decisions, limitations and uncertainties of the expressed determination are fully and systematically stated, documented, and accessible for review”.

(FAO, 1999)

Uncertainty analysis is “a method used to estimate the uncertainty associated with model inputs, assumptions and structure/form”.

(FAO, 1999)

See also note 5 to the definition of “risk” in AS/NZS ISO 31000.

Vulnerability is the “intrinsic properties of something resulting in susceptibility to a risk source that can lead to a consequence”.

(ISO, 2009b)

Appendix 2. Application of the DAFF risk estimation matrix

The following is reproduced from the Biosecurity Australia *Provisional final import risk analysis report for the importation of fresh decrowned pineapple (Ananas comosus (L.) Merr.) fruit from Malaysia* (DAFF, 2012b)

Appendix 9

Eminent Scientists Group (ESG) – response to request to review Peace Report

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Dr John Radcliffe AM, FTSE

February 28 2013

Mr Stephen Palethorpe
Committee Secretary
Senate Standing Committee on Rural and Regional Affairs and Transport
PO Box 6100,
Parliament House
Canberra ACT 2600

Dear Mr Palethorpe,

Public Hearing Friday, 08 February 2013
Questions Taken on Notice – Eminent Scientists Group

I refer to the invitation from the Committee to review the paper by Peace, C. (2013) *Advice on the risk estimation used by DAFF Biosecurity as part of the Import Risk Analysis process* (Client Report CR0127 Australian Senate Rural and Regional Affairs and Transport Committee) Wellington NZ : Risk Management Ltd. I should like to offer some comments following consultation with my colleagues who are members of the DAFF Eminent Scientists Group.

Essentially, Mr Peace appears to recognise the quality of scientific rigour provided by DAFF Biosecurity in undertaking Import Risk Analyses, an observation supported by and we hope contributed towards by the Eminent Scientists Group. However, Peace discusses changes that could be made to present analytical practices. We are unpersuaded that significant improvements would arise in consequence, but the Committee may wish to seek further advice on these alternative analytical techniques, perhaps from the Australian Centre of Excellence for Risk Analysis (ACERA) based at the University of Melbourne as these matters our outside the skills for which we were appointed to the Eminent Scientists Group. However, Mr Peace does make some helpful operational suggestions which we have supported. We further discuss various specific issues as follows:

Language

Mr Peace, as author, correctly points out in the paper the variations in meanings and definitions between treaties, agreements and standards. Much of the debate revolving around the use of Import Risk Analyses is of an etymological nature. Peace is careful to define the terms that he uses. The Committee may wish to explore whether more consistent and better-understood terms could be identified for use in Import Risk Analyses (IRAs) by DAFF Biosecurity to minimise what Peace refers to as “idiosyncratic interpretation” on page 18.

These issues are largely a matter of risk communication and may not materially alter the scientific outcome of the analysis.

Risk

We note that Peace comments that "risk is the likelihood of the consequences on an event", but we note that the statement appear not to be tacitly correct in that it discounts the likelihood of an event occurring in the first place. We are not convinced that DAFF's definition "risk being the likelihood of an event occurring" is wrong. An event may well occur ("a food product passes undetected through the barrier"), but it may or may not prove to have quarantine consequence ("the importer ate most of it and destroyed the remainder").

We note from the Risk Management Ltd website that Mr Peace over the period 2007-2012 represented Massey University on the joint standards committee under Standards Australia and Standards New Zealand that wrote AS/NZS 4360: 2004 *Risk Management* (now replaced by AS/NZS ISO 31000) and worked on risk-related standards and handbooks aligned with the international standard. The author, in a table on page 9 of his advice, summarises a comparison between AS/NZS ISO 31000:2009, WTO Sanitary and Phytosanitary measures, FAO Codex Alimentarius, the Terrestrial Animal Health Code and the International Plant Protection Convention. It is noted that steps specifically identified in the ISO document are in some cases only implicit in the other document. However, it would be our view that the explicit steps listed by the ISO document have been addressed in each of the IRAs that have been referred to the Eminent Scientists Group (ESG).

Quantitative Risk Estimates and Scientific Uncertainty

Reference is made on page 10 to a quotation from the UK Health and Safety Executive's publication *Quantified risk assessment: its input to decision making*, reviewing 16 case studies of quantified risk assessment, that

> *"…the numerical element must be viewed with great caution and treated as only one parameter in an essentially judgement exercise"*.

We support that view. Peace suggests in his advice (page 14) that records may show a specified type of event has a known frequency but matrix designers are unaware of it. That may be true for the example he gives on page 28 - dust (*e.g.* flour mill) explosions, of which there have been many and for the many other risk areas where Mr Peace has particular training and experience such as Occupational Health and Safety, Fire, Air Pollution etc.

However, in the context of analysing biosecurity risks from a proposed import, it should be recalled that the analysis has to resolve matters of scientific uncertainty in terms of the potential biological impact of a new species on agricultural practices or the natural environment, if any. When identifying the risks (hazards) that could eventuate from the introduction of new biological products at the border, the "level of risk", the probability of occurrence, and the consequences will rarely have any prior measured estimations available in the Australian environment being addressed for the purposes of establishing an Appropriate Level of Protection for Australia (ALOP) that is defendable internationally. Indeed, the thresholds for use in the matrix should be defined *a priori* before beginning the assessment to guarantee a transparent process. Judgements have to be made on the basis of the experience of the participating individuals – in essence using an "expert systems" approach to the topic. Those doing the estimations must be free of any conflicts of interests, in terms of benefitting from the judgements to be made and the existing process is designed for that purpose. As the author points out, stakeholders evaluating the outcome of the IRA

being evaluated will analyse the level of risk differently in terms of the types of consequences that might follow depending on their personal interests.

Analytical quality and communication

We note the author's page 12 statement, which we support, advising that "...it is likely DAFF import risk analyses are providing the 'best available information' for the nature of import risks". DAFF Biosecurity appears to communicate effectively to stakeholders of its intention to undertake an IRA when petitioned to do so by another national authority on behalf of a potential importer. It makes available the draft IRA for comment by anyone interested, and this process is quite transparent. From the experience of the ESG, the comprehensive nature of DAFF's science in identifying risks has been impressive, albeit sometimes slow. The ESG's task has been to review the adequacy of the science responding to issues raised by stakeholders in considering deficiencies or suggested amendments to draft IRAs. There have been very few occasions where we have been able to criticise the science or identify omissions of science in the IRAs we have examined. However, we have found quite a few examples where Biosecurity Australia could have better expressed scientific responses to issues being raised by respondents to a circulated draft, and we have identified those examples to the Director of Agriculture, Fisheries and Forestry. However, any improved scientific expression would not have materially affected the conclusions of the IRA, though it may have improved understanding. We have suggested on several occasions that in the interests of transparency, these responses should be reviewed and made publicly available.

Collateral damage

Mr Peace also comments that he was asked whether import risk analyses are adequately addressing risks for species or crops other than the subject of the import risk analysis, but felt unable to respond as it was outside his competence. Our experience is that other vectors and alternative host species are considered by DAFF within the science that is available. The review of science is quite exhaustive during the initial phase of the analysis, but where Australian native species are relevant, the amount of scientific information on which to make judgment is often limited. This may raise the issue of adopting the "precautionary principle". In developing IRAs, use must be made of the best science available at the time of the analysis, but DAFF is not expected to initiate major research programs in consequence of developing an IRA. Scientific knowledge often further evolves over time and significant new findings can lead to a subsequent revision of import policy. The proposals in the draft Biosecurity Bill should enhance science engagement by officers in the environment and health areas.

Use of matrices and alternative instruments

We observe that Peace in seeking to discuss the use of matrices, hypothesises an example that assumes (page 17) that there is a negligible risk of foot and mouth disease entering Australia but that there is a high likelihood that extreme consequences would follow if it did. This is an unfortunate illustration as a report, commissioned by DAFF from Mr Ken Matthews AO, released in November 2011, indicated that large gaps remain in Australia's capacity to prevent an incursion, or respond effectively should the disease reach Australia's shores. We understand that these gaps are being or have been addressed through the Standing Council on Primary Industries.

The paper includes considerable theoretical discussion about qualitative risk matrices. From our experience, we are not persuaded that a five point scale has any great advantage over a six point scale. We are comforted by Peace's comment "…having re-read the four IRA reports and been impressed with the qualitative analyses and their summary risk evaluations…".

Peace quotes on page 13 a paper discussing use of risk matrices by Cox L (2008) *Risk Analysis* **28** (2) 497-512, which is available on the web at http://onlinelibrary.wiley.com/doi/10.1111/j.1539-6924.2008.01030.x/full . Cox notes that

> *"…categorizing severity may require inherently subjective judgments (e.g., reflecting the rater's personal degree of risk aversion, if severity is modelled as a random variable) and/or arbitrary decisions about how far to aggregate multiple small and frequent events into fewer and less frequent but more severe events."*

The quality of judgment may well be enhanced by a good understanding of the science that underlies the judgment to be made. Cox goes on to say

> *"…risk matrices do not necessarily support good risk management decisions and effective allocations of limited management attention and resources. Yet, the use of risk matrices is too widespread (and convenient) to make cessation of use an attractive option. Therefore, research is urgently needed to better characterize conditions under which they are most likely to be helpful or harmful in risk management decision making (e.g., when frequencies and severities are positively or negatively correlated, respectively) and that develops methods for designing them to maximize potential decision benefits and limit potential harm from using them."*

This leads into a set of mathematical issues upon which my colleagues and I on the Eminent Scientists Group do not feel able to venture given that the Group was established as experts in other aspects of science to review scientific responses to the IRAs. However, we note that Cox does not suggest alternative instruments for the purpose.

While preparing our response to one of the IRAs that were referred to the ESG, we became aware that Biosecurity Australia had scope to make greater use of expertise available, and that there are a number of areas where Australian Centre of Excellence for Risk Analysis (ACERA) based at the University of Melbourne could assist. We noted that it was established specifically for this purpose and receives funding from DAFF to research methodology for biosecurity risk analysis and could be asked more explicitly by DAFF to provide advice, including any effect of qualitative versus quantitative risk analysis on the consequences and methodology of sampling and on the forms of and use of matrices.

However, we understand that some work has been done in this area for ACERA by Dr Simon Barry of CSIRO Mathematics, Informatics and Statistics, in a detailed discussion paper entitled "Putting the quantitative into qualitative Import Risk Assessments". This is available at http://www.acera.unimelb.edu.au/materials/endorsed/0705b_final-report.pdf . The paper finishes by saying

> *"In conclusion, the key issue to consider is what are the quantities that are being estimated at each step and how the questions can be framed to aid assessors in providing a well framed and interpretable response…..The discussion in the previous sections has demonstrated that it is possible to construct a compound assessment using the components typically considered in a qualitative assessment that is logically based, interpretable and all components are clearly defined. It needs no more data*

> *than a qualitative assessment as it simply requires the analyst to express what they are thinking in a coherent framework."*

We suggest that the Senate Standing Committee on Rural and Regional Affairs and Transport may wish to seek advice from ACERA on these issues.

Similarly, the ESG does not feel able to comment on whether the additional suggestions by Peace to use "event tree analysis" and "bow tie analysis" would add a higher degree of rigour to the individual pest risk assessments that underpin an IRA and ACERA's advice could be sought on their merits.

The ESG has also commented in one of its IRA responses that we see an advantage in having a suitable independent party (such as ACERA) review the range of models used in the IRA process by our major trading parties. We understand that some work in this area has been done by ACERA (refer http://www.acera.unimelb.edu.au/materials/endorsed/0709_final-report.pdf) but this could be extended further to other trading partners and might well be useful in advancing Australia's opportunities to export.

Risk Analysis Checklist

Mr Peace advises

> *"While we have been impressed with the scientific information in three import risk analyses, a detailed review of these is outside our terms of reference. The narrative reports describe the nature of each risk and for the basis for any determination of the level of risk".*

Mr Peace goes on to suggest a risk analysis checklist (pp25-26) and that DAFF officials may wish to develop it further. We would support this as a constructive suggestion.

Revision of Import Risk Analysis Handbook

It is also suggested that the Import Risk Analysis Handbook should be revised to reflect full details of techniques available to DAFF risk analysts and any underlying data or research validating those techniques. It is also observed that

> *"The current Import Risk Analysis Handbook does not mention, let alone describe the use of the DAFF risk estimation matrix."*

This is correct, but the matrix is well described in the introduction to each IRA as is made clear in Appendix 2 – "Method of pest risk analysis". In so far as the Handbook will need to be revised as a result of whatever Biosecurity legislation emerges from the current considerations, the suggestion to revise the Import Risk Analysis Handbook is also supported.

I hope these comments and discussions regarding Mr Peace's paper will be of assistance to the Committee

Yours sincerely

(Dr John C Radcliffe AM FTSE)
CHAIR, EMINENT SCIENTISTS GROUP

Appendix 10

DAFF's initial response to Peace Report – dated 8 March 2013

Australian Government
Department of Agriculture, Fisheries and Forestry

Mr Stephen Palethorpe
Committee Secretary
Senate Standing Committee on Rural and Regional Affairs and Transport
PO Box 6100
Parliament House
CANBERRA ACT 2600

Dear Mr Palethorpe

I write in response to the request by the Committee that DAFF review the report *Advice on the risk estimation matrix used by DAFF Biosecurity as part of the Import Risk Analysis process* prepared by Mr Chris Peace as part of the Committee's inquiry into *The effect on Australian pineapple growers of importing fresh pineapple from Malaysia.* I note that Dr Radcliffe, Chair of the Eminent Scientists Group (ESG) was also asked to review Mr Peace's report and provided written comment to the Committee on 28 February 2013.

Mr Peace's report identifies two broad areas of risk assessment: the scientific and technical areas applicable to the World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement); and those organisations such as exporters and corporate entities that would apply risk management frameworks such as ISO:31000. It has been the policy of successive Australian Governments that Australia's risk assessments used to establish phytosanitary measures be consistent with the SPS Agreement. This is consistent with Australia's obligations as a signatory to the WTO. In conducting import risk analyses for plant products, specific guidance is provided by the internationally agreed International Standards for Phytosanitary Measures (ISPMs) which are developed under the International Plant Protection Convention (IPPC). Other methods may be informative, but it is the SPS Agreement and the ISPMs that establish the basis for import risk analysis. In the case of animals and animal products, guidance similar to the IPPC is provided by the Office International des Epizooties (OIE). I note Australia's lead role throughout the development of the SPS Agreement.

The department notes that Mr Peace, while referring to the IPPC and some of its training materials, did not reference ISPM 2: *Framework for pest risk analysis* or ISPM 11: *Pest risk analysis for quarantine pests, including analysis of environmental risk and living modified organisms*, which provide substantial guidance on pest risk analysis for quarantine pests of plants. DAFF also notes that Mr Peace stated that chapter two of the Terrestrial Animal Health Code, published by OIE, does not define hazard, risk, risk analysis and risk assessment. Each of these terms is clearly defined in the Glossary of the Terrestrial Animal Health Code. The equivalent terms for the IPPC are defined in ISPM 5: *Glossary of phytosanitary terms.*

The purpose of the import risk analysis process is to assess pests of potential quarantine concern to Australia and to determine which require risk management measures. The process ensures that risk management measures are imposed on pests that pose an unacceptable risk, thereby mitigating against their entry, establishment and spread within Australia.

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The matrix based approach to combining the likelihood of entry, establishment and spread of a pest or disease with the consequences if that were to occur first appeared in the draft import risk analysis report for non-domestic Felidae in February 2001. The current form and labelling of the matrix subsequently appeared in the Issues Paper for the generic import risk analysis for fresh pineapple fruit in August 2001. The current DAFF methodology for assessing biosecurity risks was the subject of substantial discussion between the Commonwealth Government and the states and territories. These discussions led to the formal endorsement of the current methodology through the Primary Industries Ministerial Council in 2002.

In his report, Mr Peace did not dismiss the DAFF risk analysis matrix, only suggested that it might be possible to simplify it from the current 6x6 format to a 5x5 format and that the terms used might be amended to minimise the potential for confusion or misinterpretation. However, he recognised that the range of likelihoods and consequences in a biosecurity risk analysis might justify the larger format of a 6x6 matrix. I note that Dr Radcliffe stated that the ESG, which has substantial experience with DAFF's risk assessments, was unconvinced that a five point scale had any great advantage or that the changes suggested by Mr Peace would result in a substantially different outcome.

Mr Peace commented that the DAFF matrix is not a true consequence/likelihood. DAFF's risk analysis process aligns with the relevant international standard for plant pest risk analysis, in this case ISPM 11, by considering the probability of introduction and spread, and the potential economic consequences. These are then combined using a matrix based approach as demonstrated in the IPPC training materials, and as endorsed in the annex to ISO:31010 as being 'strongly applicable' for assessing the level of risk. DAFF's matrix combines the probability (or likelihood) of entry, establishment and spread with the consequences if that sequence of events were to occur. This results in an assessment of unrestricted risk. If the unrestricted risk is 'low' or greater, specific risk management measures are necessary.

In recommending that the *Import Risk Analysis Handbook* (IRA Handbook) be revised to include details of techniques available to DAFF and a description of the risk estimation matrix, we believe that Mr Peace does not have a correct understanding of the purpose of the IRA Handbook. The IRA Handbook describes the administrative process for conducting import risk analyses, regulated steps under the *Quarantine Regulations 2000*, and relevant background information on domestic and international policies. To inform stakeholders and readers of import risk analysis reports, each report contains a detailed description of the methodology being employed and worked examples for combining likelihoods. Mr Peace acknowledges that a limitation to his advice is that '*we have not interviewed any DAFF risk analysts or other stakeholders*'. Such contact could have limited possible misunderstandings about the purpose of the IRA Handbook or the conduct of import risk analyses.

We note that Mr Peace also misquotes the department's recent import risk analysis for fresh decrowned pineapples from Malaysia as considering the probability of entry, establishment **or** spread Instead the assessment considers the likelihood of entry, establishment **and** spread, as there is a sequence of events that must occur before a pest could become present in Australia and result in any consequences. This is the language that is used in the import risk analysis for fresh decrowned pineapples from Malaysia and in all contemporary risk analyses.

It is encouraging that Mr Peace expresses a positive view of the scientific information and the narrative describing the nature of each risk. Dr Radcliffe, on behalf of the ESG, also states that there have '*been very few occasions where we have been able to criticise the science or identify omissions of science*'.

As part of the continual efforts to develop and refine the methodology and practice of risk analysis, DAFF established the Australian Centre for Excellence in Risk Analysis (ACERA) in 2006. DAFF's work with ACERA has resulted in review and improvement in policies and operational programs, such as enhanced risk profiling, improved inspection techniques and performance measurement of passenger and mail interventions. As the committee would be aware, DAFF is also developing and seeking

stakeholder feedback on new biosecurity regulations and guidelines including the consideration of issues such as addressing regional differences in biosecurity status, independent scientific review of import risk analyses, the rights of appeal on the outcome of an import risk analysis and application of Australia's appropriate level of protection.

As the Australian Government department responsible for developing, implementing and enforcing the policies that protect Australia's favourable biosecurity status while facilitating the movement of people and goods across the border, DAFF is committed to the development of scientifically robust analyses through a transparent process. There is no substantive evidence that DAFF's risk analysis processes have not been effective in protecting Australia's favourable pest and disease status.

Yours sincerely

Rona Mellor
Deputy Secretary

8 March 2013

Appendix 11

Response from Secretary, DAFF – dated 22 May 2013

Australian Government
Department of Agriculture, Fisheries and Forestry

Andrew Metcalfe AO
SECRETARY

Ref: EXEC2013-01801

22 May 2013

Senator the Hon. Bill Heffernan
Chair
Rural and Regional Affairs and Transport References Committee
PO Box 6100
Parliament House
CANBERRA ACT 2600

Dear Senator Heffernan

Thank you for your letter of 25 March 2013 advising me of the committee's work on my department's risk assessment methodologies as it relates to the inquiries into:

The effect on Australian pineapple growers of importing fresh pineapple from Malaysia

The effect on Australian ginger growers of importing fresh ginger from Fiji

The proposed importation of potatoes for processing from New Zealand.

In your letter you asked me that all decisions in relation to the importation of pineapples from Malaysia, ginger from Fiji and potatoes for processing from New Zealand be delayed until after the Senate committee has had the opportunity to further explore the issues raised and table its report on 24 June 2013. As you are aware, the department has published final import risk analysis (IRA) reports for pineapple from Malaysia on 14 December 2012 and ginger from Fiji on 22 January 2013. My predecessor wrote to the Senate committee on 14 December 2012 indicating that the department will commence engagement with the Department of Agriculture in Malaysia to develop operational requirements of the pineapple IRA including an audit of its phytosanitary system. A letter on 24 January 2013 informed the Senate committee that a similar process is required for ginger from Fiji.

The department wrote to Malaysia on 7 February 2013, and to Fiji on 5 April 2013, outlining the next steps required, including the development of a 'work plan' by the exporting country for review by the department before trade can commence. The department has not received a 'work plan' from Malaysia or Fiji for review. As you know, no trade will occur until work plans are established to the department's satisfaction and valid import permits can be issued to an Australian applicant. It is unlikely that all operational requirements will be completed by 24 June 2013 to allow imports of pineapple from Malaysia and ginger from Fiji, in the event that import permits are sought.

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The review of import conditions for fresh potatoes for processing from New Zealand was issued as a draft report for a 60 day stakeholder comment period on 3 July 2012. The department received 27 submissions on the draft report and continues to assess the issues raised in the submissions, and the latest scientific information, relevant to developing a final report. As you know, the department sought independent expert advice to assist in the development of this policy. Once a final policy position is reached, and if it recommends that imports can occur, operational requirements will need to be developed so any final import conditions can be implemented to Australia's satisfaction. This work is also unlikely to be completed by 24 June 2013.

In your letter you also asked for a copy of the independent bacteriologist report in relation to the review of import conditions for fresh potatoes for processing from New Zealand. I enclose a copy of the report for your information. The department intends to include the independent bacteriologist review as an attachment to the final report for the review of import conditions for fresh potatoes for processing from New Zealand. Since you mentioned our correspondence may be made public, the contact details of the independent bacteriologist have been redacted.

The committee is aware that, as per the evidence provided by the department during various hearings, at any time we can take into account relevant scientific and technical developments that relate to import conditions necessary to protect Australia from pests and diseases of quarantine concern. Any relevant information that is brought to our attention through the committee's inquiries will be considered in the same way. As such, I await with interest the committee's final reports scheduled for tabling on 24 June 2013.

I note the committee's interest in the department's risk estimation matrix including commissioning a review of the matrix by the New Zealand based risk management consultant, Mr Peace.

The department's risk assessment method, including the estimation matrix, is widely used in biosecurity risk assessment activity in Australia. The risk estimation matrix has been used by the department since 2001 and was endorsed at the Primary Industry Ministerial Council on 2 May 2002. It is used by Plant Health Australia and affiliated industries in assessing risk within their Industry Biosecurity Plans (including the potato and pineapple industries; a ginger biosecurity plan is under development). It has also been used by Australian states in assessing the risk of pests potentially associated with the movement of commodities from domestic sources (e.g. Tasmania's risk assessment for fruit flies completed on 31 March 2012).

Australia's risk assessment methods were considered during the World Trade Organization (WTO) dispute on New Zealand apples. Although the WTO found fault with Australia's overly conservative interpretation of risk in the apple IRA, it did not find fault with the matrix itself. The WTO recognised the function of the risk estimation matrix in defining Australia's appropriate level of protection. It has been the policy of successive Australian Governments that Australia's risk assessments are consistent with Australia's WTO obligations. We provided the committee with advice on Mr Peace's report at the hearing of 12 March and by letter on 8 March 2013.

Australia's risk assessment methods continue to develop under the guidance of the Australian Centre of Excellence for Risk Analysis (ACERA). I note that ACERA was an initiative of the former Government announced in its Quarantine and Border Protection election policy of 2004; established in 2006 to ensure Australia stays at the forefront of world's best practice.

ACERA is guided by a Board that includes as chair Dr Ron Sandland ex deputy head of CSIRO; Emeritus Professor Pauline Ladiges former Head of School of Botany, University of Melbourne; Professor Peter Taylor, Head of Department of Mathematics and Statistics, University of Melbourne; Professor Peter Bardsley, Faculty of Economics and Commerce, University of Melbourne; and Dr Roger Paskin from the Victorian Department of Environment and Primary Industries.

Across Australia there is a network of highly qualified practitioners that are available to and work with the department on risk assessment including ACERA, CSIRO (and the recent Biosecurity Flagship), the Eminent Scientists Group and relevant Universities. I will continue to use the expertise available to me to provide the best possible advice. Given my access to world leading experts in this field, I have asked ACERA to conduct a review of Mr Peace's work. I will provide the Senate committee the ACERA advice.

I should add that the department earlier this week reached a formal agreement with the University of Melbourne to establish a successor body to ACERA, to be known as the Centre of Excellence for Biosecurity Risk Analysis (CEBRA). The objectives of CEBRA are to deliver practical and rigorous research solutions and advice related to the assessment, management, perception, and communication of biosecurity risk. The centre builds upon the world leading work undertaken by the ACERA since 2006. Importantly, it will be used to support current reform initiatives as the department continues to focus on delivering a modern biosecurity system that is responsive and targeted.

As noted in my letter of 30 April 2013, I have been familiarising myself with the role the department plays in assessing the potential biosecurity risks associated with imported commodities. I have received substantial briefing on the legal obligations of the Director of Animal and Plant Quarantine and the department with respect to managing imports and the role that IRAs play within that. I have found this useful and thought the same material may also assist the committee (Attachment A).

As you know the Regulated IRA process is set out in the *Import Risk Analysis Handbook 2011*. It is clear to me that this is only a part of the total picture in the department's role in managing imports into Australia. Given that, and the fact that the Handbook refers to a now defunct institution (Biosecurity Australia) and defunct organisational unit (the Australian Quarantine Inspection Service) I am preparing to withdraw the Handbook and make more up-to-date and comprehensive information available about the department's role in managing imports into Australia, including the IRA process.

I hope that this information is of assistance to your committee.

Yours sincerely

(Andrew Metcalfe)

Attachment A:

The legal basis for conducting import risk analyses (IRAs) is in Part 6A of the *Quarantine Regulations 2000.* The occasion for an Import Risk Analysis (IRA) usually arises as a result of an import proposal (a request from another country or an importer to import goods into Australia). Under the *Quarantine Act 1908* and the *Quarantine Proclamation 1998,* in deciding whether to grant an import permit, the Director must consider the level of quarantine risk.

One way of managing the process of assessing the risk is by developing an IRA. The IRA process is used when relevant risk management measures have not been established, or relevant risk management measures for a similar good and pest/disease combination do exist, but the likelihood and/or consequences of entry, establishment or spread of pests and diseases could differ significantly from those previously assessed.

Part 6A of the *Quarantine Regulations 2000* (the Regulations) sets out the steps to be followed if a formal IRA process is used. It is worth noting that the Regulations as they currently stand refer to the 'Chief Executive' and Biosecurity Australia as managing the regulated IRA process. Biosecurity Australia was de-prescribed as a statutory agency from 1 July 2009[1], and its functions in conducting risk analyses are now carried out within the department, in the Biosecurity Plant and Biosecurity Animal Divisions. I have nominated a senior person at First Assistant Secretary level to manage the IRA processes for the department.

The current regulations will be updated and revised as part of the modernisation of the Quarantine Act and its subordinate legislation. Regulations covering the Biosecurity Import Risk Analysis process are scheduled for release shortly.

As they currently stand, the Regulations provide for two types of IRA - a standard IRA and an expanded IRA. However, the Regulations do not confer a power or duty on any person to decide whether there should be an IRA, and if so, whether it should be a standard or expanded IRA. In practice, the Chief Executive of Biosecurity Australia, (as it currently stands in the Regulations), makes these decisions as a matter of administration, and not pursuant to any statutory power.

The standard IRA process has a timeframe of 24 months.[2] It includes a public notice at the commencement of an IRA, release of the draft IRA report for public comment and release of a provisional final report to communicate the results.[3] The release of the provisional final report is the last step in the process set out in the Regulations for both a standard and expanded IRA. As an administrative matter, the provisional final IRA report may be reviewed under a non-statutory review process (where stakeholders may appeal to the Import Risk Analysis Appeals Panel within 30 days of publication of the provisional final IRA report). The report becomes final at the end of the 30 day period, or at the end of the appeal, whichever is the later.

An expanded IRA process has a timeframe of 30 months.[4] In practice, this expanded process is chosen where there are significant differences in scientific opinion, or where significant harm to humans, animals and plants, or the environment may result from an importation. It

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[1] *Financial Management and Accountability Amendment Regulations 2009 (No. 5),* sch 1, item 3.
[2] *Quarantine Regulations 2000,* sub-reg 69E(1).
[3] *Quarantine Regulations 2000,* sub-regs 69C(1).
[4] Ibid, sub-reg 69E(2).

includes, in addition to the steps for a standard IRA, the (optional) development of an issues paper to be released for public comment before preparation of the draft report, and review of the revised draft IRA report by the Eminent Scientists Group (ESG) before preparation of the provisional final IRA report.[5]

The department also seeks independent input and advice outside of the ESG processes. For example, scientific advice was sought on plum pox virus at a workshop with experts in April 2007 in order to complete the US stone fruit IRA. Experts from the South Australian Research and Development Institute also reviewed the pest risk assessment for *Phomopsis viticola* in regards to the Chilean table grape IRA in 2005.

It is important to note that IRA reports remain valid even if the timeframes stipulated in the Regulations are not met.[6] This prevents the work and effort taken in preparing and commenting on an IRA being set aside because of a failure to meet a timeframe. However, this does not mean that timeframes should not be adhered to (the department has for the most part met the timeframes). The 'Chief Executive' can by public notice 'stop the clock' where it is essential to obtain further information or commission research or expert advice, or where a significant national or international quarantine circumstance prevents the IRA being completed within the time limits.[7]

An IRA report provides advice to the Director of Animal and Plant Quarantine (and his delegates) to consider in determining if an import can be safely imported into the country and, if not, any conditions that could be imposed in order for it to be safely imported. In considering an IRA report, the Director may provide advice to his delegates that the measures contained in the report may be taken into account in the assessment of risk in deciding whether or not to issue an import permit.

It must be noted that the Director's decision to issue a permit is not the sole determinant of an import being allowed into the country, as imports are also subject to the *Customs Act 1901* and other relevant laws depending on the particular class of import, such as the *Imported Food Control Act 1992*.

The Director may delegate the power to grant import permits under the quarantine proclamations[8] to a quarantine officer or another officer appointed under the *Quarantine Act 1908*.[9] In considering the level of quarantine risk and whether conditions should be imposed to limit the quarantine risk to an acceptably low level, the Director, or delegate, may take into account any relevant information, including an IRA. However, the decision to issue an import permit is not dependent on an IRA being conducted or completed.[10]

A final IRA report is not a statutory decision to allow or prohibit imports into Australia and is not reviewable under the *Administrative Decisions (Judicial Review) Act 1977*. In *Director of Animal and Plant Quarantine v Australian Pork Limited* [2005] FCAFC 206, the Full Court of the Federal Court of Australia held that:

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[5] Ibid, sub-regs 69C(2), 69E(2).
[6] Ibid, reg 69F
[7] Ibid, sub-reg 69H.
[8] *Quarantine Proclamation 1998, Quarantine (Christmas Island) Proclamation 2004* and *Quarantine (Cocos Islands) Proclamation 2004*.
[9] *Quarantine Act 1908*, s 10B.
[10] *Quarantine Regulations 2000*, sub-reg 69C(4). Decisions to issue or not issue import permits are reviewable under the *Administrative Decisions (Judicial Review) Act 1977*.

'The Determination [accepting the final IRA report] did not 'authorise' anything. It did not affect anyone's rights or impose obligations...it did no more than put forward matters to be taken into account by the Director in granting permits. There was no jurisdictional error because no statute conferred jurisdiction to make the Determination; it was a purely internal administrative exercise.'[11]

A final IRA report is not subject to merits review by the Administrative Appeals Tribunal. An IRA can be reviewed by the department at any time in the light of new scientific information on the pest and/or disease risk assessed in the IRA. This is managed at an administrative level through a non-regulated analysis of existing policy and conditions or measures, consistent with the department's obligation to consider new information to ensure national import conditions continue to meet Australia's appropriate level of protection. For example, Australia has the right to take emergency action and impose sanitary or phytosanitary measures as appropriate in response to a newly reported pest, or changed pest status, in a country that exports to Australia. In such circumstances, Australia is then obliged to conduct an objective assessment of the risk and review the sanitary or phytosanitary measure accordingly within a reasonable period of time. A recent example is the pest risk analysis conducted for *Drosophila suzukii* that was detected in North America.

[11] *Director of Animal and Plant Quarantine v Australian Pork Limited* [2005] FCAFC 206 (at 85).

13 December 2012

Report to DAFF on the *Draft report for the review of import conditions for fresh potatoes for processing from New Zealand*

and

Recommended quarantine conditions with regard to *"Candidatus* Liberibacter solanacearum"

A. Chris Hayward

(Honorary Reader in Microbiology, School of Chemistry and Molecular Biosciences, the University of Queensland, St. Lucia, 4072, Qld)

Consultant, Bacterial Plant Diseases

[redacted]

Contents

1. Access to the current literature on Zebra Chip disease of potato

The literature on the disease is distributed among the scientific periodicals covering plant pathology such as *Phytopathology, Plant Disease,* and the *European Journal of Plant Pathology;* those papers primarily concerned with the properties of the insect vector *Bactericera cockerelli* are usually found in the entomological literature in the *Journal of Economic Entomology, Environmental Entomology* and *Insect Science.* A few important papers have appeared elsewhere in the *American Journal of Potato Research, Crop Protection, PLoS ONE, Pest Management Science* and *Biological Control.* The journals listed are not the only sources of reference material but most of the research on zebra chip appears within their pages.

An important source of current research information is the proceedings of the Annual Zebra Chip Reporting Session held annually in the United States. The *Proceedings of the 11th Annual Zebra Chip Reporting Session* (Workneh F, Rashed A, Rush C M ed. San Antonio, TX, November 6-9, 2011) have been published and are freely available online. The eight sessions were on the following topics: epidemiology/survey; pathogen/vector management; insect biology/management; resistance/germplasm identification; Zebra chip impact on potato production; host/pathogen interaction; pathogen detection; pathogen/vector management; molecular biology and physiology. The 12th Conference has been held October 30 – November 2, 2012 at the Crowne Plaza, San Antonio, TX. Some conference abstracts are available online. The November issue of *Psyllid News* published by Potatoes New Zealand includes a brief summary of some of the research findings reported at the 12th Conference as well as a valuable account of some of the current New Zealand research and of that being carried out internationally. Two recent conferences provide additional information on zebra chip disease. The World Potato Conference was held in Edinburgh, Scotland, from 27-30 May, 2012 and the proceedings are available online through the following link:

http://www.potatocongress.org/proceedings-2012/

The paper presented by Dr Kevin Clayton-Greene gives an assessment of the biosecurity risks to Australia resulting from pest incursion, and that given by Dr. Neil Gudmestad provides an overview of current research on zebra chip and the psyllid vector in North America and elsewhere.

The conference "Psyllid 2012: Tomato Potato Psyllid in New Zealand" was held from 26-27 July, in Auckland, New Zealand, and the proceedings are available online through the following link:

http://www.potatoesnz.co.nz/Overview/Who-are-we/2012-Potatoes-New Zealand-Conference.htm.

All but three of the 30 conference presentations are concerned with current research in New Zealand. Visiting authorities from the USA provided information on the grower experience and research being carried out in North America.

The literature on zebra chip disease is steadily expanding, currently at the rate of about one paper every week. The most recent authoritative review on the subject (Munyaneza 2012a) lists 192 references.

2. Entry of the tomato potato psyllid into New Zealand

The tomato potato psyllid (TPP) *Bactericera cockerelli* was first reported in New Zealand in May, 2006, and is now established throughout the North Island and in most regions of the South Island, including Southland (Thomas et al. 2011). A thorough analysis has been made of the possible entry pathways for this insect pest, with the following conclusions:

"Although a definitive pathway of entry for TPP could not be explicitly identified, this paper has documented the current assessment that (1) New Zealand's TPP originated from western USA, (2) the original site of establishment in NZ is unclear, (3) the likelihood of introduction on legally imported nursery stock is unlikely, (4) the likelihood of introduction on fresh produce is unlikely (5) the likelihood of introduction by natural dispersal is negligible, and (6) TPP might plausibly have been introduced by the smuggling of primary host material." (Thomas et al. 2011).

The authors concluded that the most likely pathway of entry of TPP was via smuggling from western USA.

3. The Possible Evolutionary Origin of "*Candidatus* Liberibacter solanacearum"

"*Candidatus* Liberibacter solanacearum" (CLso) associated with zebra chip of potato has emerged as a new pathogen in the past twenty years and its evolutionary origin is the subject of much speculation. A plausible hypothesis is that CLso evolved from being exclusively an endosymbiont in the gut of the tomato potato psyllid to a pathogen adapted to growth in the phloem of a variety of solanaceous host plants including potato. Horizontal (or lateral) gene transfer is well known to occur in prokaryotes. Phage-mediated transduction is one mechanism well known to be a driver of genetic diversity in bacteria and to be a way in which virulence factors can be acquired (Johnson et al. 2011).

Two recent studies using pyrosequencing of the conserved 16S rRNA genes have explored the diversity of bacteria found within the gut of different life stages of the tomato potato psyllid (Nachappa et al. 2011; Hail et al. 2012). Within this diverse community of resident endosymbiotic and transient bacteria, referred to as the microbiome (Hail et al. 2012), horizontal gene transfer may also occur by uptake of naked DNA (transformation) or by conjugation. At this stage there is no evidence to show whether either mechanism has contributed to the evolution of CLso.

4. The Tomato Potato Psyllid: Feeding Habits and Oviposition

Bactericera cockerelli is a species of jumping plant lice, or psyllids (Psylloidea), which comprise a group of around 3000 species of small plant-sap-feeding insects related to the aphids and whiteflies. The common name of jumping lice comes from their well-known habit of jumping when disturbed. A review of life cycle and adaptation in the Psylloidea by Hodkinson (2009) shows they are always associated with above ground plant material for feeding and reproduction oviposition and nymphal development; association with root material is exceedingly rare. Hodkinson (2009) has compiled an exhaustive review of the life history characteristics of Psylloidea world-wide, including the site of overwintering on the plant host and the feeding site (shoot apex, expanded leaf, flower, stem, roots or buds). Feeding on roots is confined to one species, *Craspedolepta subpunctata;* in a further eight species (four confirmed and four suspected) overwintering occurs on root material when seasonal conditions are unfavourable. During favourable seasonal conditions conducive for plant growth, feeding and reproduction occur on shoot material. It is noteworthy that *C. subpunctata* and related species are contained within the family Psyllidae, taxonomically distant from the family Triozidae which includes all of the vectors of CLso and its four haplotypes.

The life cycle of the tomato potato psyllid with fresh above ground plant material is consistent with the vast majority of Psylloidea. The tomato potato psyllid was first described in 1909 and has been studied extensively since the 1920's when it was recognised as an important pest of potato and other Solanaceae (Butler and Trumble 2012b). According to the comprehensive review of *B. cockerelli* by Butler and Trumble (2012b) adult psyllids feed primarily on the underside of leaves of host plants, with some individuals also feeding on the upper surface of leaves as well as stems and petioles. For example, in a field study conducted at multiple sites and years, 99% of psyllids are found on leaves with 70% of these on the underside of the leaf (Butler and Trumble 2012a). Histological studies show that this insect, like aphids, are phloem feeders. When leaves are probed by the insect, penetration occurs through the leaf epidermis intercellularly through the spongy mesophyll until the stylets reach the phloem parenchyma cells, which is the region of the leaf where the most extensive feeding occurs.

Despite numerous studies on the tomato potato psyllid and CLso, including repeated sampling of potato tubers, there is no indication in any of the literature read that the tomato potato psyllid feeds on potato tubers below ground or harvested potatoes (Butler and Trumble 2012b; Munyaneza 2012a; Munyaneza and Henne 2013). Further, the jumping behaviour of adult psyllids in response to disturbance is likely to limit any association with potatoes during handling of potatoes during harvest, cleaning and packing.

According to Munyaneza and Henne (2013): "The eggs of *B. cockerelli* are deposited singly, principally on the lower surface of leaves and usually near the leaf edge, but some eggs can

be found throughout suitable host plants. Often, females will lay numerous eggs on a single leaf."

There is no indication in any of the literature read of oviposition on harvested potato tubers (Butler and Trumble 2012b; Munyaneza 2012a; Munyaneza and Henne 2013). Further, it has been shown that even for preferred host material (actively growing shoots) soil components have a repellency effect on the tomato potato psyllid (see section 5).

5. Chemical and Biological Methods for Control of the Insect Vector

Management of zebra chip disease is targeted against the potato psyllid vector using insecticides (Guenthner et al. 2012; Munyaneza 2012a; Butler et al. 2011, 2012). Detection of the insect vector early in the season is essential to minimize psyllid reproduction in the field and spread of the disease throughout fields (Munyaneza 2012a). New treatments are emerging including the finding of insecticides which are deterrents to feeding as well repellents (Butler et al. 2011a). For example, kaolin particle films (a type of clay) on tomato under laboratory and field conditions have been shown to have a repellent effect on the tomato potato psyllid (Peng et al. 2011).

Wuriyanghan et al. (2011) have used RNA interference technology to induce mortality in *B. cockerelli* with promising results. The authors conclude that: "RNAi can be a powerful tool for gene function studies in psyllids, and give support for continued efforts for investigating RNAi approaches as possible tools for psyllid and plant disease control."

Biological control methods are showing promise as tools for the management of zebra chip disease. Two commercially available entomopathogenic fungi, *Metarhizium anisopliae* and *Isaria fumosorosea* , have been shown to give comparable reductions in plant damage and symptoms of zebra chip to the those obtained with an insecticide treatment (Lacey at al. 2011). In New Zealand, O'Connell et al. (2012) have exploited the 'new species association' approach based on the ecological principle in which a natural enemy is used that has not coevolved with a pest. In a laboratory based study they were able to show that two New Zealand naturalized coccinellids, *Cryptolaemus montrouzieri* and *Cleobora mellyi* were predatory on and consumed the potato tomato psyllid. Their results suggest that a new species association may potentially exist between the two coccinellids and the psyllid.

6. Impact of Current Literature on Zebra Chip on Quarantine Conditions for Importation of Fresh Potatoes for Processing from New Zealand

Very little of the current literature on zebra chip disease of potato affects the import conditions for importation of potatoes for processing from New Zealand. Four subjects which relate directly to the Draft Report are tuber transmission of zebra chip disease (Pitman et al. 2011), the recognition of the existence of haplotypes in CLso (Nelson et al. 2011; Munyaneza 2012a), consideration of the properties of this bacterial pathogen which might affect its capacity for survival when shed into the environment; and the impact of improved diagnostic methods for diagnosis of zebra chip disease. These aspects are considered in turn.

i) Tuber transmission

Until very recently there has been no interest among North American research workers in risk assessment or in the fate of CLso in potato tubers held in store. This lack of interest is reflected in the session topics covered in the *Proceedings of the Annual Zebra Chip Reporting Session* at least as late as the 11th meeting held in 2011.

Zebra chip disease has recently been reported in the Pacific NorthWest of the United States, in Oregon and Washington (Crosslin et al. 2012). This discovery raises the question of the risk of Zebra Chip developing in stored tubers, in view of the fact that most of the potatoes produced in this part of the United States go into storage following harvest. Because migration of psyllids is late in the season, exposure of potatoes to infection also occurs late in the season. Plants exposed to infected psyllids less than three weeks before harvest usually produce tubers without symptoms of zebra chip disease (Buchman et al. 2012). Munyaneza (2012a) reports unpublished preliminary trials in 2010 and 2011 showing that an average of 10-22% and 46-66.4%, respectively, of symptomless tubers harvested from potato (cv. Atlantic) plants exposed to infected psyllids two to three weeks before harvest developed symptoms of zebra chip after two and three months in storage at 10 °C. Similar results have been obtained by Rashed et al. (2011). They reported symptom development in potato tubers of the chipping cultivar FL1867 after three months in storage at 5 °C. The tubers which were from plants exposed to infected psyllids two weeks prior to harvest were symptomless at harvest. Results from the same laboratory showed that this increase in symptom severity was accompanied by a decrease in titre of CLso (Rush et al. unpublished). If there is a decline in numbers of CLso in stored tubers as symptoms develop this may be a reflection of the profound change in the chemistry of the potato. Symptomatic tubers in comparison with asymptomatic tubers contain higher levels of free amino acids, phenolic compounds and defense-related proteins and enzymes, and many of these compounds also were positively correlated with zebra chip disease severity (Wallis et al. 2012; Yang et al. 2011). Similar observations have been made using tomato as the host plant (Casteel et al. 2012).

The fate of the bacterial pathogen in tubers has implications for the transmission to daughter tubers. This will have most significance for potato tubers used for propagation where the growth of tubers is the primary purpose of the imported material. The pathway considered in the draft report is only for potatoes for processing. Processing will stop potatoes from growing and therefore prevent tuber transmission.

ii) Haplotypes of '*Candidatus* Liberibacter solanacearum' and potential vectors

There are four haplotypes of CLso; haplotypes A and B associated with zebra chip of potato and both with the same insect vector; haplotypes C and D with a disease of carrot and with different psyllid species that are suspected to be the vector in Scandinavia and parts of Spain because of their consistent association with infected hosts (Appendix 2). The recognition of different haplotypes of CLso occurring on different host plants and insect vectors, and in widely separate geographical locations, is an important finding (Nelson et al. 2011; Nelson et al. 2012). To quote Nelson et al. (2011): "These apparently stable haplotypes suggest separate bacterial populations of long standing."

Phylogenetic analysis of the 16S rRNA gene has shown that two of the haplotypes, CLsoA in the Americas and CLsoC in northern Europe are closer to each other in spite of a large geographic separation and differences in plant host and insect vector (Nelson et al. 2012).

The genetic diversity of CLso populations in different geographical locations has also been explored using multilocus sequence typing (MLST) (Glynn et al. 2012) and by typing using a panel of eight simple sequence repeat (SSR) markers (Lin et al 2012). Both MLST and SSR typing systems have provided information that confirms and extends the haplotyping scheme.

The number of psyllid vectors for CLso that are associated with particular haplotypes may suggest a very highly specific pathogen/vector relationship. Recent work in the USA has shown that there are three biotypes of the tomato potato psyllid though only two have been shown to acquire CLso (Swisher et al. 2012), evidence suggesting a very high level of specificity between pathogen and vector. However, the potential for native psyllid vectors to acquire the pathogen from sprouting shoot material is not ruled out. The pathway considered in the draft report is only for potatoes for processing. Processing will stop tubers from growing and therefore prevent shoot growth that could allow any potential native psyllid vector(s) to feed and acquire the bacterium.

No published information has been found indicating that haplotypes C and D are transmissible to potato.

iii) Survival of the Zebra Chip Pathogen external to its insect or plant host.

CLso is an obligate intracellular parasite that resides in the phloem cells of the plant which it infects and which is transmitted by insect vectors. CLso is a fastidious bacterium which has so far defied all efforts to obtain pure cultures on an artificial medium. There is no indication in the literature that resting cells are produced by the bacterium which would enable survival when exposed to environmental stresses of desiccation, ultraviolet radiation and high temperature. If imported potatoes carrying CLso were accidentally released into the environment and then washed into water courses or crushed, it is likely that the pest population would lose viability and numbers decline to zero, when subjected to environmental stress or in competition with native microbiota, antibiotic-producing bacteria

or predatory protozoa, for example. Like "*Candidatus* Liberibacter africanus", CLso is known to be heat sensitive to temperatures above 32 °C (Munyaneza et al 2012b). Genetic analysis also shows that CLso has reduced metabolic capabilities reflecting its fastidious and obligate parasitic nature (Doddapaneni et al. 2010), including a limited capacity to utilise complex carbohydrates (Lin et al. 2011). The reduced metabolic capacity of CLso would limit any ability to compete with specialist saprophytes.

iv) Impact of improved diagnostic method

Diagnostic methods of the required sensitivity and specificity are an essential prerequisite for an understanding of the transmission pathway of zebra chip, the epidemiology of the disease, as well as for screening of potato germplasm and in seed certification programs to ensure the availability of clean potato seed (Li et al. 2009). Diagnostic methods based on cultural procedures, including the use of selective media are not available because CLso has not been obtained in culture. Accordingly there has been the need for development of DNA-based diagnostic procedures.

There have been several attempts to develop early detection of CLso in plant tissue and the tomato potato psyllid using polymerase chain reaction (PCR) assays and primer sets located in the conserved 16S rRNA gene, with unreliable and somewhat variable results depending on the primer sets used (Li et al. 2009; Wen et al. 2009; Ravindran et al. 2011). New primer sets have been developed targeting a conserved intergenic region between the 16S and 23S rRNA genes and a conserved bacterial housekeeping gene, adenylate kinase. These primer sets have proved to be more sensitive and reliable in detecting CLso (Ravindran et al. 2011) in plant tissue and insects. Quantitative real-time PCR (qPCR) enables the quantification of CLso populations in environmental samples, in terms of genome equivalents /g plant tissue (Li et al. 2009). The Loop-mediated isothermal amplification procedure or LAMP is a further improvement in methodology with the advantage that a thermocycler is not needed for amplification or agarose gel electrophoresis for resolution (Ravindran et al. 2012). LAMP shows promise as a reliable, rapid and cost-effective method of detecting CLso and other Liberibacter pathogens in psyllids and field-grown potato plants and tubers.

In summary DNA-based diagnostic procedures enable, for example, early detection and monitoring of infective populations of the tomato potato psyllid throughout the growing season. Control of psyllid populations through timely application of insecticides is made possible. The same methodologies have made possible fundamental studies on the acquisition of CLso by its insect vector and its transmission to host plants (Rashed et al. 2012).

7. Conclusion

It is required that New Zealand potatoes are imported in insect proof containers and opened only within quarantine approved premises in a metropolitan area, as specified in the *Draft report for the review of import conditions for fresh potatoes for processing from New*

Zealand, 3 July 2012. When these conditions are applied the risks of importing an exotic pest are minimised, as previously concluded (Hayward 2011).

There are numerous studies on the biology of the zebra complex that provide a very good understanding of the behaviour of the tomato potato psyllid in relation to the potato plant. These studies also assist to answer key questions raised by authorities carrying out pest risk analysis for importation of potatoes for processing from a country such as New Zealand in which zebra chip disease is endemic. In addition expert opinion can also be sought to provide additional guidance. In this context Munyaneza (2012b) writes as follows:

"ZC-infected tubers potentially being a source of the disease spread is a major concern, especially for national and international trade of fresh and seed potatoes. Recent research conducted in the United States by Dr. Munyaneza and collaborators showed that potato seed quality of ZC-infected tubers is significantly diminished as the tubers generally do not sprout and if they do, produce hair sprouts and weak plants.

However, the study concluded that the risk of spreading ZC through disease-infected tubers is extremely low and not significant because the number of ZC-infected tubers giving rise to infected plants is generally negligible and these potatoes are short-lived. Most importantly, potato psyllids must be present to spread the disease.

The main pathway for introducing the disease into potato and other solanaceous crops in regions where ZC is absent would be the introduction of infective potato psyllids, rather than infected seed material or fresh tubers. All life stages of the psyllid can easily be transported on live plant material that serves as hosts to potato psyllid, including produce for sale as well as plants meant for propagation.

Because potato tubers are not a suitable host of the psyllid, exported potato tubers are much less likely to contribute to psyllid movement. Therefore more emphasis should be on developing strategies and phytosanitary measures to effectively exclude the potato/tomato psyllid instead of focusing on preventing export of fresh and seed potatoes."

Appendix 1

Current Literature on Zebra Chip of Potato and the Insect Vector *Bactericera cockerelli* (December, 2012)

Alfaro-Fernandez A, Cebrian M C, Villaescusa F J, Hermoso de Mendoza A, Ferrandiz J C, Sanjuan S, Font M I (2012a) First report of "*Candidatus* Liberibacter solanacearum" in carrot in mainland Spain. *Plant Disease* 96: 582.

Alfaro-Fernandez A, Siverio F, Cebrian M C, Villaescusa F J, Font M I (2012b) "*Candidatus* Liberibacter solanacearum" associated with *Bactericera trigonica*-affected carrots in the Canary Islands. *Plant Disease* 96: 581.

Alvarado V Y, Odokonyero D, Duncan O, Mirkov T E, Scholthof H B (2012) Molecular and physiological properties associated with zebra complex disease in potatoes and its relation with *Candidatus* Liberibacter contents in psyllid vectors. *PLoS ONE* 7: e37345.

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Buchman J L, Heilman B E, Munyaneza J.E. (2011) Effects of Liberibacter-infective *Bactericera cockerelli* (Hemiptera: Triozidae) density on zebra chip potato disease incidence, potato yield and tuber processing quality. *Journal of Economic Entomology* 104: 1783-1792.

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Butler C D, Byrne F J, Keremane M L, Lee R F, Trumble J T (2011) Effects of insecticides on behaviour of adult *Bactericera cockerelli* (Hemiptera: Triozidae) and transmission of *Candidatus* Liberibacter psyllaurous. *Journal of Economic Entomology* 104: 586-594.

Butler C D, Trumble J T (2012a) Spatial dispersion and binomial sequential sampling for the potato psyllid (Hemiptera: Triozidae) on potato. *Pest Management Science*. 68: 865-869.

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Appendix 2

Haplotypes of "*Candidatus* Liberibacter solanacearum": Hosts, Vectors and Geographical Distribution.

Haplotype	Host Plant	Insect vector	Geographical distribution	Reference
A	Potato	*Bactericera cockerelli*	Honduras, Guatemala, western Mexico, Arizona, California, Idaho, Oregon, Washington, New Zealand	Nelson et al. 2012; Wen et al. 2012
B	Potato	*Bactericera cockerelli*	eastern Mexico, Texas, south, central Washington	Wen et al. 2012
C	Carrot	*Trioza apicalis*	Finland, Sweden, Norway	Nissinen et al. 2012; Munyaneza et al. 2010a, b, c; 2011; 2012c, d
D	Carrot	*Bactericera trigonica*	Canary Islands, mainland Spain	Alfaro-Fernandez et al 2012a, b

1) CLso has been reported on carrots in association with *Trioza apicalis* in France but the haplotype involved has not been determined (http://archives.eppo.int/EPPOReporting/2012/Rse-1210.pdf).

2) CLso has been reported on celery (Apiaceae) in Spain in association with *Bactericera trigonica* (www.http://archives.eppo.int/EPPOReporting/2012/Rse-1206.pdf).

Appendix 12

Import Risk Analysis Effectiveness Checklist – provided by Chris Peace

Table 1. Import risk analysis effectiveness checklist

Questions	Findings
Does the report summarise relevant quarantine and other relevant Australian Government legislation or international treaties?	
Are the sanitary and phytosanitary objectives of the Australian Government clearly identified in the import risk analysis report?	
Arising from the sanitary and phytosanitary objectives, quarantine and other legislation and international treaties, have clear sanitary and phytosanitary criteria been established for risk evaluation? Criteria are the appropriate level of protection (ALOP) set by the Australian Government.	
Is there a clear description of the context of the export country?	
Does this description include the maturity and ethics of state sector regulatory agencies and the degree of self-regulation?	
Is there a clear description of the context of harvesting, processing and transporting the product before export?	
Does this description include relevant sanitary or similar controls and their reliability?	
Which stakeholders did the risk analysts communicate with before, during and on completion of risk analysis?	
Which stakeholders did the risk analysts consult with before, during and on completion of risk analysis?	
Does the report clearly identify the stakeholders' concerns about the proposal and associated risks?	
Did the risk analysts follow a consistent process meeting best practice to identify risks, understand the nature of each risk and then determine the level of each risk?	
Which techniques were used to identify the risks associated with the proposed import?	
Does each risk name set out the: • risk source • possible causes of the risk event • the risk event • possible consequences • impacts on the sanitary and phytosanitary objectives	
Which risk analysis techniques did the risk analysts use?	
Did those techniques enable "triangulation" to show the different characteristics of each risk and so build a comprehensive picture of each risk?	
Is the description of the nature of each risk clear and unambiguous?	
Has uncertainty been discussed in relation to the nature of each risk and how did this inform the use of any quantitative risk analysis?	
How was the level of each risk determined?	
Has the level of each risk been compared with other, similar risks that have been accepted or rejected by the Australian Government?	
Has the import risk analysis been adapted to any unusual features of the proposal and is any such adaptation clearly identified?	
Overall, is the import risk analysis systematic and structured?	

Questions	Findings
Does the risk assessment process provide the best available information to decision-makers in a useful and usable way?	

Appendix 13

Pineapple Biosecurity Plan – Emergency Plant Pest Priority List

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