Australian Government

Department of Agriculture, Fisheries and Forestry

Importation of Fresh Bananas from the Philippines

Addendum to
revised Draft IRA Report of February 2004

June 2004

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CONTENTS

LIST OF TABLES

INTRODUCTION

Following the release of the revised Draft Import Risk Analysis (IRA) Report for the importation of fresh bananas from the Philippines on 19 February 2004, Biosecurity Australia found a transcription error in the Excel spreadsheet model used to estimate risk.

Subsequently, the IRA team for the Philippines banana IRA has reviewed the implications of correcting the error and advised Biosecurity Australia of changes to the report and to the recommended quarantine conditions. The findings are presented in this Addendum.

THE EXCEL SPREADSHEET ERROR

The revised draft report used the following formula (see Table 14, page 87 of the February report) to estimate the probability of entry, establishment or spread (P_{EES}) of each quarantine pest associated with a tonne of imported banana fruit:

$$P_{EES} = 1-(1- P_{Commercial}) \times (1 - P_{Household}) \times (1 - P_{Wild})$$

Where:

- $P_{Commercial}$ is the probability of entry, establishment or spread through the exposure of commercial banana plants;
- $P_{Household}$ is the probability of entry, establishment or spread through the exposure of household (non-commercial) banana plants or other susceptible garden plants (including weeds); and
- P_{Wild} is the probability of entry, establishment or spread through the exposure of wild plants (including bananas) or susceptible plants other than bananas.

The spreadsheet formula erroneously sourced information for $P_{Household}$ from the cell containing the value for $P_{Commercial.}$ Consequently, the calculation omitted $P_{Household}$ and represented $P_{Commerical}$ twice.

The corrected model is now available on Biosecurity Australia's website www.daff.gov.au/biosecurityaustralia.

IMPLICATIONS OF CORRECTING THE SPREADSHEET ERROR

Risk Estimates

The correction has changed the overall annual probability of entry, establishment or spread (Annual PEES) for some pests with consequent changes to some risk estimates.

- For banana bract mosaic virus (BBrMV), Annual PEES increased from low to moderate. This moves the unrestricted risk to low, requiring risk management to reduce the biosecurity risk to within Australia's Appropriate Level of Protection (ALOP).
- For Moko, Annual PEES increased from moderate to high. This has not affected the unrestricted risk estimate. However, the low pest prevalence level of about one Moko infected mat per four hectare per year proposed in the February draft report is not sufficient to reduce the biosecurity risk to within Australia's ALOP.
- For mealybugs (*D. neobrevipes* and *P. jackbeardsleyi*), the change to Annual PEES (within the high category) is small but is enough to adjust the risk management measures required to reduce biosecurity risk to within Australia's ALOP.

For all other pests, the change to the PEES for one tonne of bananas is either insufficient to change the probability category assigned to Annual PEES or, if the Annual PEES changed, the overall risk is such that a change to risk management is not required.

To help identify the changes easily, tables have been prepared showing the inputs and outputs for the uncorrected and the corrected model. Tables 1 and 2 provide unrestricted risk model outputs for all quarantine pests. Tables 3, 4, 5, 6 and 7 provide the restricted risk model outputs for pests requiring risk management – Moko, freckle, BBrMV and mealybugs. Differences resulting from the correction are highlighted. There are three cases where model outputs in the pest risk assessments reported in the February report need to be changed. The text of the February report should be amended as follows:

Page Number (revised Draft IRA Report February 2004)	Pest	Description of Correction
131	BBrMV	• Annual probability of entry establishment or spread: change - Low to Moderate
		• Unrestricted risk: change - Very low to Low
162	Moko	• Annual probability of entry establishment or spread: change - Moderate to High
258	Spider mites	• Probability of entry establishment or spread (1 tonne): change - Very low to Low

It should be noted that there is no change to the model inputs reported in the February report. For convenience, model inputs are shown in Tables 1-7 with their respective model outputs.

Risk Management

Changes to the risk estimates of BBrMV, Moko and mealybugs (*D. neobrevipes* and *P. jackbeardsleyi*) required changes to risk management recommendations for these pests:

- For BBrMV, sourcing bananas from areas with a low pest prevalence level of no more than three infected mats per hectare would be required to reduce the biosecurity risk to within Australia's ALOP. As with Moko and freckle, restricting the distribution of bananas to areas within Australia where commercial bananas are not grown would also reduce the risk of BBrMV to within Australia's ALOP.
- For Moko, reducing the biosecurity risk to within Australia's ALOP would require sourcing bananas from areas with a low pest prevalence level of no more than one infected mat per seven hectare per year (rather than a low pest prevalence level of no more than one infected mat per four hectare per year as previously recommended).
- For mealybugs (*D. neobrevipes* and *P. jackbeardsleyi*), reducing the biosecurity risk to within Australia's ALOP would require an insecticide treatment in the packing station combined with washing and brushing the spaces between banana fingers.

Amendments to the February revised Draft IRA Report

The *Risk Management for Quarantine Pests* section in the revised Draft IRA Report has been redrafted to take account of the changes to the risk estimates for BBrMV, Moko, freckle and mealybugs, and some changes have also been made to the *Quarantine Conditions* section and the *Executive Summary*. While the changes are not extensive, these three sections of the February report have been completely replaced in Attachments 1, 2 and 3 and with the changes highlighted for ease of reading.

STAKEHOLDER COMMENTS

Biosecurity Australia invites comments on the *revised Draft IRA Report* and this Addendum within 60 days of publication of the Addendum, i.e by 16 August 2004. The IRA Team will take account of all comments and any other pertinent scientific information that comes to hand in finalising its recommendations.

Table 1 Unrestricted Risk – Simulation Model Inputs and Outputs[1] for Banana Bract Mosaic Virus, Banana Bunchy Top Virus, Moko, Freckle, Black Sigatoka and Panama.

Model Parameters	Banana Bract Mosaic Virus	Banana Bunchy Top Virus	Moko	Freckle	Black Sigatoka	Panama
Importation Scenario						
Importation Step Likelihood						
Imp1	High	High	High	High	High	Low
Imp2	Very low	Extremely low	Extremely low	Low	Extremely low	Negligible
Imp3	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Imp4	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Imp5	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Imp6	Negligible	Negligible	Negligible	Negligible	Moderate	Negligible
Imp7	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Imp8	Certain	Certain	High	High	High	High
Imp9	Certain	Certain	High	High	Moderate	High
Imp10	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
P (Importation)	Very low	Extremely low	Extremely low	Low	Extremely low	Negligible
Distribution						
Prop1	Low	Low	Low	Low	Low	Low
Prop2	Moderate	Moderate	High	Moderate	Moderate	High
Prop3	Low	Low	High	Low	Low	High
Dist1	Certain	Certain	High	High	Moderate	High
Dist2	Certain	Certain	Certain	Certain	Certain	Certain
Dist3	Extremely low	Extremely low	Low	Very low	Extremely low	Low
Dist4	Extremely low	Extremely low	Low	Very low	Extremely low	Low
Dist5	Extremely low	Extremely low	Low	Very low	Extremely low	Low

[1] For the February 2004 model (Uncorrected) and the June 2004 Model (Corrected). All model outputs are highlighted in light grey. Any differences between the uncorrected and corrected are clearly highlighted dark grey with white lettering.

Model Parameters	Banana Bract Mosaic Virus	Banana Bunchy Top Virus	Moko	Freckle	Black Sigatoka	Panama
Partial Probability of Distribution						
1. PPD Commercial	Extremely low	Extremely low	Very low	Very low	Extremely low	Very low
2. PPD Household	Extremely low	Extremely low	Low	Very low	Extremely low	Low
3. PPD Wild	Extremely low	Extremely low	Low	Very low	Extremely low	Low
Establishment and Spread						
Partial Probabilities of Establishment and Spread						
1. Commercial Establishment and Spread						
PPE Commercial	High	High	Moderate	Low	Low	High
PPS Commercial	High	High	High	High	High	High
2. Household Establishment and Spread						
PPE Household	High	High	Moderate	Moderate	Moderate	High
PPS Household	High	High	Moderate	Moderate	Moderate	Moderate
3. Wild Establishment and Spread						
PPE Wild	High	High	Moderate	Moderate	Moderate	High
PPS Wild	High	High	Moderate	Moderate	Moderate	Moderate
Consequences						
(a) Direct Criteria						
Animal or plant life or health	C	B	B	B	C	C
Human life or health	A	A	A	A	A	A
Any other aspects of the environment	A	A	A	A	A	A
(b) Indirect Criteria						
Eradication or control etc	C	B	C	B	C	C
Domestic trade or industry effects	B	A	C	C	B	A

Model Parameters	Banana Bract Mosaic Virus	Banana Bunchy Top Virus	Moko	Freckle	Black Sigatoka	Panama
International trade effects	A	A	A	A	A	A
Indirect effects on the environment	A	A	B	A	B	C
Overall Consequences	Low	Very low	Low	Low	Low	Low
Uncorrected Outputs						
One tonne likelihood (PEES)	Extremely low	Negligible	Extremely low	Extremely low	Negligible	Negligible
Annual likelihood (Annual PEES)	Low	Very low	Moderate	High	Extremely low	Very low
Unrestricted risk	Very low	Negligible	Low	Low	Negligible	Negligible
Corrected Outputs						
One tonne likelihood (PEES)	Extremely low	Negligible	Extremely low	Extremely low	Negligible	Negligible
Annual likelihood (Annual PEES)	**Moderate**	Very low	**High**	High	Extremely low	Very low
Unrestricted risk	**Low**	Negligible	Low	Low	Negligible	Negligible

Table 2 Unrestricted Risk – Inputs and Outputs (continued) for Fruit Flies, Hard Scales, Mealybugs, Spider Mites and Weevils.

Model Parameters	Fruit Flies	Hard Scales	Mealybugs D. neobrevipes P. jackeardsleyi	Mealybug *R. invadens*	Spider Mites	Weevils
Importation Scenario						
Importation Step Likelihood						
Imp1	High	High	High	Very low	High	Moderate
Imp2	Negligible	Moderate	Moderate	Extremely low	Moderate	Extremely low
Imp3	Negligible	Negligible	Extremely low	Extremely low	Extremely low	Negligible
Imp4	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Imp5	Moderate	Very low	Low	Low	Very low	High
Imp6	Negligible	Low	Low	Low	Moderate	High
Imp7	Extremely low	Very low	Extremely low	Extremely low	Extremely low	Very low
Imp8	High	High	High	High	High	High
Imp9	High	High	High	High	High	High
Imp10	Very low	Low	Very low	Very low	Very low	Low
P(Importation)	Negligible	Low	Low	Extremely low	Low	Extremely low
Distribution						
Prop1	Low	Low	Low	Low	Low	Low
Prop2	High	High	High	High	High	Moderate
Prop3	High	High	High	High	High	Moderate
Dist1	High	High	High	High	High	High
Dist2	Certain	Certain	Certain	Certain	Certain	Certain
Dist3	High	Negligible	Extremely low	Extremely low	Low	Negligible
Dist4	High	Extremely low	Very low	Very low	Moderate	Extremely low
Dist5	High	Extremely low	Very low	Very low	Moderate	Extremely low
Partial Probability of Distribution						
PPD Commercial	Low	Negligible	Extremely low	Extremely low	Very low	Negligible

Model Parameters	Fruit Flies	Hard Scales	Mealybugs D. neobrevipes P. jackeardsleyi	Mealybug *R. invadens*	Spider Mites	Weevils
PPD Household	Moderate	Extremely low	Very low	Very low	Moderate	Extremely low
PPD Wild	Moderate	Extremely low	Very low	Very low	Moderate	Extremely low
Establishment and Spread						
Partial Probabilities of Establishment and Spread						
1. Commercial Establishment and Spread						
PPE Commercial	High	High	Very low	Very low	High	Very low
PPS Commercial	High	High	High	High	High	Moderate
2. Household Establishment and Spread						
PPE Household	High	Moderate	Very low	Very low	High	Very low
PPS Household	High	Moderate	High	High	High	Moderate
3. Wild Establishment and Spread						
PPE Wild	High	Moderate	Very low	Very low	High	Very low
PPS Wild	High	Moderate	High	High	High	Moderate
Consequences						
(a) Direct Criteria						
Animal or plant life or health	A	A	C	C	B	B
Human life or health	A	A	A	A	A	A
Any other aspects of the environment	A	A	A	A	A	A
(b) Indirect Criteria						
Eradication or control etc	B	A	B	B	B	B
Domestic trade or industry effects	C	B	B	B	B	A
International trade effects	D	B	B	C	A	A
Indirect effects on the environment	A	A	A	A	A	A

Model Parameters	Fruit Flies	Hard Scales	Mealybugs D. neobrevipes P. jackeardsleyi	Mealybug *R. invadens*	Spider Mites	Weevils
Overall Consequences	Moderate	Very low	Low	Low	Very low	Very low
Uncorrected Outputs						
One tonne likelihood (PEES)	Negligible	Extremely low	Extremely low	Negligible	Very low	Negligible
Annual likelihood (Annual PEES)	Very low	High	High	Very low	High	Negligible
Unrestricted risk	Very low	Very low	Low	Negligible	Very low	Negligible
Corrected Outputs						
One tonne likelihood (PEES)	Negligible	Extremely low	Extremely low	Negligible	**Low**	Negligible
Annual likelihood (Annual PEES)	Very low	High	High	Very low	High	Negligible
Unrestricted risk	Very low	Very low	Low	Negligible	Very low	Negligible

Table 3 Restricted Risk – Banana Bract Mosaic Virus – Simulation Model Inputs and Outputs[1]

	Unrestricted Risk	Risk Management Measures		
Model Parameters	**(included for ease of comparison)**	**Area Freedom**	**Low Pest Prevalence**	**Restricted Distribution**
Importation Scenario				
Importation Step Likelihood				
Imp1	High	Negligible	High	High
Imp2	Very low	Negligible	Other[2] 1.2×10^{-2}	Very low
Imp3	Negligible	Negligible	Negligible	Negligible
Imp4	Negligible	Negligible	Negligible	Negligible
Imp5	Negligible	Negligible	Negligible	Negligible
Imp6	Negligible	Negligible	Negligible	Negligible
Imp7	Negligible	Negligible	Negligible	Negligible
Imp8	Certain	Certain	Certain	Certain
Imp9	Certain	Certain	Certain	Certain
Imp10	Negligible	Negligible	Negligible	Negligible
P(Importation)	Very low	Negligible	Very low	Very low
Distribution				
Prop1	Low	Low	Low	Extremely low
Prop2	Moderate	Moderate	Moderate	Low
Prop3	Low	Low	Low	Extremely low
Dist1	Certain	Certain	Certain	Certain
Dist2	Certain	Certain	Certain	Certain

[1] June 2004 Model (Corrected). All model outputs are highlighted in light grey.

[2] 'Other' = a quantitative estimate

	Unrestricted Risk	Risk Management Measures		
Model Parameters	**(included for ease of comparison)**	**Area Freedom**	**Low Pest Prevalence**	**Restricted Distribution**
Dist3	Extremely low	Extremely low	Extremely low	Extremely low
Dist4	Extremely low	Extremely low	Extremely low	Extremely low
Dist5	Extremely low	Extremely low	Extremely low	Extremely low
Partial Probability of Distribution				
PPD Commercial	Extremely low	Extremely low	Extremely low	Negligible
PPD Household	Extremely low	Extremely low	Extremely low	Extremely low
PPD Wild	Extremely low	Extremely low	Extremely low	Negligible
Establishment and Spread				
Partial Probabilities of Establishment and Spread				
1. Commercial Establishment and Spread				
PPE Commercial	High	High	High	High
PPS Commercial	High	High	High	High
2. Household Establishment and Spread				
PPE Household	High	High	High	High
PPS Household	High	High	High	High
3. Wild Establishment and Spread				
PPE Wild	High	High	High	High
PPS Wild	High	High	High	High
Consequences				
(a) Direct Criteria				
Animal or plant life or health	C	C	C	C
Human life or health	A	A	A	A
Any other aspects of the environment	A	A	A	A

	Unrestricted Risk	Risk Management Measures		
Model Parameters	**(included for ease of comparison)**	**Area Freedom**	**Low Pest Prevalence**	**Restricted Distribution**
(b) Indirect Criteria				
Eradication or control etc	C	C	C	C
Domestic trade or industry effects	B	B	B	B
International trade effects	A	A	A	A
Indirect effects on the environment	A	A	A	A
Overall consequences	Low	Low	Low	Low
Uncorrected Outputs				
One tonne likelihood (PEES)	Extremely low	Not assessed	Not assessed	Not assessed
Annual likelihood (Annual PEES)	Low			
Restricted risk	Very low			
Corrected Outputs				
One tonne likelihood (PEES)	Extremely low	Negligible	Extremely low	Extremely low
Annual likelihood (Annual PEES)	Moderate	Extremely low	Low	Low
Restricted risk	Low	Negligible	Very low	Very low

Table 4 Restricted Risk – Moko – Simulation Model Inputs and Outputs[1]

	Unrestricted Risk	Risk Management Measures				
Model Parameters	**(included for ease of comparison)**	**Area Freedom**	**Internal Peduncle**	**Low Pest Prevalence (1 mat / 4 ha / year)**	**Low Pest Prevalence (1 mat / 7 ha / year)**	**Restricted Distribution**
Importation Scenario						
Importation Step Likelihood						
Imp1	High	Negligible	High	High	High	High
Imp2	Extremely low	Negligible	Extremely low	Other 1.3×10^{-4}	Other 7.94×10^{-5}	Extremely low
Imp3	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Imp4	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Imp5	Negligible	Negligible	Moderate	Negligible	Negligible	Negligible
Imp6	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Imp7	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Imp8	High	High	High	High	High	High
Imp9	High	High	High	High	High	High
Imp10	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
P(Importation)	Extremely low	Negligible	Extremely low	Extremely low	Extremely low	Extremely low
Distribution						
Prop1	Low	Low	Low	Low	Low	Extremely low
Prop2	High	High	High	High	High	High
Prop3	High	High	High	High	High	High
Dist1	High	High	High	High	High	High
Dist2	Certain	Certain	Certain	Certain	Certain	Certain

[1] For the February 2004 model (Uncorrected) and the June 2004 Model (Corrected). All model outputs are highlighted in light grey. Any differences between the uncorrected and corrected are clearly highlighted dark grey with white lettering.

	Unrestricted Risk	Risk Management Measures				
Model Parameters	**(included for ease of comparison)**	**Area Freedom**	**Internal Peduncle**	**Low Pest Prevalence (1 mat / 4 ha / year)**	**Low Pest Prevalence (1 mat / 7 ha / year)**	**Restricted Distribution**
Dist3	Low	Low	Low	Low	Low	Low
Dist4	Low	Low	Low	Low	Low	Low
Dist5	Low	Low	Low	Low	Low	Low
Partial Probability of Distribution						
PPD Commercial	Very low	Very low	Very low	Very low	Very low	Extremely low
PPD Household	Low	Low	Low	Low	Low	Low
PPD Wild	Low	Low	Low	Low	Low	Low
Establishment and Spread						
Partial Probabilities of Establishment and Spread						
1. Commercial Establishment and Spread						
PPE Commercial	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
PPS Commercial	High	High	High	High	High	High
2. Household Establishment and Spread						
PPE Household	Moderate	Moderate	Moderate	Moderate	Moderate	Extremely low
PPS Household	Moderate	Moderate	Moderate	Moderate	Moderate	Extremely low
3. Wild Establishment and Spread						
PPE Wild	Moderate	Moderate	Moderate	Moderate	Moderate	Extremely low
PPS Wild	Moderate	Moderate	Moderate	Moderate	Moderate	Extremely low
Consequences						
(a) Direct Criteria						
Animal or plant life or health	B	B	B	B	B	B
Human life or health	A	A	A	A	A	A

	Unrestricted Risk	Risk Management Measures				
Model Parameters	**(included for ease of comparison)**	**Area Freedom**	**Internal Peduncle**	**Low Pest Prevalence (1 mat / 4 ha / year)**	**Low Pest Prevalence (1 mat / 7 ha / year)**	**Restricted Distribution**
Any other aspects of the environment	A	A	A	A	A	A
(b) Indirect Criteria						
Eradication or control etc	C	C	C	C	C	C
Domestic trade or industry effects	C	C	C	C	C	C
International trade effects	A	A	A	A	A	A
Indirect effects on the environment	B	B	B	B	B	B
Overall consequences	Low	Low	Low	Low	Low	Low
Uncorrected Outputs						
One tonne likelihood (PEES)	Extremely low	Negligible	Extremely low	Extremely low	Not assessed	Negligible
Annual likelihood (Annual PEES)	Moderate	Very low	Moderate	Low		Extremely low
Restricted risk	Low	Negligible	Low	Very low		Negligible
Corrected Outputs						
One tonne likelihood (PEES)	Extremely low	Negligible	Extremely low	Extremely low	Extremely low	Negligible
Annual likelihood (Annual PEES)	**High**	Very low	Moderate	**Moderate**	Low	Extremely low
Restricted risk	Low	Negligible	Low	**Low**	Very low	Negligible

Table 5 Restricted Risk – Freckle – Simulation Model Inputs and Outputs[1]

	Unrestricted Risk	Risk Management Measures			
Model Parameters	**(included for ease of comparison)**	**Area Freedom**	**Low Pest Prevalence**	**Restricted Distribution**	**Augmented Inspection**
Importation Scenario					
Importation Step Likelihood					
Imp1	High	Negligible	High	High	High
Imp2	Low	Negligible	Other 1.8×10^{-3}	Low	Low
Imp3	Negligible	Negligible	Negligible	Negligible	Negligible
Imp4	Negligible	Negligible	Negligible	Negligible	Negligible
Imp5	Negligible	Negligible	Negligible	Negligible	Negligible
Imp6	Negligible	Negligible	Negligible	Negligible	Negligible
Imp7	Negligible	Negligible	Negligible	Negligible	Extremely low
Imp8	High	High	High	High	High
Imp9	High	High	High	High	High
Imp10	Negligible	Negligible	Negligible	Negligible	Very low
P(Importation)	Low	Negligible	Very low	Low	Low
Distribution					
Prop1	Low	Low	Low	Extremely low	Low
Prop2	Moderate	Moderate	Moderate	Low	Moderate
Prop3	Low	Low	Low	Extremely low	Low
Dist1	High	High	High	High	High
Dist2	Certain	Certain	Certain	Certain	Certain
Dist3	Very low	Very low	Very low	Very low	Very low
Dist4	Very low	Very low	Very low	Extremely low	Very low

[1] For the February 2004 model (Uncorrected) and the June 2004 Model (Corrected). All model outputs are highlighted in light grey. Any differences between the uncorrected and corrected are clearly highlighted dark grey with white lettering.

	Unrestricted Risk	Risk Management Measures			
Model Parameters	**(included for ease of comparison)**	**Area Freedom**	**Low Pest Prevalence**	**Restricted Distribution**	**Augmented Inspection**
Dist5	Very low	Very low	Very low	Very low	Very low
Partial Probability of Distribution					
PPD Commercial	Very low	Very low	Very low	Extremely low	Very low
PPD Household	Very low	Very low	Very low	Extremely low	Very low
PPD Wild	Very low	Very low	Very low	Extremely low	Very low
Establishment and Spread					
Partial Probabilities of Establishment and Spread					
1. Commercial Establishment and Spread					
PPE Commercial	Low	Low	Low	Low	Low
PPS Commercial	High	High	High	High	High
2. Household Establishment and Spread					
PPE Household	Moderate	Moderate	Moderate	Moderate	Moderate
PPS Household	Moderate	Moderate	Moderate	Moderate	Moderate
3. Wild Establishment and Spread					
PPE Wild	Moderate	Moderate	Moderate	Moderate	Moderate
PPS Wild	Moderate	Moderate	Moderate	Moderate	Moderate
Consequences					
(a) Direct Criteria					
Animal or plant life or health	B	B	B	B	B
Human life or health	A	A	A	A	A
Any other aspects of the environment	A	A	A	A	A
(b) Indirect Criteria					
Eradication or control etc	B	B	B	B	B
Domestic trade or industry effects	C	C	C	C	C
International trade effects	A	A	A	A	A

	Unrestricted Risk	Risk Management Measures			
Model Parameters	**(included for ease of comparison)**	**Area Freedom**	**Low Pest Prevalence**	**Restricted Distribution**	**Augmented Inspection**
Indirect effects on the environment	A	A	A	A	A
Overall consequences	Low	Low	Low	Low	Low
Uncorrected Outputs					
One tonne likelihood (PEES)	Extremely low	Negligible	Extremely low	Negligible	Extremely low
Annual likelihood (Annual PEES)	High	Extremely low	Low	Very low	High
Restricted risk	Low	Negligible	Very low	Negligible	Low
Corrected Outputs					
One tonne likelihood (PEES)	Extremely low	Negligible	Extremely low	**Extremely low**	Extremely low
Annual likelihood (Annual PEES)	High	Extremely low	Low	**Low**	High
Restricted risk	Low	Negligible	Very low	**Very low**	Low

Table 6 Restricted Risk – Mealybugs – Simulation Model Inputs and Outputs[1]

	Unrestricted Risk	Risk Management Measures						
Model Parameters	**(1) (include for ease of comparison)**	**(2) Permanent Packing Stations (PPS)**	**(3) Targeted Inspection (TI)**	**(4) Targeted Sponging (TS)**	**(5) Insecticide (I)**	**(6) PPS & TI**	**(7) PPS & TS**	**(8) PPS & I**
Importation Scenario								
Importation Step Likelihood								
Imp1	High	High	High	High	High	High	High	High
Imp2	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Imp3	Extremely low	Negligible	Extremely low	Extremely low	Extremely low	Negligible	Negligible	Negligible
Imp4	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Imp5	Low	Low	High	Low	Low	High	Low	Low
Imp6	Low	Low	Low	High	High	Low	High	High
Imp7	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low
Imp8	High	High	High	High	High	High	High	High
Imp9	High	High	High	High	High	High	High	High
Imp10	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
P(Importation)	Low	Low	Low	Very low	Very low	Low	Very low	Very low
Distribution								
Prop1	Low	Low	Low	Low	Low	Low	Low	Low
Prop2	High	High	High	High	High	High	High	High
Prop3	High	High	High	High	High	High	High	High
Dist1	High	High	High	High	High	High	High	High
Dist2	Certain	Certain	Certain	Certain	Certain	Certain	Certain	Certain

[1] For the February 2004 model (Uncorrected) and the June 2004 Model (Corrected). All model outputs are highlighted in light grey. Any differences between the uncorrected and corrected are clearly highlighted dark grey with white lettering.

	Unrestricted Risk	Risk Management Measures						
Model Parameters	**(1) (include for ease of comparison)**	**(2) Permanent Packing Stations (PPS)**	**(3) Targeted Inspection (TI)**	**(4) Targeted Sponging (TS)**	**(5) Insecticide (I)**	**(6) PPS & TI**	**(7) PPS & TS**	**(8) PPS & I**
Dist3	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low
Dist4	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
Dist5	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
Partial Probability of Distribution								
PPD Commercial	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low
PPD Household	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
PPD Wild	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
Establishment and Spread								
Partial Probabilities of Establishment and Spread								
1. Commercial Establishment and Spread								
PPE Commercial	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
PPS Commercial	High	High	High	High	High	High	High	High
2. Household Establishment and Spread								
PPE Household	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
PPS Household	High	High	High	High	High	High	High	High
3. Wild Establishment and Spread								
PPE Wild	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
PPS Wild	High	High	High	High	High	High	High	High
Consequences								
(a) Direct Criteria								
Animal or plant life or health	C	C	C	C	C	C	C	C
Human life or health	A	A	A	A	A	A	A	A

	Unrestricted Risk	Risk Management Measures						
Model Parameters	**(1) (include for ease of comparison)**	**(2) Permanent Packing Stations (PPS)**	**(3) Targeted Inspection (TI)**	**(4) Targeted Sponging (TS)**	**(5) Insecticide (I)**	**(6) PPS & TI**	**(7) PPS & TS**	**(8) PPS & I**
Any other aspects of the environment	A	A	A	A	A	A	A	A
(b) Indirect Criteria								
Eradication or control etc	B	B	B	B	B	B	B	B
Domestic trade or industry effects	B	B	B	B	B	B	B	B
International trade effects	B	B	B	B	B	B	B	B
Indirect effects on the environment	A	A	A	A	A	A	A	A
Overall consequences	Low	Low	Low	Low	Low	Low	Low	Low
Uncorrected Outputs								
One tonne likelihood (PEES)	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low
Annual likelihood (Annual PEES)	High	High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Restricted risk	Low	Low	Low	Low	Low	Low	Low	Low
Corrected Outputs								
One tonne likelihood (PEES)	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low
Annual likelihood (Annual PEES)	High	High	High	**High**	**High**	**High**	**High**	**High**
Restricted risk	Low	Low	Low	Low	Low	Low	Low	Low

Table 7 Restricted Risk – Mealybugs (continued) – Simulation Model Inputs and Outputs

	Risk Management Measures							
Model Parameters	**(9) TI & TS**	**(10) TI & I**	**(11) TS & I**	**(12) PPS, TI & TS**	**(13) TI, TS & I**	**(14) PPS, TS & I**	**(15) PPS, TI & I**	**(16) PPS, TS, TI & I**
Importation Scenario								
Importation Step Likelihood								
Imp1	High	High	High	High	High	High	High	High
Imp2	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Imp3	Extremely low	Extremely low	Extremely low	Negligible	Extremely low	Negligible	Negligible	Negligible
Imp4	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Imp5	High	High	Low	High	High	Low	High	High
Imp6	High	High	Other 9.78×10^{-1}	High	Other 9.78×10^{-1}	Other 9.78×10^{-1}	High	Other 9.78×10^{-1}
Imp7	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low
Imp8	High	High	High	High	High	High	High	High
Imp9	High	High	High	High	High	High	High	High
Imp10	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
P(Importation)	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
Distribution								
Prop1	Low	Low	Low	Low	Low	Low	Low	Low
Prop2	High	High	High	High	High	High	High	High
Prop3	High	High	High	High	High	High	High	High
Dist1	High	High	High	High	High	High	High	High
Dist2	Certain	Certain	Certain	Certain	Certain	Certain	Certain	Certain
Dist3	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low
Dist4	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low

	Risk Management Measures							
Model Parameters	**(9) TI & TS**	**(10) TI & I**	**(11) TS & I**	**(12) PPS, TI & TS**	**(13) TI, TS & I**	**(14) PPS, TS & I**	**(15) PPS, TI & I**	**(16) PPS, TS, TI & I**
Dist5	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
Partial Probability of Distribution								
PPD Commercial	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low
PPD Household	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
PPD Wild	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
Establishment and Spread								
Partial Probabilities of Establishment and Spread								
1. Commercial Establishment and Spread								
PPE Commercial	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
PPS Commercial	High	High	High	High	High	High	High	High
2. Household Establishment and Spread								
PPE Household	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
PPS Household	High	High	High	High	High	High	High	High
3. Wild Establishment and Spread								
PPE Wild	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
PPS Wild	High	High	High	High	High	High	High	High
Consequences								
(a) Direct Criteria								
Animal or plant life or health	C	C	C	C	C	C	C	C
Human life or health	A	A	A	A	A	A	A	A
Any other aspects of the environment	A	A	A	A	A	A	A	A
(b) Indirect Criteria								
Eradication or control etc	B	B	B	B	B	B	B	B

	Risk Management Measures							
Model Parameters	**(9) TI & TS**	**(10) TI & I**	**(11) TS & I**	**(12) PPS, TI & TS**	**(13) TI, TS & I**	**(14) PPS, TS & I**	**(15) PPS, TI & I**	**(16) PPS, TS, TI & I**
Domestic trade or industry effects	B	B	B	B	B	B	B	B
International trade effects	B	B	B	B	B	B	B	B
Indirect effects on the environment	A	A	A	A	A	A	A	A
Overall consequences	Low	Low	Low	Low	Low	Low	Low	Low
Uncorrected Outputs								
One tonne likelihood (PEES)	Extremely low	Extremely low	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed
Annual likelihood (Annual PEES)	Low	Low						
Restricted risk	Very low	Very low						
Corrected Outputs								
One tonne likelihood (PEES)	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low	Extremely low
Annual likelihood (Annual PEES)	**Moderate**	**Moderate**	Low	Moderate	Low	Low	Moderate	Low
Restricted risk	**Low**	**Low**	Very low	Low	Very low	Very low	Low	Very low

Attachment 1: Replacement section of the Revised Draft IRA - Risk management for quarantine pests

The unrestricted biosecurity risk of each quarantine pest was estimated in the previous section, *Risk Assessment for Quarantine Pests*, to ascertain whether it exceeded Australia's ALOP ('very low'). In cases where the unrestricted risk was found to be 'very low' or 'negligible', the risk was considered acceptable and it was concluded that no risk management measures were required in respect of that pest. The unrestricted biosecurity risk of Moko, freckle, BBrMV and mealybugs in relation to the importation of commercially produced fresh hard green Cavendish bananas originating from areas of Mindanao in the Philippines was estimated in each case to exceed Australia's ALOP and thus it was concluded that risk management measures would be required for those pests.

This section evaluates those measures available to manage the biosecurity risk of Moko, freckle, BBrMV and mealybugs to meet Australia's ALOP. Risk management 'options evaluation' methodology is described in the *Method for Import Risk Analysis*.

The measures discussed below are in addition to the risk management practices used in the production, processing, quality control, packing, transport and shipment of fruit from the specified areas in the Philippines, as described in the Philippines Department of Agriculture responses to the IRA team questions and the *Draft IRA Report* regarding the proposal to import Philippine bananas (Philippines Dept. Agriculture, 2001; 2002a; 2002b). These practices are discussed in the *Method for Import Risk Analysis* and in the various pest risk assessments.

The least trade restrictive of the measures discussed below for Moko, freckle, BBrMV and mealybugs, in conjunction with standard practices used in the Philippines in the production of commercially grown bananas, form the basis of proposed import conditions for Philippine bananas that are detailed in the section entitled *Quarantine Conditions*.

MOKO

Because the scenario of concern for Moko (*Ralstonia solanacearum* Race 2) is 'symptomless' infection of banana fruit, alteration of harvesting procedures (Imp3), processing steps in the packing station (Imp4 and Imp6), quarantine inspection parameters (Imp7), transport conditions (Imp8 and Imp9) and on-arrival inspection in Australia (Imp10) would not influence the likelihood of entry, establishment or spread.

No technically and economically feasible physical or chemical treatment is currently available to mitigate the risk of Moko bacterium present in symptomless infected fruit.

Nevertheless, the likelihood that the Moko bacterium would enter, establish or spread in Australia by way of imported Philippines Cavendish bananas could be reduced by the following four strategies:

- Source bananas for export from pest free areas (area freedom)
- Source bananas for export from areas of low pest prevalence
- Inspection for internal peduncle symptoms of Moko by quality assurance staff
- Restrict the distribution of imported bananas to parts of Australia in which bananas are not grown commercially.

Area freedom

Area freedom as described in the IPPC ISPM 4 – *Requirements for pest free areas* and ISPM 10 – *Requirements for the establishment of pest free places of production and pest free production sites* was recognised, in principle, as a risk management measure. Area freedom would require, among other things, systems to establish, maintain and verify freedom, including assurance that the pest was absent at the time of harvest and that it had not been reported within a specified period prior to harvest. A buffer zone may also be required, for example a bordering area in which all banana plants (commercial, native or feral) should be free from the pest for a specified period.

Freedom from Moko within the area from which bananas for export to Australia would be sourced would influence the first step in the importation pathway (Imp1). This step describes the likelihood that the pest would be present in the plantation from which a tonne of fruit would be sourced.

It was considered that under area freedom arrangements, the likelihood that Moko would be present in a plantation from which a tonne of harvested fruit would be sourced (Imp1), and the likelihood that a tonne of harvested fruit would be infected with Moko (Imp2) would be negligible. When these modified (restricted) likelihoods were placed in the risk simulation model, and the assessment for Moko repeated, the restricted annual likelihood of entry, establishment or spread was found to be very low. When this was combined with the estimate of disease consequences, the restricted risk for Moko was found to be negligible. Because this satisfies Australia's ALOP, bananas could, in theory, safely be imported from pest free areas.

The efficacy of area freedom as a risk management strategy for Moko is summarised in Table 18 below.

Table 18 Moko: establishment of pest free areas in the Philippines

Importation Step[1]	Unrestricted likelihood[2]	Restricted likelihood[3]
Imp1	High	Negligible
Imp2	Extremely low	Negligible
Annual likelihood[4]	**High**	**Very low**
Risk estimate[5]	**Low**	**Negligible**

1 Steps in the importation of fresh bananas from the Philippines as described in Table 9.

2 Unrestricted likelihood of the importation step estimated using all information available and in the context of the practices and procedures used in the production and processing of banana fruit as described in *Method for Import Risk Analysis.*

3 Restricted likelihood of the importation step estimated by taking account of the effect of the risk management measure under consideration.

4 Annual likelihood of entry, establishment or spread described in *Method for Import Risk Analysis* and summarised in Table 14.

5 Biosecurity risk estimate described in *Method for Import Risk Analysis* and summarised in Table 15.

However, while the principle of area freedom is theoretically available as a risk management measure for Moko, delimitation, establishment and maintenance of a pest free area would need to be relevant to the biology of Moko, including its survival potential and means of spread, as well as the characteristics of production places/sites. The epidemiology of Moko is such that it might be difficult to meet the requirements of ISPM 4 and 10. As such, this measure may not be a technically feasible option in the current circumstances in the Philippines. Other measures were considered to be technically feasible and these are discussed in more detail below.

Areas of low pest prevalence

The concept of "area of low[3] pest prevalence" is accepted internationally by phytosanitary experts, and is a recognised pest management measure under the SPS Agreement (Article 6).

There is currently no international standard established by the IPPC specifically devoted to low pest prevalence. At the April 2003 Interim Commission for Phytosanitary Measures (ICPM), low pest prevalence was included on the ICPM work program. Accordingly, the May 2003 meeting of the Standards Committee Working Group developed a 'Specification' for a standard and the Working Group that will develop a draft standard held its first meeting 4-12 December 2003. Nevertheless, the North American Plant Protection Organization (NAPPO) has developed a Regional Standard for Phytosanitary Measures (RSPM) for low pest prevalence, "*Guidelines for the Establishment, Maintenance and Verification of Areas of Low Pest Prevalence for insects*" (RSPM 20)[4]. This standard has been used as guide for the following discussion.

In this *IRA Report*, the concept of low pest prevalence is applied to a production area. A production area could be a place of production (i.e. a plantation) or a production site (i.e. a portion of a place of production or of a plantation) that is managed as a single unit.

The prevalence of Moko in the plantation from which export bananas would be sourced would influence the likelihood that a tonne of fruit would be infected with the Moko bacterium (Imp2).

In the Moko risk assessment, Imp2 was estimated using the equation

$$Imp2 = 1-(1-P)^N$$

where:

- P, the likelihood that a harvested bunch will bear a symptomless infection calculated as: prevalence of Moko ((Moko infected mats (cases) per hectare per week)/number of mats per hectare (1700)) x Moko incubation period (12 weeks) x likelihood that an infected plant would bear a symptomless but infected bunch (0.15) x proportion of a symptomless infected bunch bearing symptomless but infected fruit (0.5); and
- N, the number of bunches required for a tonne of export quality fruit = 50

Under standard Philippines plantation practice, Imp 2 was estimated to be 6.7×10^{-4} using 0.025 Moko cases per hectare per week. This number of Moko cases per hectare per week was estimated from data provided by BPI (Philippines Dept. Agriculture, 2001).

[3] The term 'low', as used by the SPS Agreement in the context of a low pest prevalence area, is not the same concept as used in Biosecurity Australia's formal definition of a low likelihood

[4] http://www.nappo.org/Standards/NEW/RSPM20-e.pdf

Working down from 0.025 cases per hectare per week, it was determined, using the above equation, that if bananas were sourced from an area where the Moko prevalence (per 1700 mats per hectare) was no higher than 0.003 cases (infected mats) per hectare per week, which is about 1 case per 7 hectares per year, the point estimate for Imp2 would be 7.94×10^{-5}.

When this point estimate was placed in the risk simulation model, and the assessment for Moko repeated, the restricted annual likelihood of entry, establishment or spread was found to be low. When this likelihood was combined with the estimate of disease consequences, the restricted risk for Moko was found to be very low. Because this satisfies Australia's ALOP, bananas could safely be imported from areas of low pest prevalence provided that the prevalence is at or below 0.003 cases (infected mats) per hectare per week.

The efficacy of areas of low pest prevalence as a risk management strategy for Moko is summarised in Table 19 below.

Table 19 Moko: establishment of low pest prevalence areas in the Philippines

Step	Unrestricted likelihood	Restricted likelihood
Imp2	Extremely low	7.94×10^{-5}
Annual likelihood	**High**	**Low**
Risk estimate	**Low**	**Very low**

Requirements of an area of low pest prevalence

Using the NAPPO RSPM 20, the IRA team has developed an outline of the requirements for an area of low pest prevalence for Moko that may be used as a basis for export of fresh hard green Philippines bananas to Australia. The details would need to be agreed between the Philippines BPI and Biosecurity Australia (BA). BA would consider proposals from the Philippines that can be objectively demonstrated to offer an equivalent level of protection.

An area of low pest prevalence (ALPP) would be established under the auspices of the Philippines BPI as the relevant National Plant Protection Organisation. In accordance with Article 6.3 of the SPS Agreement, BPI would provide the necessary evidence in order to objectively demonstrate to BA that the designated area is, and is likely to remain, a low pest prevalence area during the course of export of bananas to Australia from the designated area.

The fundamental requirements for establishing and maintaining an ALPP and verification of low pest prevalence area status are summarised below. Following BPI demonstration of an ALPP, BPI and BA would jointly prepare a bilateral arrangement document covering these requirements.

General requirements

General information relating to the application of phytosanitary measures and procedures may be sourced from International Standards for Phytosanitary Measures. In particular, ISPM 4, 5, 6, 8, 10, 13 and 14 are relevant. Before designating an ALPP, BPI would need to ensure that the area would meet the specific requirements described below.

Specific requirements

1. Establishment of an area of low pest prevalence

The average disease prevalence in an ALPP would be less than or equal to 0.003 infected mats per hectare per week, as demonstrated by weekly surveys of banana plants within the ALPP over a minimum period of two years — BPI would produce 2 years of survey reports for the area prior to recognition of the ALPP status by Australia for that area.

Low pest prevalence (LPP) would be achieved through the application of phytosanitary measures and procedures aimed at reducing and maintaining a specified LPP for Moko. As described in the *Method for Import Risk Analysis* all plants in commercial Cavendish plantations in the Philippines are inspected weekly and therefore the requirement for weekly inspections would not be an additional impost. The proposed two-year period for demonstrating LPP is based on reports that the B strain of Moko can survive in the soil for up to two years (Stover, 1972; Sequeira, 1962).

The phytosanitary measures and procedures to achieve LPP would include control of disease spread to and within the ALPP and details would be covered in the bilateral arrangement document between BPI and BA.

1.1. Geographic description

- BPI would describe the designated ALPP with supporting maps showing boundaries of the area (including precise grid references) and also location of banana and heliconia plants in proximity to the ALPP.
- BPI would also describe, with supporting maps and documentation, the buffer zones adjacent to the designated area.
- BPI would determine appropriate buffers between an ALPP and other banana plants to maintain the ongoing LPP of Moko in the ALPP. The size of the buffer zone for Moko would depend on disease prevalence, environmental conditions and other biological and epidemiological factors and feasibility. It is noted that the Philippines has adopted a 50-metre buffer zone around commercial plantations to prevent spread of bunchy top disease to those commercial plantations by insect vectors.

1.2. Surveillance activities

BPI would document survey data to demonstrate that the prevalence of Moko in each ALPP did not exceed the LPP level specified by BA, i.e. an average prevalence level of less than or equal to 0.003 cases per hectare per week, over a continuous period of two years.

1.3. Phytosanitary control measures

BPI would verify that the phytosanitary control measures and procedures are applied to achieve the pest prevalence at or below the LPP level specified by BA. BPI would also verify that control measures used to achieve the LPP for Moko are documented and the efficacies of these measures have been recorded.

1.4. Other technical information

BPI would retain historical records of detection and survey activities in every designated ALPP and document phytosanitary control measures and procedures applied and the efficacy of the measures to prevent spread of Moko into or within the ALPP.

1.5. Registration

BPI would register each ALPP and enter into an agreement with the plantation and packing station manager(s) to ensure that phytosanitary measures and procedures aimed at meeting the ALPP requirements are properly applied.

2. Maintenance of an area of low pest prevalence

- The specified average LPP level for Moko of less than or equal to 0.003 cases per hectare per week in a registered ALPP would be maintained by the continued application of phytosanitary control measures.
- The status of the area would be confirmed by the ongoing weekly monitoring surveys. The location of each case of Moko would be recorded on a plan of the ALPP.
- BPI would put in place regulatory measures as necessary to minimise the likelihood of spread of Moko into and within the ALPP.
- To achieve this objective, one of the measures would be that any Moko case (infected mat) in the ALPP would be eradicated within 48 hours of the disease detection in the ALPP and the buffer area. This time period was considered to be both reasonable and expeditious taking into account standard plantation management practices. It is noted that in the Philippines, the common practice in commercial banana plantations is to remove, expeditiously, the infected mat and also mats immediately surrounding the infected plant (Philippines Dept. Agriculture, 2002a) and mats within a radius of 5 to 6 m from the infected plant (PCARRD, 1988). According to Stover (1972) and Lehmann-Danzinger (1987), a plant-to-plant buffer area could be up to 10 m to prevent spread of the disease. BPI would determine the appropriate plant-to-plant buffer zone depending on conditions affecting the spread of Moko in a given area.

2.1. Phytosanitary control measures

BPI would ensure that phytosanitary control measures and procedures are applied to maintain the prevalence of Moko at or below the LPP level specified by BA and that the phytosanitary control measures and procedures are documented. BPI would maintain an audit and monitoring program to ensure that the control measures are properly applied.

2.2. Surveillance activities

BPI would maintain a quality control program for the survey to confirm and document that all protocols are met.

2.3 Movement controls

BPI would put in place controls on movement of plants and plant products to minimise the likelihood of entry of the Moko bacterium into an ALPP. BPI would identify the pathways and articles that require phytosanitary control and establish an audit and monitoring program for nominated articles (e.g. soil, used machinery, tools and planting material, etc.) moving into the ALPP.

3. Verification of an area of low pest prevalence

BPI would verify that the requirements to maintain the ALPP continue to be met. In addition to the surveillance activities, phytosanitary control measures, and movement controls detailed in the bilateral arrangement document, BPI would conduct audits of field and packing station inspections.

4. Change in the status of an area of low pest prevalence

- The detection of Moko that exceeds the specified LPP level within the designated ALPP would result in the implementation of the emergency action plan as described at point 6 below and immediate notification of BA and AQIS.
- This situation would result in the immediate suspension of fruit exports from the affected ALPP. An ALPP status may be terminated if appropriate emergency actions are not taken in response to the detection of Moko above the specified LPP level.
- BPI would take appropriate emergency action to delimit, contain, control and/or eradicate Moko detected in an ALPP according to the bilateral arrangement document.
- Suspension of an ALPP would remain in place until it is proven that prevalence is at or below the specified LPP for a minimum period of two years (based on the survival time of the Moko bacterium in the soil). If prevalence is exceeded in a limited area that can be identified and isolated, then the ALPP may be redefined to exclude that area. Identification of such areas of prevalence must include mapping (by techniques such as aerial photography) of all detections within a two-year period on the plan of the designated area.
- Failure of BPI to take appropriate emergency actions would result in termination of the low pest prevalence status of an area.

5. Reinstatement of the status of an area of low pest prevalence

Implementation of required phytosanitary measures that achieve verifiable reduction in the prevalence of Moko to the specified LPP level for a continuous period of two years or more would be eligible for reinstatement of the ALPP status. Following bilateral discussions and review, the size of an ALPP area may be redefined as described at point 4 above.

6. Emergency action plan

BPI would prepare a documented plan of emergency actions to be implemented if Moko exceeds the specified LPP level of prevalence in the ALPP. The emergency action plan would include the delimiting survey, inspections and testing, phytosanitary control measures, and control of the movement of fruit for Australia from the ALPP. The emergency actions would be initiated within 48 hours of confirmation that the specified LPP level has been exceeded in the ALPP in order to minimise the spread of the Moko bacterium by the application of phytosanitary control measures and procedures at the infection foci. BPI would notify Australia immediately upon initiation of the emergency action plan. Failure to implement emergency actions would result in termination of the ALPP status.

7. Administration by the NPPO

BPI would ensure availability of necessary legislation, administrative infrastructure, qualified personnel, and material resources to comply with the provisions of the bilateral arrangement document.

8. Documentation

BPI would make available to BA, immediately upon request, the documentation supporting the LPP status of a designated area(s), including establishment, maintenance, verification and reinstatement of the ALPP.

9. Bilateral arrangement document

As noted above, requirements would be addressed in a bilateral arrangement document for recognition of an ALPP as a basis for export of fresh hard green Philippines bananas to Australia. There would be consultation in the early stages of the process in order to ensure that all of Australia's biosecurity requirements are met. The transportation, integrity of consignments, financial responsibilities, roles and responsibilities of BPI, AQIS and BA and producers, among other things, would be addressed in the bilateral arrangement document. BPI would establish a quality control program for the survey, laboratory diagnosis and eradication of Moko cases, including the surveyor and diagnostician competency.

Inspection for internal peduncle symptoms of Moko by quality assurance staff

It is well documented that Moko infection causes vascular discolouration irrespective of whether external disease symptoms develop (Rorer, 1911; Ashby; 1926; Martyn, 1934; Sequeira, 1958; Buddenhagen, 1961; Power, 1976; Kastelein and Gangadin, 1984; Soguilon *et al.*, 1994b; Jeger *et al.*, 1995; Soguilon, 2003a). Buddenhagen (1961) claimed that peduncle discolouration is a distinctive symptom of Moko. However, it is also well documented that the degree of discolouration varies from cream or yellow through reddish brown, brown and black. The colour variation is likely to depend on the time elapsed since infection and the severity of the infection. In some cases there may be no discolouration if the peduncle is examined in cross section within the 'lag period' between when bacteria in the vascular bundles pass the examination point and the first visible signs of vascular discolouration.

Nevertheless, it was considered that an examination of the cut peduncle surface of banana bunches harvested for export to Australia would be a means of detecting at least some Moko infected banana bunches not expressing visible symptoms and thus a means of reducing the likelihood of importing 'symptomlessly infected' banana fruit.

Inspection for internal Moko symptoms in freshly cut cross sections of peduncles could be conducted within the packing station after receival of the bunches from the plantation by quality assurance staff trained to detect vascular discolouration caused by the Moko bacterium. This inspection would be in addition to the routine quality assurance regimes targeted at ensuring the removal of fruit with blemishes, obvious distortion in shape, premature ripening and visible splits. While quality assurance staff may not detect all occurrences of discolouration, if peduncle tissue from all harvested bunches for export to Australia were examined, it was considered that there would be a moderate likelihood that 'symptomless infected' bunches would be detected and removed by routine quality inspection at Imp5.

When this restricted likelihood was placed in the risk simulation model, and the assessment for Moko repeated, the restricted annual likelihood of entry, establishment or spread was found to be moderate. When this likelihood was combined with the estimate of disease consequences, the restricted risk for Moko was found to be low, which exceeds Australia's ALOP. The use of targeted inspection for internal peduncle Moko symptoms would, therefore, not be an effective risk management measure.

The efficacy of inspecting the cut peduncle for internal (vascular) symptoms of Moko infection is summarised in Table 20 below.

Table 20 Moko: inspection of cut peduncle for vascular Moko symptoms

Step	Unrestricted likelihood	Restricted likelihood
Imp5	Negligible	Moderate
Annual likelihood	**High**	**Moderate**
Risk estimate	**Low**	**Low**

Restricting the distribution of imported bananas

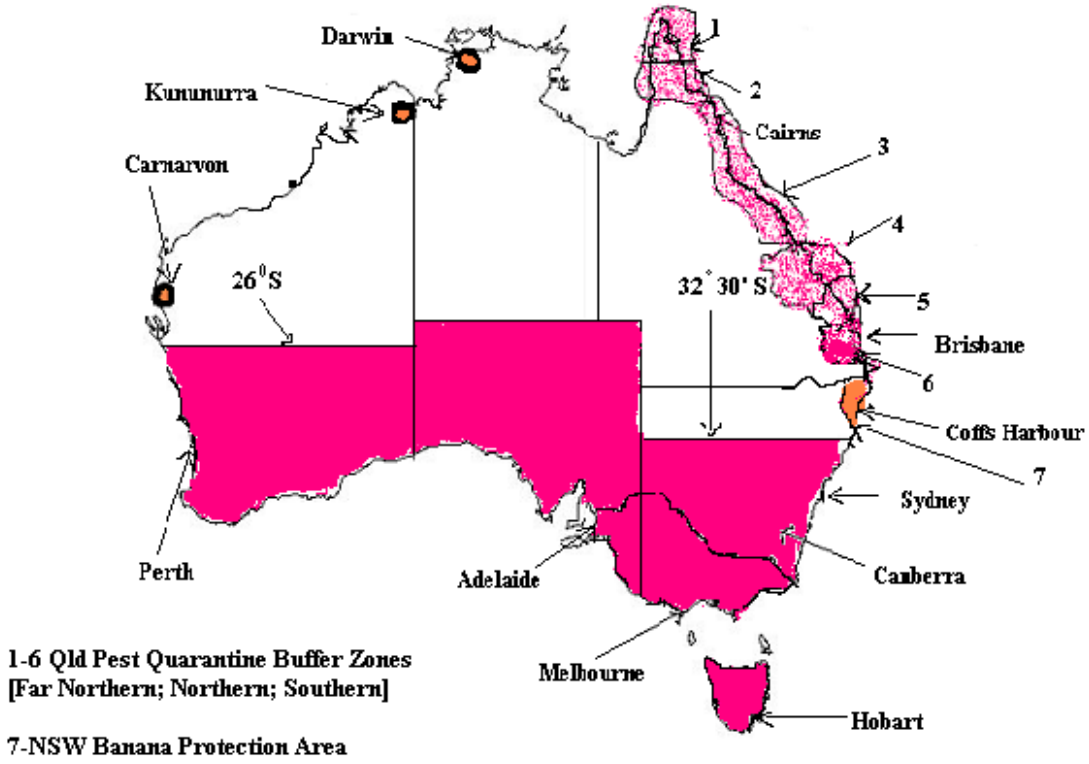
Restricting the port of importation *and* limiting the distribution of imported bananas to areas in which bananas are not grown commercially would reduce the likelihood of Moko entering, establishing or spreading within Australia.

If undertaken, movement restrictions could be based on delineating the parts of Australia where bananas are grown commercially, from other parts of Australia. Not independently, this would also provide for delineation between tropical or subtropical parts of Australia where Moko could establish or spread, and temperate, arid or alpine zones where climate would limit establishment or spread. A demarcating line has been drawn across Australia for this purpose (Figure 13).

In placing this line, the IRA team has ensured that parts of Australia where State declared quarantine areas/zones in respect to banana pests and diseases lie to the north. Lower risk areas lie to the south. Specifically, the demarcation meant that *all* of Queensland and Northern Territory, parts of New South Wales north of $32^0$30'S, and parts of Western Australia north of 26^0S were included in the higher risk northern zone.

The 26th parallel was chosen as the starting point for the demarcation line on the west side of Australia because this is the line that separates the area in Western Australia where non-Western Australian grown bananas can be marketed from the area where they cannot (described previously in *Proposal to import bananas from the Philippines*). The South Australian border was chosen as the most convenient line to link the 26th parallel in the west with the 32nd 30' parallel in eastern Australia, a convenient line below the New South Wales Banana Protection Area (described previously in *Proposal to import bananas from the Philippines*).

Figure 13 Restricting the distribution of Philippines bananas in Australia



Restricting the distribution of Philippines bananas in Australia in the manner described above could be implemented by the Commonwealth Government using the Quarantine Act 1908 (the Act) and its subordinate legislation.

Ports of entry

The entry of Philippines bananas into Australia could be restricted to ports in that part of Australia south of the demarcation line.

Paragraphs 13(1)(a) of the Act provides that the Governor-General may declare any ports in Australia to be first ports of entry for overseas vessels. Paragraph 13(1)(b) of the Act provides that the Governor-General may declare any ports in Australia to be ports where imported animals, plants or other goods, or imported animals, plants or other goods of a particular kind or description or having a particular use may be landed.

An amendment to the *Quarantine Proclamation 1998* (the Proclamation) would be required to restrict the ports at which Philippines banana fruit could be landed. Those ports would be the ports in the States of South Australia, Victoria, New South Wales, Tasmania and Western Australia south of the 26th parallel as specified in section 13 of the Proclamation. Once this amendment is made, a person would be guilty of an offence under section 20D of the Act if he/she lands the banana fruit at a port other than a port declared by the Proclamation to be a port at which it may be landed. The maximum penalty for this offence is imprisonment for 10 years.

Distribution of imported fruit

After the Philippines bananas have been released from Quarantine Approved Premises (designated for the purpose of on-arrival inspection by AQIS) the imported Philippines banana fruit would be free to be moved anywhere in that part of Australia south of the demarcation line. Movement to that part of Australia north of the demarcation line would be prohibited unless a permit is granted. If a permit is granted, movement to and within that part of Australia north of the demarcation line would then be subject to the permit and any conditions set out in the permit.

Subsection 13(1)(g) of the Act provides that the Governor-General may, by proclamation, prohibit the removal of, amongst other things, any plants or parts of plants from any part of the Commonwealth to any other part of the Commonwealth. Subsection 13(2A) of the Act provides that a proclamation prohibiting the removal of anything from one part of Australia to any other part may provide that the removal is prohibited unless a permit to remove the thing is granted by a Director of Quarantine. Subsection 13(2B) provides that such a permit may be granted subject to compliance with conditions or requirements that are set out in the permit. Under section 67 of the Act it is an offence to remove a thing from one part of Australia to another part without a permit (if the Proclamation states that one is required) or in contravention of the conditions or requirements set out in the permit. The maximum penalty for this offence is imprisonment for 10 years.

An amendment to the Proclamation would be required to prohibit the removal of Philippines bananas from that part of Australia south the demarcation line to that part of Australia north of the demarcation line unless a permit is granted. It is envisaged that a permit would only be granted under special circumstances and would be for a specific location within the area north of the demarcation line on case-by-case basis. In deciding whether to grant a permit to move fruit to that location, the Director of Animal and Plant Quarantine would, among other things, take into account the level of Moko biosecurity risk at that location. Section 70 (1) of the Proclamation would also be amended to include “removal of a thing from one part of Australia to another part of Australia”.

An awareness campaign would also be undertaken to inform the Australia community about the restrictions on the movement of Philippines bananas within Australia and the penalties that apply if they are moved illegally from one part of Australia to another part of Australia across the demarcation line. This campaign would particularly focus on participants in the distribution chain (wholesalers and retailers) and seek their cooperation.

To ensure that imported fruit could be readily distinguished from domestic fruit, quarantine conditions would need to include a requirement that imported fruit cartons (lid and box) are appropriately labelled. Additionally, because banana fruit is generally separated from cartons when it is presented to consumers at the point of sale, it may be necessary to identify imported Philippines banana fruit so that they could be readily distinguished from domestically grown fruit. This could be achieved by affixing labels to individual banana hands as part of the pre-packing arrangements or perhaps dipping the tips of fingers into a particular coloured wax as is done presently in Australia to distinguish some types of domestic banana production.

Restricting the distribution of bananas in Australia to areas south of the demarcation line (Figure 13) would have an impact on many of the likelihoods contributing to the probability of Moko distribution in Australia, the partial probabilities of Moko establishment and the partial probabilities of Moko spread. Estimation of these likelihoods is described in detail in *Method for Import Risk Analysis* and in the Moko risk assessment.

The impacts on these likelihoods are discussed individually below.

Dist1 — *the likelihood that a pest will survive storage and ripening of fruit and its distribution to wholesalers.* Restriction of the distribution of fruit is unlikely to alter Dist1 from its unrestricted rating of **high**.

Prop1 — *the proportion of imported bananas that is likely to be distributed to an area in which bananas are grown commercially.* Because commercial banana-growing areas lie to the north of the demarcation line, Prop1 would, with complete compliance, be zero. The IRA team, however, recognises that by virtue of complex wholesale and retail distribution networks and unaware travelling consumers an **extremely low** proportion of imported fruit might be moved north of the demarcation line.

Prop2 — *the proportion of imported bananas that is likely to be distributed to an area in which susceptible household (non-commercial) banana plants, or other susceptible garden plants (including weeds) are grown.* Because Moko may utilise as host plants, heliconias and some common garden weed species (e.g. *B. pilosa* and *S. nigrum*) that are found in most parts of Australia, restricting the distribution of Philippines bananas in Australia will not greatly alter Prop2. The restricted likelihood for Prop2 will thus remain **high**.

Prop3 — *the proportion of imported bananas that is likely to be distributed to an area in which susceptible wild plants or susceptible cultivated plants other than bananas are found*. For the reason as outlined for Prop2 (see above) Prop3 will remain **high**.

Dist2 — *the likelihood that the pest will be discarded with banana waste (fruit and peel) from fruit purchased by, or intended for purchase by, persons or households — or otherwise enter the environment.* Restriction of the distribution of fruit is unlikely to alter Dist2 from its unrestricted rating of **certain**.

Dist3 — *the likelihood that commercially cultivated bananas would be exposed to the pest discarded with banana waste (fruit and peel), or that had otherwise entered the environment*. Dist3 pre-supposes that the pest has entered the environment in an area where this group of susceptible hosts can be found. The extremely low likelihood that imported bananas will be distributed to an area where commercial bananas can be found has been incorporated in Prop1. However, if bananas were to be distributed to such an area, then the likelihood that commercial bananas would be exposed to the pest would be unchanged from its unrestricted rating of **low**.

Dist4 — *the likelihood that household (non-commercial) banana plants or other susceptible garden plants (including weeds) would be exposed to the pest discarded with banana waste (fruit and peel), or that had otherwise entered the environment*. The scenario of concern for the exposure of susceptible household plants was the discarding of infected peel at a site adjacent to a susceptible plant. Although there are fewer household banana plants in the area south of the demarcation line, susceptible weed species are common and widespread, and Dist4 is unlikely to be altered from the unrestricted rating of **low**.

Dist5 — *the likelihood that susceptible wild (native or feral) plants or other susceptible commercial plants other than bananas would be exposed to the pest associated with banana waste (fruit and peel), or that had otherwise entered the environment*. For the reasons outlined above, Dist5 was also unlikely to be altered from the unrestricted rating of **low**.

PPE $_{\text{Commercial}}$ — *the partial probability of establishment for commercial bananas*. Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **moderate**.

PPE $_{\text{Household}}$ — *the partial probability of establishment for susceptible household plants*. Under these restrictions, establishment will be limited largely to populations of household

banana plants and alternative hosts in unfavourable temperate, arid or alpine environments. This is likely to reduce establishment potential for household plants from moderate to **extremely low**.

PPE $_{\text{Wild}}$ — *the partial probability of establishment for wild plants or cultivated plants other than bananas*. For the reason above, establishment potential for wild plants, or for commercially cultivated plants other than heliconias, will also be reduced to **extremely low**.

PPS $_{\text{Commercial}}$ — *the partial probability of spread for commercial bananas*. Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **high**.

PPS $_{\text{Household}}$ — *the partial probability of spread for susceptible household plants*. Under these restrictions, establishment will have been limited to populations of household banana plants and alternative hosts in unfavourable temperate, arid or alpine environments. The likelihood of subsequent spread of the Moko bacterium from a point of establishment in these environments will also be reduced to **extremely low**.

PPS $_{\text{Wild}}$ — *the partial probability of spread for wild plants or cultivated plants other than bananas*. For the reasons above, spread potential for wild plants, or for commercially cultivated plants other than heliconias, will also be reduced to **extremely low**.

Summary: restricting the distribution of imported bananas in Australia

When the modified (restricted) likelihoods described above were placed in the risk simulation model, and the assessment for Moko repeated, the restricted annual likelihood of entry, establishment or spread was found to be extremely low. The restricted annual likelihood of entry, establishment or spread was subsequently combined with the estimate of disease consequences, to give the restricted risk for Moko under this management scenario.

The restricted risk for Moko if the distribution of Philippines bananas is limited to parts of Australia south of the demarcation line was found to be negligible. Because this satisfies Australia’s ALOP, bananas could, in principle, safely be imported under this risk management option.

This process is summarised in Table 21 below.

Table 21 Moko: restricting the distribution of Philippines bananas in Australia

Step	Unrestricted likelihood	Restricted likelihood
Dist1	High	High
Prop1	Low	Extremely low
Prop2	High	High
Prop3	High	High
Dist2	Certain	Certain
Dist3	Low	Low
Dist4	Low	Low
Dist5	Low	Low
$PPE_{Commercial}$	Moderate	Moderate
$PPE_{Household}$	Moderate	Extremely low
PPE_{Wild}	Moderate	Extremely low
$PPS_{Commercial}$	High	High
$PPS_{Household}$	Moderate	Extremely low
PPS_{Wild}	Moderate	Extremely low
Annual likelihood	**High**	**Extremely low**
Risk estimate	**Low**	**Negligible**

Conclusions: risk management for Moko

Two feasible risk management measures were identified for Moko:

- The designation of low pest prevalence areas; and
- Restriction of the distribution of Philippines bananas in Australia

Each of these measures would provide security sufficient to meet Australia's ALOP. The major difference between these two measures is likely to be the time required and the administrative complexity of providing for their implementation. The administration of the restriction on the movement of Philippines banana fruit would require additional arrangements and resources to address such issues as monitoring, auditing and non-compliance. The cost of these arrangements and resources would be borne by importers or wholesalers also necessitating the need to develop infrastructure for cost recovery.

It was considered that the time required to develop the suite of legal, administrative and operational arrangements that would be necessary to give the restricted distribution of Philippines banana fruit practical application in Australia is likely to be longer than the time required to demonstrate areas with Moko prevalence at or below the specified LPP level. On this basis, the use of ALPP was considered to be the least trade restrictive of the two risk management options.

FRECKLE

Because the main scenario of concern for freckle (*Guignardia musae*) is symptomless infection of banana fruit, alteration of procedures for transport of harvested fruit to the packing station (Imp3), processing steps in the packing station (Imp4 and Imp6), and transport conditions (Imp8 and Imp9) would not influence the likelihood of entry, establishment or spread through this pathway. Management of the likelihoods assigned to these steps was, therefore, not considered further.

The likelihood that (freckle) would enter, establish or spread in Australia by way of imported Philippines bananas could be reduced through the following four separate measures:

- Source bananas for export from pest free areas (area freedom)
- Source bananas for export from low pest prevalence areas
- Augment quarantine inspection (Imp7 and Imp10)
- Restrict the distribution of imported bananas to parts of Australia in which bananas are not grown commercially.

Area freedom

Freedom from freckle within the area from which bananas for export to Australia would be sourced would influence the first step in the importation pathway (Imp1). This step describes the likelihood that the pest would be present in the plantation from which a tonne of fruit would be sourced.

Area freedom as described in the IPPC ISPM 4 and 10 and as discussed above, would require, among other things, systems to establish, maintain and verify freedom, including assurance that the pest was absent at the time of harvest and that it had not been reported within a specified period prior to harvest. A buffer zone may also be required, for example a bordering area in which all banana plants (commercial, native or feral) should be free from the pest for a specified period. Freedom from freckle could be established by regular inspections prior to de-leafing and be subject to audit.

It was considered that under area freedom arrangements, the likelihood that freckle would be present in a plantation from which a tonne of harvested fruit would be sourced (Imp1), and the likelihood that a tonne of harvested fruit would be infected with freckle (Imp2) would be negligible. When these modified (restricted) likelihoods were placed in the risk simulation model, and the assessment for freckle repeated, the restricted annual likelihood of entry, establishment or spread was found to be extremely low. When this was combined with the estimate of disease consequences, the restricted risk for freckle was found to be negligible. Because this satisfies Australia's ALOP, bananas could, in theory, safely be imported from pest free areas.

The efficacy of area freedom as a risk management strategy for freckle is summarised in Table 22 below.

Table 22 Freckle: establishment of pest free areas in the Philippines

Step	Unrestricted likelihood	Restricted likelihood
Imp1	High	Negligible
Imp2	Low	Negligible
Annual likelihood	**High**	**Extremely low**
Risk estimate	**Low**	**Negligible**

However, while the principle of area freedom is available as a risk management measure for freckle, delimitation, establishment and maintenance of a pest free area would need to be relevant to the biology of freckle, including its means of spread, as well as the characteristics of production places/sites. As such, this measure may not be a technically feasible option in the current circumstances in the Philippines. Other measures were considered to be technically feasible and these are discussed in more detail below.

Areas of low pest prevalence

An ALPP could be established, maintained and verified for freckle in the same manner as described for Moko. BPI may use various measures to maintain LPP level, including cultural practices or fungicide sprays.

As discussed in importation step 2 of the freckle risk assessment (Imp2) and based on information presented in Meredith (1968), the likelihood of symptomless freckle infection occurring on a bunch was considered to be very low in commercial plantations in the Philippines. Further, and as previously discussed in Imp2, the proportion of a bunch that may carry symptomless infected fruit is expected to be low.

The current prevalence of freckle in Philippines plantations has not been calculated. However, the IRA team has determined that if bananas were sourced from an area where the prevalence of freckle was no higher than 1 case (infected mat) per hectare per week, the point estimate for Imp2 would be 0.0018 (or 1.8×10^{-3}) based on the equation below.

$$Imp2 = 1-(1-P)^N$$

Where;

- A case is defined as the detection of freckle symptoms on any part of a mat from which a bunch could be harvested;
- P is the likelihood that a harvested bunch will bear a symptomless infection = 3.5×10^{-5} calculated as: prevalence of freckle ((1 infected mat (cases) per hectare per week)/number of mats per hectare (1700)) x freckle incubation period (4 weeks) x likelihood that an infected plant would bear a symptomless but infected bunch ($0.05^{\#}$) x proportion of a symptomless infected bunch bearing symptomless but infected fruit ($0.3^{\#}$); and

($^{\#}$ For the purposes of this analysis the upper limit of Biosecurity Australia's likelihood category of 'very low' or 'low' was used)

- N is the number of bunches required for a tonne of export quality fruit (50).

When the point estimate for Imp2 (i.e. 1.8×10^{-3}) was placed in the risk simulation model, and the assessment for freckle repeated, the restricted annual likelihood of entry, establishment or spread was found to be low. When this likelihood was combined with the estimate of disease consequences, the restricted risk for freckle was found to be very low. Because this satisfies Australia's ALOP, bananas could safely be imported from an ALPP.

The efficacy of ALPP as a risk management strategy for freckle is summarised in Table 23 below.

Table 23 Freckle: establishment of low pest prevalence areas in the Philippines

Step	Unrestricted likelihood	Restricted likelihood
Imp2	Low	1.8×10^{-3}
Annual likelihood	**High**	**Low**
Risk estimate	**Low**	**Very low**

Requirements of an area of low pest prevalence

The key variations to arrangements for an ALPP for freckle as compared to Moko would be as follows:

- The specified LPP level for freckle is less than or equal to 1 case (infected mat) per hectare per week.
- The specified LPP level must be demonstrated by weekly surveys over a minimum period of four (4) weeks before registering an ALPP. A four-week period was considered reasonable for demonstrating the specified LPP level for freckle in a designated area taking into account the most likely incubation period.
- In the event the ALPP status is suspended or terminated, reinstatement would require a verifiable reduction in the prevalence of freckle back to at or below the specified LPP level for a continuous period of four (4) weeks or more.

Augmenting quarantine inspection

Inspection may be augmented at importation step Imp7 (quarantine inspection in the Philippines) or at importation step Imp10 (AQIS inspection on-arrival in Australia). Augmentation can be either by using magnification or increasing the number of fruit examined in a consignment (Imp7) or a lot (Imp10).

As explained in the *Method for Import Risk Analysis*, the effectiveness of inspection will be determined by the following expression:

$$P(\text{at least one affected cluster is detected}) = 1 - P(\text{all affected clusters are not detected})$$

$$= 1 - (1 - P \times S)^{\text{Number of clusters examined}}$$

Where;

- P is the prevalence of affected clusters within the consignment or lot, which for Imp7 and Imp10 was considered to be extremely low

- S is the 'sensitivity' of the inspection process, or the likelihood that the pest would be identified during examination of an individual infected cluster.

The likelihood that a cluster of 'symptomless' fruit would be identified at quarantine inspection in the Philippines (Imp7) is negligible. Because small freckles are unlikely to increase to a size where they might be visible to the naked eye during the voyage to Australia, it was considered that the likelihood of detection at Imp10 would also be negligible.

With *magnification*, some of the small freckles previously invisible with the naked eye would become visible. This means that the likelihood that a cluster of infected fruit would be detected at quarantine inspection in the Philippines (Imp7) may no longer be negligible. Likewise, the likelihood that infected clusters would be detected at AQIS on-arrival inspection would also be increased (Imp10). It was considered that the degree of improvement in ability to detect an infected cluster would be greater for AQIS on-arrival inspection than for Philippines inspection because some small freckle lesions not visible at Imp7 would somewhat enlarge in transit and become visible under magnification during on-arrival inspection (Imp10). Overall, while the degree of improvement in ability to detect an infected cluster using magnification was difficult to estimate with precision, it was considered to be extremely low for Imp7 and very low for Imp10.

Under routine inspection procedures, 600 clusters would be examined from either a consignment (Imp7) or a lot (Imp10).

Placing 600 clusters into the above formula, the effect of magnification at each inspection step was calculated (Table 24). The use of magnification at quarantine inspection in the Philippines (Imp7) and in Australia (Imp10) would increase the overall effectiveness of the inspection process from negligible (without magnification) to extremely low and very low, respectively.

Repeating the calculation above with increased numbers of clusters sampled, it was found that the effectiveness of quarantine inspection would not improve even if 4000 clusters from each lot or consignment were examined.

Table 24 Effectiveness of quarantine inspection for freckle

Step	Sensitivity		Number of clusters examined		
			600	1000	4000
Imp7	**Visual inspection**	Negligible	*Negligible**	*Negligible*	*Negligible*
	Magnification	Extremely low	*Extremely low*	*Extremely low*	*Extremely low*
Imp10	**Visual inspection**	Negligible	*Negligible*	*Negligible*	*Negligible*
	Magnification	Very low	*Very low*	*Very low*	*Very low*

* Cells in this table were calculated using the Uniform probability distributions described in the *Method for Import Risk Analysis.*

When the modified likelihoods for Imp7 and/or Imp10 for inspection under magnification of 600, 1000 or 4000 clusters were placed in the risk simulation model, and the assessment for freckle repeated, the restricted overall risk was found to be low (Table 25). This level of risk

exceeds Australia's ALOP and therefore augmented quarantine inspection cannot be used as a single measure to mitigate the biosecurity risk of freckle.

Table 25 Freckle: augmentation of quarantine inspection in the Philippines and in Australia

Step	Unrestricted likelihood	Restricted likelihood
Imp7	Negligible	Extremely low
Imp10	Negligible	Very low
Annual likelihood	**High**	**High**
Risk estimate	**Low**	**Low**

Restricting the distribution of imported bananas

Restricting the port of importation *and* limiting the distribution of imported bananas to areas in which bananas are not grown commercially would reduce the likelihood of freckle entering, establishing or spreading within Australia.

The principles and practical difficulties of limiting the distribution of Philippines banana fruit in Australia were explained in the discussion of risk management for Moko (see above). Also explained was the demarcation of Australia into higher and lower risk parts of Australia (Figure 13). To reiterate, the IRA team chose that demarcation line to ensure that parts of Australia where State declared quarantine areas/zones in respect to banana pests and diseases lie to its north - representing areas in Australia where bananas are commercially grown. Areas where bananas are either not grown or not grown commercially (lower risk areas) lie to the south of the line (See Appendix 2: *Survey of households for banana plants in Australia*). Specifically, the demarcation meant that *all* of Queensland and Northern Territory, parts of New South Wales north of $32^0$30'S, and parts of Western Australia north of 26^0S were included in the higher risk northern zone.

Restricting the distribution of Philippines bananas to parts of Australia south of this line would have an impact on several of the likelihoods contributing to the probability of distribution of freckle.

These likelihoods are discussed individually below.

Dist1 — *the likelihood that a pest will survive storage and ripening of fruit and its distribution to wholesalers.* Restriction of the distribution of fruit is unlikely to alter Dist1 from its unrestricted rating of **high**.

Prop1 — *the proportion of imported bananas that is likely to be distributed to an area in which bananas are grown commercially*. Because commercial banana-growing areas lie to the north of the demarcation line, Prop1 would, with complete compliance, be zero. The IRA team, however, recognises that by virtue of complex wholesale and retail distribution networks, and unaware travelling consumers, an **extremely low** proportion of imported fruit might be moved north of the demarcation line.

Prop2 — *the proportion of imported bananas that is likely to be distributed to an area in which susceptible household (non-commercial) banana plants, or other susceptible garden plants (including weeds) are grown*. Because freckle is specific to bananas, restricting the

distribution of imported fruit to parts of Australia below the demarcation line will reduce Prop2 from moderate to **low**.

Prop3 — *the proportion of imported bananas that is likely to be distributed to an area in which susceptible wild plants or susceptible cultivated plants other than bananas are found*. For the reason outlined for Prop2 (see above) Prop3 will be reduced from low to **extremely low**.

Dist2 — *the likelihood that the pest will be discarded with banana waste (fruit and peel) from fruit purchased by, or intended for purchase by, persons or households — or otherwise enter the environment*. Restriction of the distribution of fruit is unlikely to alter Dist2 from its unrestricted rating of **certain**.

Dist3 — *the likelihood that commercially cultivated bananas would be exposed to the pest discarded with banana waste (fruit and peel), or that had otherwise entered the environment.* Dist3 pre-supposes that the pest has entered the environment in an area where this group of susceptible hosts can be found. The extremely low likelihood that imported bananas will be distributed to an area where commercial bananas can be found has been incorporated in Prop1. However, if bananas were to be distributed to such an area, then the likelihood that commercial bananas would be exposed to the pest would be unchanged from its unrestricted rating of **very low**.

Dist4 — *the likelihood that household (non-commercial) banana plants or other susceptible garden plants (including weeds) would be exposed to the pest discarded with banana waste (fruit and peel), or that had otherwise entered the environment*. The scenario of concern for the exposure of susceptible household plants was the discarding of infected peel at a site adjacent a susceptible plant. The low likelihood that imported bananas will be distributed to an area where household bananas can be found has been incorporated in Prop2. Additionally, because there are many fewer household banana plants in these areas south of the demarcation line, and because freckle does not have alternative hosts, Dist4 will be lowered from an unrestricted rating of very low, to a restricted rating of **extremely low**.

Dist5 — *the likelihood that susceptible wild (native or feral) plants or susceptible commercial plants other than bananas would be exposed to the pest associated with banana waste (fruit and peel), or that had otherwise entered the environment.* The extremely low likelihood that imported bananas will be distributed to an area where wild (native or feral) bananas can be found has been incorporated in Prop3. However, if imported bananas were to be distributed to such an area, then the likelihood that susceptible hosts in this group would be exposed to the pest would be unchanged from its unrestricted rating of **very low**.

PPE $_{\text{Commercial}}$ — *the partial probability of establishment for commercial bananas*. Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **low**.

PPE $_{\text{Household}}$ — *the partial probability of establishment for susceptible household plants.* Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **moderate**.

PPE $_{\text{Wild}}$ — *the partial probability of establishment for susceptible wild plants, or cultivated plants other than bananas*. Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **moderate**.

PPS $_{\text{Commercial}}$ — *the partial probability of spread for commercial bananas*. Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **high**.

PPS $_{Household}$ — *the partial probability of spread for susceptible household plants*. Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **moderate**.

PPS $_{Wild}$ — *the partial probability of spread for wild plants or cultivated plants other than bananas*. Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **moderate**.

Summary: restricting the distribution of imported bananas in Australia

When the modified (restricted) likelihoods described above were placed in the model, and the assessment for freckle repeated, the restricted annual likelihood of entry, establishment or spread was found to be low. The restricted annual likelihood of entry, establishment or spread was subsequently combined with the estimate of disease consequences, to give the restricted risk for freckle under this mitigation scenario.

The restricted risk for freckle if the distribution of Philippines bananas is limited to parts of Australia south of the demarcation line was found to be very low. Because this satisfies Australia's conservative ALOP, bananas could be imported under this condition.

This process is summarised in Table 26 below.

Table 26 Freckle: restricting the distribution of Philippines bananas in Australia

Step	Unrestricted likelihood	Restricted likelihood
Dist1	High	High
Prop1	Low	Extremely low
Prop2	Moderate	Low
Prop3	Low	Extremely low
Dist2	Certain	Certain
Dist3	Very low	Very low
Dist4	Very low	Extremely low
Dist5	Very low	Very low
PPE $_{Commercial}$	Low	Low
PPE $_{Household}$	Moderate	Moderate
PPE $_{Wild}$	Moderate	Moderate
PPS $_{Commercial}$	High	High
PPS $_{Household}$	Moderate	Moderate
PPS $_{Wild}$	Moderate	Moderate
Annual likelihood	**High**	**Low**
Risk estimate	**Low**	**Very low**

Conclusions: risk management for freckle

Two feasible risk management measures were identified for freckle:

- The designation of low pest prevalence areas (ALPP);
- Restriction of the distribution of Philippines bananas in Australia; and

Each of these measures provided security sufficient to meet Australia's ALOP. As previously noted, while designating areas free of freckle (area freedom) is an acceptable risk management option, it would be more difficult to achieve than the option of using ALPPs. Consequently, ALPP was considered to be more feasible and the least trade restrictive of these two measures.

As discussed in the Moko risk management section, the major difference between using ALPPs and restricting the distribution of Philippines banana fruit in Australia is likely to be the time required and the administrative complexity of providing for their implementation. The time required to develop the suite of legal, administrative and operational arrangements that would be necessary to give the restricted distribution of Philippines banana fruit practical application in Australia is very likely to be longer than the time required to demonstrate areas with freckle prevalence at or below the specified LPP level. On this basis, the use of ALPP was considered to be the least trade restrictive of these two risk management options.

BANANA BRACT MOSAIC VIRUS

Because the main scenario of concern for BBrMV is symptomless infection of banana fruit, alteration of procedures for transport of harvested fruit to the packing station (Imp3), processing steps in the packing station (Imp4 and Imp6), transport conditions (Imp8 and Imp9) and inspection (Imp7 and Imp10) would not influence the likelihood of entry, establishment or spread through this pathway. Management of the likelihoods assigned to these steps was, therefore, not considered further.

The likelihood that (BBrMV) would enter, establish or spread in Australia by way of imported Philippines bananas could be reduced through the following three separate measures:

- Source bananas for export from pest free areas (area freedom)
- Source bananas for export from low pest prevalence areas
- Restrict the distribution of imported bananas to parts of Australia in which bananas are not grown commercially.

Area freedom

Freedom from BBrMV within the area from which bananas for export to Australia would be sourced would influence the first step in the importation pathway (Imp1). This step describes the likelihood that the pest would be present in the plantation from which a tonne of fruit would be sourced.

Area freedom as described in the IPPC ISPM 4 and 10 and as discussed above, would require, among other things, systems to establish, maintain and verify freedom, including assurance that the pest was absent at the time of harvest and that it had not been reported within a specified period prior to harvest. A buffer zone may also be required, for example a bordering area in which all banana plants (commercial, native or feral) should be free from

the pest for a specified period. Freedom from BBrMV could be established by regular inspections and be subject to audit.

It was considered that under area freedom arrangements, the likelihood that BBrMV would be present in a plantation from which a tonne of harvested fruit would be sourced (Imp1), and also the likelihood that a tonne of harvested fruit would be infected with BBrMV (Imp2) would be negligible. When these modified (restricted) likelihoods were placed in the risk simulation model, and the assessment for BBrMV repeated, the restricted annual likelihood of entry, establishment or spread was found to be extremely low. When this was combined with the estimate of disease consequences, the restricted risk for BBrMV was found to be negligible. Because this satisfies Australia's ALOP, bananas could, in theory, safely be imported from pest free areas.

The efficacy of area freedom as a risk management strategy for BBrMV is summarised in Table 27 below.

Table 27 BBrMV: establishment of pest free areas in the Philippines

Step	Unrestricted likelihood	Restricted likelihood
Imp1	High	Negligible
Imp2	Very low	Negligible
Annual likelihood	**Moderate**	**Extremely low**
Risk estimate	**Low**	**Negligible**

However, while the principle of area freedom is available as a risk management measure for BBrMV, delimitation, establishment and maintenance of a pest free area would need to be relevant to the biology of BBrMV, including its means of spread, as well as the characteristics of production places/sites. The epidemiology of BBrMV, as described in the risk assessment of this virus, is such that it might be difficult to meet the requirements of ISPM 4 and 10. As such, this measure may not be a technically feasible option in the current circumstances in the Philippines. Other measures were considered to be technically feasible and these are discussed in more detail below.

Areas of low pest prevalence

An ALPP could be established, maintained and verified for BBrMV in the same manner as described for Moko. BPI may use various measures to maintain a LPP level, including cultural practices and insecticide sprays.

The risk scenario of concern for BBrMV is symptomless infection of harvested fruit. The prevalence of BBrMV in the plantation from which export bananas would be sourced would influence the likelihood that a harvested bunch would bear visibly or non-visibly (symptomless) infected fruit. That likelihood, in turn would influence the likelihood that a tonne of harvested fruit would be infected with the BBrMV (Imp2). Imp2 was assessed as very low in the risk assessment of BBrMV.

The current prevalence of BBrMV in Philippines plantations has not been calculated. However, the IRA team has determined that if bananas were sourced from an area where the

prevalence of BBrMV was no higher than 0.05 cases (infected mat) per hectare per week, the point estimate for Imp2 would be 0.012 (1.2×10^{-2}) based on the equation below.

$$Imp2 = 1-(1-P)^N$$

Where;

- A case is defined as the detection of BBrMV symptoms on any part of a mat from which a bunch could be harvested;
- P is the likelihood that a harvested bunch will bear a symptomless infection = 2.06×10^{-4} calculated as: prevalence of BBrMV ((0.05 infected mat (case) per hectare per week)/number of mats per hectare (1700) x BBrMV incubation period (7 weeks[#]); and

([#]For the purpose of this analysis incubation period of BBrMV was considered to be similar to the incubation period for banana bunchy top virus (BBTV) as described previously in the risk assessment)

- N is the number of bunches required for a tonne of export quality fruit (50).

When the point estimate for Imp2 (1.2×10^{-2}) was placed in the risk simulation model, and the assessment for BBrMV repeated, the restricted annual likelihood of entry, establishment or spread was found to be low. When this likelihood was combined with the estimate of disease consequences, the restricted risk for BBrMV was found to be very low. Because this satisfies Australia's ALOP, bananas could safely be imported from an ALPP.

The efficacy of ALPP as a risk management strategy for BBrMV is summarised in Table 28 below.

Table 28 BBrMV: establishment of low pest prevalence areas in the Philippines

Step	Unrestricted likelihood	Restricted likelihood
Imp2	Very low	1.2×10^{-2}
Annual likelihood	**Moderate**	**Low**
Risk estimate	**Low**	**Very low**

Requirements of an area of low pest prevalence

The key variations to arrangements for an ALPP for BBrMV as compared to Moko and freckle would be as follows:

- The specified LPP level for BBrMV is less than or equal to 0.05 case (infected mat) per hectare per week which is about 3 cases per hectare per year.
- The specified LPP level must be demonstrated by weekly surveys over a minimum period of seven (7) weeks before registering an ALPP. A seven-week period was considered reasonable for demonstrating the specified LPP level for BBrMV in a designated area taking into account the incubation period for this pest and the likely detection efficiency over that 7 week period (as discussed for BBTV).
- In the event the ALPP status is suspended or terminated, reinstatement would require a verifiable reduction in the prevalence of BBrMV back to at or below the specified LPP level for a continuous period of seven (7) weeks or more.

Restricting the distribution of imported bananas

Restricting the port of importation *and* limiting the distribution of imported bananas to areas in which bananas are not grown commercially would reduce the likelihood of BBrMV entering, establishing or spreading within Australia.

The principles and practical difficulties of limiting the distribution of Philippines banana fruit in Australia were explained in the discussion of risk management for Moko (see above). Also explained was the demarcation of Australia into higher and lower risk parts of Australia (Figure 13). To reiterate, the IRA team chose that demarcation line to ensure that parts of Australia where State declared quarantine areas/zones in respect to banana pests and diseases lie to its north - representing areas in Australia where bananas are commercially grown. Areas where bananas are either not grown or not grown commercially (lower risk areas) lie to the south of the line (See Appendix 2: *Survey of households for banana plants in Australia*). Specifically, the demarcation meant that *all* of Queensland and Northern Territory, parts of New South Wales north of $32^0$30'S, and parts of Western Australia north of 26^0S were included in the higher risk northern zone.

Restricting the distribution of Philippines bananas to parts of Australia south of this line would have an impact on several of the likelihoods contributing to the probability of distribution of BBrMV.

These likelihoods are discussed individually below.

Dist1 — *the likelihood that a pest will survive storage and ripening of fruit and its distribution to wholesalers.* Restriction of the distribution of fruit is unlikely to alter Dist1 from its unrestricted rating of **certain**.

Prop1 — *the proportion of imported bananas that is likely to be distributed to an area in which bananas are grown commercially*. Because commercial banana-growing areas lie to the north of the demarcation line, Prop1 would, with complete compliance, be zero. The IRA team, however, recognises that by virtue of complex wholesale and retail distribution networks, and unaware travelling consumers, an **extremely low** proportion of imported fruit might be moved north of the demarcation line.

Prop2 — *the proportion of imported bananas that is likely to be distributed to an area in which susceptible household (non-commercial) banana plants, or other susceptible garden plants (including weeds) are grown*. Because BBrMV is specific to bananas, restricting the distribution of imported fruit to parts of Australia below the demarcation line will reduce Prop2 from moderate to **low**.

Prop3 — *the proportion of imported bananas that is likely to be distributed to an area in which susceptible wild plants or susceptible cultivated plants other than bananas are found*. For the reason outlined for Prop2 (see above) Prop3 will be reduced from low to **extremely low**.

Dist2 — *the likelihood that the pest will be discarded with banana waste (fruit and peel) from fruit purchased by, or intended for purchase by, persons or households — or otherwise enter the environment.* Restriction of the distribution of fruit is unlikely to alter Dist2 from its unrestricted rating of **certain**.

Dist3 — *the likelihood that commercially cultivated bananas would be exposed to the pest discarded with banana waste (fruit and peel), or that had otherwise entered the environment.* Dist3 pre-supposes that the pest has entered the environment in an area where this group of susceptible hosts can be found. The extremely low likelihood that imported bananas will be distributed to an area where commercial bananas can be found has been incorporated in

Prop1. However, if bananas were to be distributed to such an area, then the likelihood that commercial bananas would be exposed to the pest would be unchanged from its unrestricted rating of **extremely low**.

Dist4 — *the likelihood that household (non-commercial) banana plants or other susceptible garden plants (including weeds) would be exposed to the pest discarded with banana waste (fruit and peel), or that had otherwise entered the environment*. The scenario of concern for the exposure of susceptible household plants was the discarding of infected peel at a site adjacent to a susceptible plant. The low likelihood that imported bananas will be distributed to an area where household bananas can be found has been incorporated in Prop2. Whilst Dist4 will be somewhat lower if bananas were to be distributed to areas south to the demarcation line because there are many fewer household banana plants in these areas and BBrMV does not have alternative hosts, it was considered the likelihood for Dist4 would be unchanged from its unrestricted rating of **extremely low**.

Dist5 — *the likelihood that susceptible wild (native or feral) plants or susceptible commercial plants other than bananas would be exposed to the pest associated with banana waste (fruit and peel), or that had otherwise entered the environment.* The extremely low likelihood that imported bananas will be distributed to an area where wild (native or feral) bananas can be found has been incorporated in Prop3. However, if imported bananas were to be distributed to such an area, then the likelihood that susceptible hosts in this group would be exposed to the pest would be unchanged from its unrestricted rating of **extremely low**.

$PPE_{Commercial}$ — *the partial probability of establishment for commercial bananas*. Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **high**.

$PPE_{Household}$ — *the partial probability of establishment for susceptible household plants.* Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **high**.

PPE_{Wild} — *the partial probability of establishment for susceptible wild plants, or cultivated plants other than bananas*. Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **high**.

$PPS_{Commercial}$ — *the partial probability of spread for commercial bananas*. Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **high**.

$PPS_{Household}$ — *the partial probability of spread for susceptible household plants*. Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **high**.

PPS_{Wild} — *the partial probability of spread for wild plants or cultivated plants other than bananas*. Restriction of the distribution of fruit is unlikely to alter this likelihood from its unrestricted rating of **high**.

Summary: restricting the distribution of imported bananas in Australia

When the modified (restricted) likelihoods described above were placed in the model, and the assessment for BBrMV repeated, the restricted annual likelihood of entry, establishment or spread was found to be low. The restricted annual likelihood of entry, establishment or spread was subsequently combined with the estimate of disease consequences, to give the restricted risk for BBrMV under this mitigation scenario. The restricted risk for BBrMV if the distribution of Philippines bananas is limited to parts of Australia south of the demarcation line was found to be very low. Because this satisfies Australia's ALOP, bananas could be imported under this condition.

This process is summarised in Table 29 below.

Table 29 BBrMV: restricting the distribution of Philippines bananas in Australia

Step	Unrestricted likelihood	Restricted likelihood
Dist1	Certain	Certain
Prop1	Low	Extremely low
Prop2	Moderate	Low
Prop3	Low	Extremely low
Dist2	Certain	Certain
Dist3	Extremely low	Extremely low
Dist4	Extremely low	Extremely low
Dist5	Extremely low	Extremely low
$PPE_{Commercial}$	High	High
$PPE_{Household}$	High	High
PPE_{Wild}	High	High
$PPS_{Commercial}$	High	High
$PPS_{Household}$	High	High
PPS_{Wild}	High	High
Annual likelihood	**Moderate**	**Low**
Risk estimate	**Low**	**Very low**

Conclusions: risk management for BBrMV

Two feasible risk management measures were identified for BBrMV:

- The designation of low pest prevalence areas (ALPP); and
- Restriction of the distribution of Philippines bananas in Australia.

Each of these measures provided security sufficient to meet Australia's ALOP. As previously noted, while designating areas free of BBrMV (area freedom) is an acceptable risk management option, it would be more difficult to achieve than the option of using ALPPs. Consequently, ALPP was considered to be more feasible and the least trade restrictive of these two measures.

As discussed in the Moko risk management section, the major difference between using ALPPs and restricting the distribution of Philippines banana fruit in Australia is likely to be in relation to the time required and the administrative complexity of providing for their implementation. The time required to develop the suite of legal, administrative and operational arrangements that would be necessary to give the restricted distribution of Philippines banana fruit practical application in Australia is very likely to be longer than the

time required to demonstrate areas with BBrMV prevalence at or below the specified LPP level. On this basis, the use of ALPP was considered to be the least trade restrictive of these two risk management options.

MEALYBUGS

Three mealybug species were examined in this analysis. Of the three, only the risk associated with *Dysmicoccus neobrevipes* and *Psuedococcus jackbeardsleyi* exceeded Australia's ALOP and required risk management.

The likelihood that these mealybugs would enter, establish or spread in Australia by way of imported Philippines bananas could be reduced through the following measures:

- The use of permanent packing stations only (Imp3);
- Targeted inspection for the mealybugs by quality assurance staff (Imp 5)
- Augmentation of the routine washing and decontamination procedures in the packing station (Imp 6) by:
    - the use of an insecticidal treatment; and
    - targeted sponging and brushing of the spaces between banana fruit
- Augmentation of on-arrival AQIS inspection (Imp10).

The scenario of concern for mealybugs is infestation of spaces between banana fingers.

- Measures that might reduce the high likelihood that *D. neobrevipes* and *P. jackbeardsleyi* are present on the source plantation (Imp1) such as area freedom were not identified. Area freedom was not considered a feasible measure based on the reproductive strategy and thus persistence of mealybugs, and their dispersal ability;
- Despite the use of chlorpyrifos-impregnated bunch covers in many Philippines plantations, mealybugs are considered a contaminant of hard green fruit at the point of harvest (Imp2) given that mealybugs have been intercepted on Philippines bananas in Japan and New Zealand (Spence, 2002; Sugimoto, 1994). Additional field management measures that might reduce the likelihood assigned to this step were not identified and hence the use of low pest prevalence areas was not considered a feasible measure;
- The likelihood that harvested fruit would become contaminated within the packing station (Imp4) was considered negligible, and, thus could not be further reduced; and
- The likelihoods that surviving mealybugs would remain viable during transport to the wharf (Imp8) and subsequently to Australia (Imp9) were considered high. Measures that might reduce these likelihoods were not identified.

In addition, because these mealybugs are polyphagous pests whose hosts include many species of fruiting plant in a range of climate zones, limiting the distribution of imported fruit to areas in which bananas are not grown commercially was not explored as a possible means of reducing risk.

Permanent packing stations

It was considered that when bunches are de-handed in the field, as occurs where mobile packing stations are used, there may be a higher likelihood of infestation with mealybugs (see mealybug risk assessment). The likelihood that infestation would occur during transport to the packing station could, therefore, be reduced by requiring that all bunches be

transported to the packing station on overhead cableways. This would mean that only permanent packing stations could be used for fruit for export to Australia.

The relative impact of mobile and permanent packing stations on the likelihood assigned to this step (Imp3) can be calculated using the formula below. As stated in the *Method for Import Risk Analysis*, approximately 10% of bananas are packed in mobile packing stations.

$$\text{Imp3}_{\text{Overall}} = (10\% \times \text{Imp3}_{\text{Mobile packing stations}}) + (90\% \times \text{Imp3}_{\text{Permanent packing stations}})$$ [5]

In this expression, $\text{Imp3}_{\text{Mobile packing stations}}$ is the likelihood of infestation where a mobile packing station is used. This was considered to be extremely low. Likewise, $\text{Imp3}_{\text{Permanent packing stations}}$ is the likelihood of infestation where a permanent packing station is used. This was considered to be negligible.

When *all* packing stations are permanent, the likelihood of infestation ($\text{Imp3}_{\text{Overall}}$) would be negligible.

When the modified likelihood for Imp3 was placed in the model, and the assessment for *D. neobrevipes* and *P. jackbeardsleyi* was repeated, the restricted annual likelihood of entry, establishment or spread was found to be high. Because the restricted annual likelihood of entry, establishment or spread remained the same as the unrestricted annual likelihood of entry, establishment or spread, the overall restricted risk for *D. neobrevipes* and *P. jackbeardsleyi* would remain above Australia's ALOP and therefore the use of only permanent packing stations would not be an effective risk management measure.

Targeted inspection for the mealybugs by quality assurance staff

Routine quality assurance regimes are targeted at ensuring the removal of fruit with blemishes, obvious distortion in shape, premature ripening and visible splits.

It was considered that if quality assurance staff were to specifically target the spaces between banana fingers as part of their quality inspections, that there would be a high likelihood that *D. neobrevipes* and *P. jackbeardsleyi* would be seen and hence these mealybugs would be removed from the fruit at this stage of the importation pathway. When the modified likelihood for Imp5 was placed in the simulation model, and the assessment for *D. neobrevipes* and *P. jackbeardsleyi* was repeated, the restricted annual likelihood of entry, establishment or spread was found to be high. When this was combined with the estimate of consequences of *D. neobrevipes* and *P. jackbeardsleyi*, the restricted risk for these mealybugs was found to be low, which exceeds Australia's ALOP. The use of only targeted inspection of the spaces between banana fingers would, therefore, not be an effective risk management measure.

Augmentation of the routine washing and decontamination procedures in the packing station

Insecticidal treatment

Insecticidal treatment by way of a dip or spray at the packing station could be used to kill *D. neobrevipes* and *P. jackbeardsleyi* present on harvested fruit. While an insecticide is unlikely to be completely effective in killing all *D. neobrevipes* and *P. jackbeardsleyi* individuals in

[5] The calculations on Imp3 were performed by simulating the probability ranges described in the *Method for Import Risk Analysis*

the spaces between banana fruit fingers, it is considered that it would be highly effective. Thus the rating assigned to *Imp6 — The likelihood that the pest will be removed from fruit or destroyed as a result of routine washing and decontamination procedures undertaken within the packing station* would be increased from low to high. When the modified likelihood for Imp6 was placed in the model, and the assessment for *D. neobrevipes* and *P. jackbeardsleyi* was repeated, the restricted annual likelihood of entry, establishment or spread was found to be high. When this likelihood was combined with the estimate of consequences of *D. neobrevipes* and *P. jackbeardsleyi*, the restricted risk for these mealybugs was found to be low, which exceeds Australia's ALOP. The use of only an insecticide dip or spray would, therefore, not be an effective risk management measure.

Targeted sponging and brushing of the spaces between banana fingers

The routine cleaning procedures for bananas include hosing fruit bunches with water, immersion of de-handed fruit in water treated with chlorine and alum and, finally, sponging and brushing of visibly contaminated fruit.

Hosing the fruit bunches is intended to remove dirt and admixed organic matter. This is relevant for pests loosely attached to the surface of fruit or associated with soil or organic matter but augmentation at this stage is unlikely to remove mealybugs between banana fingers. Sponging or brushing, on the other hand, is used to clean fruit, and to remove contaminants such as mealybug pests. All fruit pass through this cleaning procedure. Nevertheless, unless specifically targeting the spaces between banana fruit fingers, it was considered that sponging or brushing would not remove all mealybugs that might be lodged in those spaces.

It was considered, however, that if packing station staff were to specifically focus at Imp6 on cleaning the spaces between banana fingers as part of their cleaning regime, that there would be a high likelihood that *D. neobrevipes* and *P. jackbeardsleyi* would be removed from the fruit at this stage of the importation pathway. When the modified likelihood of high for Imp6 was placed in the simulation model, and the assessment for *D. neobrevipes* and *P. jackbeardsleyi* was repeated, the restricted annual likelihood of entry, establishment or spread was found to be high. When this likelihood was combined with the estimate of consequences of *D. neobrevipes* and *P. jackbeardsleyi*, the restricted risk for these mealybugs was found to be low, which exceeds Australia's ALOP. The use of only targeted sponging and brushing of the spaces between banana fingers would, therefore, not be an effective risk management measure.

Combination of insecticide treatment and targeted sponging and brushing of the spaces between banana fingers

As discussed above, when applied independently, it was considered that each of these measures would result in a high likelihood that *D. neobrevipes* and *P. jackbeardsleyi* mealybugs would be removed from the fruit at this stage of the importation pathway.

The effect of combining targeted sponging and brushing of the spaces between banana fingers by packing station staff and an insecticide treatment with proven high efficacy against mealybugs on the likelihood assigned to Imp6 can be calculated by the formula below.

$$Imp6_{Overall} = 1-(1\text{-efficacy of sponging and brushing}) \times (1\text{-efficacy of insecticide})$$

Where;

- The efficacy of sponging and brushing and the efficacy of an insecticidal treatment was modelled using the probability distribution, L ~ Uniform (0.7, 1) assigned to the

qualitative likelihood descriptor of high as described on page 51.

When the modified likelihood of 9.78 x10 $^{-1}$ for Imp6 was placed in the simulation model, and the assessment for *D. neobrevipes* and *P. jackbeardsleyi* repeated, the restricted annual likelihood of entry, establishment or spread was found to be low. When this likelihood was combined with the estimate for consequences of *D. neobrevipes* and *P. jackbeardslyei*, the restricted risk for these mealybugs was found to be very low, which meets Australia's ALOP. The use of a combination of targeted sponging and brushing of the spaces of between banana fingers and an insecticide dip or spray treatment would, therefore be an effective risk management measure.

Augmentation of inspection

Inspection may be augmented at importation step Imp7 (quarantine inspection in the Philippines) or at importation step Imp10 (AQIS inspection on-arrival in Australia). Inspection augmentation that was considered appropriate for mealybugs was an increase of the number of fruit examined in a consignment (Imp7) or a lot (Imp10) rather than magnification because mealybugs are already readily visible on bananas. The reason for selecting Imp10 over Imp7 (quarantine inspection by BPI in the Philippines) is that fruit may take up to 2 weeks to travel from the Philippines to Australia, and, during this time, important changes in the populations of *D. neobrevipes* and *P. jackbeardsleyi* mealybugs may have occurred — in particular:

- Adult females are likely to remain alive, while crawlers may have advanced to later stages of development;
- Female crawlers may have become adults, and sought out spaces between the fingers of bananas; and
- Male crawlers may have developed into the dormant and cocooned later stage nymphs, or even into adults. Male nymphs within cocoons are likely to remain viable, while adult males are fragile and short-lived and would have died in transit. Both the waxy cocoons and dead winged adult males are macroscopic and, if present in opened cartons, would be likely to be observed by AQIS inspectors.

The effectiveness of inspection will be determined by the following expression:

P(at least one pest or effected cluster detected) = 1 - P(all pests or effected clusters not detected)

$$= 1 - (1 - P \times S)^{\text{Number of clusters examined}}$$

Where;

- P is the prevalence of affected clusters within the consignment or lot, which, for Imp10 was considered extremely low;
- S is the 'sensitivity' of the examination process, or the likelihood that the pest would be identified during the examination of an individual infested cluster.

As discussed in the risk assessment for mealybugs, the effectiveness of AQIS on-arrival inspection if 600 clusters of Philippines bananas were to be inspected, was considered to be very low. By increasing the sampling number of clusters in the calculation above, it was found that the effectiveness of quarantine inspection would not improve until 4000 clusters from each lot were examined (Table 30).

Table 30 Effectiveness of quarantine inspection for mealybugs

Step	Number of clusters examined		
	600	2000	4000
Imp10	Very low	Very low	Moderate

When the modified likelihood of moderate for Imp10 using 4000 clusters was placed in the model, and the assessment for these mealybugs repeated, the restricted annual likelihood of entry, establishment or spread was found to be high. Because the restricted annual likelihood of entry, establishment or spread remained the same as the unrestricted annual likelihood of entry, establishment or spread, the overall restricted risk for *D. neobrevipes* and *P. jackbeardsleyi* would remain above Australia's ALOP and therefore increasing the sampling number of banana clusters inspected by AQIS to 4000 at on-arrival inspection would not be an effective risk management measure. In any event, it was concluded that an examination of more than six times the routine sample number used by AQIS at on-arrival inspection was likely to be viewed as trade restrictive in terms of the added costs (both time and money) that would flow from such a measure so it was not considered further.

Conclusions: risk management for *D. neobrevipes* and *P. jackbeardsleyi*

There were no individual measures identified that would reduce the risk associated with *D. neobrevipes* and *P. jackbeardsleyi* to within Australia's ALOP.

Risk was then estimated using various combinations of the risk management measures discussed above (except augmented inspection) and the results are summarised in Table 31.

It was found that the minimum combination of measures (i.e. the least trade restrictive risk management measure combination) that would reduce the biosecurity risk associated with *D. neobrevipes* and *P. jackbeardsleyi* to an acceptable level was a combination of targeted sponging and brushing between banana fingers by packing station staff and an insecticide treatment with proven high efficacy against mealybugs as part of the routine procedures undertaken within the packing station (Imp6).

Table 31 Risk management measures for mealybugs

	Imp3 Permanent packing stations	Imp 5 Targeted quality inspection	Imp6 Targeted sponging and brushing	Imp6 Insecticidal treatment	Annual Likelihood – entry, stablishment or spread	Restricted risk
1.	-	-	-	-	H	Low
2.	+	-	-	-	H	Low
3.	-	+	-	-	H	Low
4.	-	-	+	-	H	Low
5.	-	-	-	+	H	Low
6.	+	+	-	-	H	Low
7.	+	-	+	-	H	Low
8.	+	-	-	+	H	Low
9.	-	+	+	-	M	Low
10.	-	+	-	+	M	Low
11.	-	-	+	+	L	Very Low
12.	+	+	+	-	M	Low
13.	-	+	+	+	L	Very Low
14.	+	-	+	+	L	Very Low
15.	+	+	-	+	M	Low
16.	+	+	+	+	L	Very Low

Attachment 2: Replacement section of the Revised Draft IRA - Quarantine Conditions

INTRODUCTION

The quarantine conditions described below are based on the conclusions from this IRA. Specifically, they are based on the risk management options evaluation described in *Risk Management for Quarantine Pests* and the risk assessment and risk management of shipment contaminants described in *Contaminants of Banana Shipments from the Philippines*. The conditions are in addition to the risk management practices used in the production, processing, quality control, packing, transport and shipment of fruit from the specified areas in the Philippines, as described in the Philippines Department of Agriculture responses to the IRA team questions and the *Draft IRA Report* regarding the proposal to import Philippine bananas (Philippines Dept. Agriculture, 2001; 2002; 2002b). These practices are discussed in the *Method for Import Risk Analysis* and in the various pest risk assessments.

Biosecurity Australia considers that the quarantine conditions i.e. risk management measures proposed below are the least trade restrictive means of ensuring that Australia's ALOP would be met and are commensurate with the identified risks. Biosecurity Australia invites technical comments on the economic and practical feasibility of the measures. Alternative measures for managing risk may be accepted, generally or on a case-by-case basis if the proponent can demonstrate that they provide an equivalent level of quarantine protection. Those seeking to propose alternative risk management measures should provide a submission for consideration. Such proposals are welcome and should include supporting scientific information and describe how the alternative measures would meet Australia's ALOP.

A bilateral arrangement document would be signed between the Bureau of Plant Industry (BPI) and Biosecurity Australia to ensure that Australia's biosecurity requirements are satisfied.

Recognition of the competent authority

The Bureau of Plant Industry (BPI) is the Philippines' designated National Plant Protection Organization (NPPO) under the auspices of the International Plant Protection Convention (IPPC). BPI is the official plant protection organisation responsible, *inter alia*, for inspection of plants and plant products moving in international trade and the issuance of certificates relating to phytosanitary condition and origin of consignments of plants and plant products.

Systems for monitoring and surveillance

Monitoring and surveillance systems used in commercial banana plantations, packing stations and transportation in the Philippines are described in the *Method for Import Risk Analysis* and individual pest risk assessments. All export banana plantations are inspected weekly for pests and diseases. Fruit is subject to quality assurance and quarantine inspection. In addition to specific pests, the hard green condition of the fruit is monitored in quality assurance and quarantine inspections.

CERTIFICATION REQUIREMENTS

Pre-import measures

Import Permit

1. A valid 'Permit to Import Quarantine Material' is required to be obtained from the Australian Quarantine and Inspection Service (AQIS).

Quarantine Entry

2. A Quarantine Entry must be lodged with AQIS for fresh hard green bananas. The Quarantine Entry may be lodged by an importer or their agent or broker.

Export areas

3. These conditions apply to sea and air shipments of fresh hard green Cavendish bananas grown in approved commercial plantations, which are located in approved areas of Mindanao in the Philippines. Registered packing stations will also be located in the approved areas at or in the vicinity of the registered plantations.

Export Plantations

4. The bananas will only be permitted from approved plantations.
   - 4.1. All bananas for export to Australia must be sourced only from approved plantations. BPI is required to register all plantations for export to Australia prior to commencement of exports to enable trace back in the event of non-compliance. BPI will maintain a register of plantations 'Approved for Export to Australia' consisting of the following information.
     - 4.1.1. Ownership details
     - 4.1.2. Management details
     - 4.1.3. Precise geographical/physical location of approved plantations, including block boundaries and numbers.
5. All plants in export plantations will be inspected weekly, and complete records will be maintained for external audit.
6. Operation of participating plantations will be approved under ISO 9002 Certification or an approved equivalent, and will cover all relevant aspects of these import conditions.

Low pest prevalence for Moko in a plantation[*]

7. The bananas will only be permitted from an approved area with demonstrated low pest prevalence of Moko (*Ralstonia solanacearum* Race 2).
   7.1. An area of low pest prevalence (ALPP) would be established under the auspices of BPI and boundaries identified by precise grid references.
   7.2. The low pest prevalence (LPP) level for Moko in an approved ALPP will not exceed 0.003 cases per hectare per week, which is about 1 case per 7 hectares per year. A case is defined as an infected mat. This LPP level would be demonstrated by weekly surveys over a minimum period of two (2) years immediately preceding harvest of fruit intended for export to Australia.
   7.3. BPI would ensure the availability of legislation, administrative infrastructure, competent personnel and other resources necessary to meet the requirements of the ALPPs.
   7.4. In the event that the prevalence of Moko exceeds the set LPP level, the affected area shall be suspended from export to Australia for a minimum period of two (2) years.

Low pest prevalence for freckle in a plantation[*]

8. The bananas will be sourced from an approved area with demonstrated low prevalence of freckle (*Guignardia musae* Racib.; anamorph, *Phyllostictina musarum* (Cooke) van der Aa).
   8.1. An ALPP would be established under the auspices of BPI and boundaries identified by precise grid references.
   8.2. The LPP level for freckle in an approved ALPP will not exceed 1 infected mat per hectare per week. A case is defined as the detection of freckle symptoms on any part of a mat from which a bunch could be harvested. This LPP would be demonstrated by weekly survey data over a minimum period of four (4) weeks immediately preceding harvest of fruit intended for export to Australia.
   8.3. BPI would establish a quality control program for the survey, laboratory diagnosis and eradication of freckle cases, including the assessment of surveyor and diagnostician competency. BPI would regularly audit and verify pest survey records and make this information available to Australia as required.
   8.4. In the event the prevalence of freckle exceeds the set LPP level, the affected area shall be suspended from export to Australia for a minimum period of four (4) weeks.

Low pest prevalence for banana bract mosaic virus in a plantation[*]

9. The bananas will be sourced from an approved area with demonstrated low prevalence of banana bract mosaic virus
   9.1. An ALPP would be established under the auspices of BPI and boundaries identified by precise grid references.
   9.2. The LPP level for banana bract mosaic virus in an approved ALPP will not exceed

[*] Restricted distribution of Philippines banana fruit may be approved as an alternative condition to low pest prevalence (see post-import measures)

0.05 cases per hectare per week, which is about 3 cases per hectare per year. A case is defined as an infected mat. This LPP would be demonstrated by weekly survey data over a minimum period of seven (7) weeks immediately preceding harvest of fruit intended for export to Australia.

9.3. BPI would establish a quality control program for the survey, laboratory diagnosis and eradication of banana bract mosaic virus cases, including the assessment of surveyor and diagnostician competency. BPI would regularly audit and verify pest survey records and make this information available to Australia as required.

9.4. In the event the prevalence of banana bract mosaic virus exceeds the set LPP level, the affected area shall be suspended from export to Australia for a minimum period of seven (7) weeks.

Packing station measures to address the risk associated with the mealybugs *D. neobrevipes* and *P. jackbeardsleyi*

10. Packing station staff responsible for cleaning banana fruit as it passes through the packing station will specifically target the spaces between individual banana fruit fingers for cleaning by sponging and brushing to remove *D. neobrevipes* and *P. jackbeardsleyi* mealybugs.
11. An insecticide with proven high efficacy against mealybugs will be applied to all banana fruit in the packing station after the fruit has passed through the cleaning step.

Packing stations

12. BPI is required to register all export packing station facilities prior to commencement of exports to enable trace back in the event of non-compliance.
13. The manager of the packing station will ensure that equipment and storage areas used for handling export bananas are clean and are practically free from quarantine pests or other regulated articles before being used to process export fruit.
14. BPI will inspect packing stations during the packing and storage of export bananas to monitor and verify that the necessary requirements are met, including measures to prevent contamination of fruit and packing materials with quarantine pests and other regulated articles.
15. BPI will conduct unannounced random audit checks on approved packing stations to monitor the measures taken to prevent mixing or substitution of bananas eligible for export to Australia with non-export bananas.
16. The solution in de-handing and flotation tanks in the packing station will be continuously maintained at 20ppm available chlorine and 200ppm alum. Concentration of chlorine and alum will be monitored by an approved technique, and records will be audited by BPI.
17. The bananas will be packed in clean new packaging. The bananas will be partially vacuum packed in polyethylene bags and then placed into vented cartons, which will be assembled immediately prior to packing.
18. Operation of participating packing stations will be approved under ISO 9002 Certification or an approved equivalent.
19. Quality assurance inspection will be carried out after each ‘lot’ has been packed, and 600 clusters from each lot will be inspected. A lot is the quantity of bananas packed for export to Australia by a packing station on a day.

20. BPI will suspend exports from non-compliant packing stations.
21. BPI will make available to AQIS, on request, information on its supervisory activities in relation to packing stations.

Labelling

22. Identification of origin of fruit will be displayed on each carton – including
    - 22.1. Plantation identification number (as per register)
    - 22.2. Block identification number
    - 22.3. Packing facility number
    - 22.4. Date of packing
    - 22.5. Packing line number
    - 22.6. Packer identification number
    - 22.7. BPI Inspection stamp/No.
    - 22.8. Should restricted distribution of Philippines banana fruit in Australia be approved then both the lid and the box must be labelled clearly - For restricted distribution in Australia and/or describe those parts of Australia where the fruit can and cannot be distributed, and indicate that it is a serious offence under the Quarantine Act to contravene this regulation.
23. In the event that restricted distribution of bananas within Australia is used as an alternative to areas of low pest prevalence for Moko, freckle and BBrMV, each hand would be clearly labelled to identify the origin of the fruit as from the Philippines or each finger would be coded for example, by dipping in a coloured wax.
24. Palletised product will be identified by attaching a uniquely numbered pallet card to each pallet or part pallet. Pallet cards will be marked with the plantation registration number.

Storage

25. Any packed cartons that are not immediately transported to the wharf will be stored in approved premises practically free from quarantine pests or other regulated articles.

Loading and transport

26. Packed cartons will be immediately loaded into a shipping container, or on to a vehicle and transported to the wharf.
27. If packed fruit is not containerised at a packing station, the vehicle cargo area will be covered to prevent contamination with quarantine pests or other regulated articles.
28. If fruit is not containerised, palletised fruit at the wharf will be stored separately from domestic or other export fruit in areas practically free from quarantine pests or other regulated articles.
29. Cartons, containers, pallets, transportation vehicle cargo areas, and ship or aircraft holds will be practically free from quarantine pests and other regulated articles.
30. A consignment will not be split or have its packaging changed while in transit to Australia or while in another country en route to Australia.

Pre-export quarantine inspection

31. All consignments will be subject to pre-export inspection by BPI
    - 31.1. Inspection will occur prior to loading the shipment into containers or ships.
    - 31.2. From each consignment, the BPI officer will randomly select 600 clusters for inspection. Where a consignment incorporates more than a single lot, then each individual lot would be sampled.
    - 31.3. A nil tolerance will apply to quarantine pests and other regulated articles.
    - 31.4. A nil tolerance will apply to fruit that is not in mature hard green condition or is damaged in order to ensure freedom from fruit flies.

Phytosanitary documents

32. A single Phytosanitary Certificate and other relevant documents will accompany each banana consignment, and will be endorsed by BPI.
    - 32.1. BPI will verify that fruit for Australia has been sourced from a registered plantation(s), and complies with Australia's biosecurity requirements as set out in the bilateral arrangement document.
    - 32.2. The relevant Notice of Intent (NOI) number(s) to export bananas, annotated with the pallet card numbers of pallets will be included in the consignment.
    - 32.3. Timber packaging and pallets must be certified on the Notice of Intent to export bananas (NOI) as having been inspected and cleared by BPI.
    - 32.4. The shipping container number(s) and container seal number(s) must be supplied by BPI.
    - 32.5. Each consignment will be accompanied by the following additional declaration:
    - 32.6. "The bananas in this consignment have been produced in an approved area(s) of Mindanao in accordance with the conditions governing the entry of bananas from the Philippines to Australia"

Notification

33. BPI will notify AQIS immediately of any notifiable non-compliance, including detection of Moko, freckle or BBrMV in registered plantations above the specified pest levels and details of deregistered plantations.

Post-import measures

Verification of phytosanitary documents

34. AQIS staff will inspect and verify documentation concerning the shipment.
    - 34.1. The shipment must have a valid import permit.
    - 34.2. The shipment must have a phytosanitary certificate that identifies registered plantations and bears the above additional declaration.
    - 34.3. Any shipment with incomplete documentation or certification that does not

conform to specifications must be refused entry, with the option of re-export or destruction. AQIS would notify BPI immediately of action taken.

On-arrival quarantine inspection and treatment

35. The bananas and packaging materials will be inspected by AQIS.
    35.1. All shipments are subject to inspection on arrival and any treatment necessary before release.
    35.2. Timber packaging, pallets or dunnage in full container load (FCL) containers will be subject to inspection and treatment on arrival, unless certified as having been treated by an approved method.
    35.3. The AQIS authorised officer will select at random 600 clusters for inspection. A 600-unit inspection sample will be drawn for each lot.
    35.4. A nil tolerance will apply to quarantine pests and other regulated articles.
    35.5. A nil tolerance will apply to fruit that is not in mature hard green condition or is damaged.
36. All potential quarantine pests found during on-arrival inspection must be forwarded to an AQIS approved appropriate laboratory for identification. AQIS will provide the results of pest interceptions to BPI.
37. Possible treatment of rejected fruit will be considered in consultation with quarantine entomologists or pathologists.
38. Any non-compliant shipments will be treated, re-exported or destroyed at the importers expense.
39. If live stages of a quarantine arthropod pest are intercepted during on-arrival inspection, and the importer accepts the treatment option, the affected shipment will be fumigated with methyl bromide in accordance with the relevant AQIS standards. It is noted that, if methyl bromide fumigation is required, this treatment may damage the bananas.
40. The efficacy of fumigation will be verified by inspection 24 hours after completion of the treatment.

Restricted distribution of Philippines fruit in Australia

These conditions apply only as an alternative if fruit is not sourced from low pest prevalence areas for Moko, freckle and BBrMV (see conditions 7 and 8). As noted at the beginning of this section, these conditions are in addition to the risk management practices used in the production, processing, quality control, packing, transport and shipment of fruit from the specified areas in the Philippines, as described in the Philippines Department of Agriculture responses to the IRA team questions and the Draft IRA Report *regarding the proposal to import Philippine bananas (Philippines Dept. Agriculture, 2001; 2002a; 2002b). These practices are discussed in the* Method for Import Risk Analysis *and in the various pest risk assessments.*

41. Philippines banana fruit are restricted to distribution in those parts of Australia south of a demarcation line across Australia (Figure 13). The demarcation line starts on the Western Australian coast at the 26th parallel and continues east along the 26th parallel until it intersects with the South Australia border. The demarcation line follows the South Australian border north until it meets the Northern Territory border. At this point, the

demarcation line moves east and follows South Australia's northern border to its end at the Queensland border. The demarcation line turns south following South Australia's border as far as the parallel equating to $32^{0}30$'S. The demarcation line follows the 32nd 30' parallel east across New South Wales to the east coast of Australia.

42. The entry of Philippines banana fruit into Australia is limited to those ports south of the demarcation line described at condition 41. Those ports would be the ports in the States of South Australia, Victoria, New South Wales, Tasmania and Western Australia south of the 26th parallel, as specified in section 12 of the Proclamation.

Audits

43. AQIS may audit the pathway of imported fruit at any time.

Review of import conditions

44. AQIS may review conditions at any time and may, in consultation with BPI, suspend the importation of bananas. A suspension would be reviewed following a joint AQIS, Biosecurity Australia and BPI investigation.
45. AQIS, and Biosecurity Australia, in consultation with BPI, will review the import requirements if circumstances or information warrant such action.

Attachment 3: Replacement section of the Revised Draft IRA - Executive Summary

EXECUTIVE SUMMARY

In June 2000, Australia initiated an import risk analysis (IRA) on Philippines bananas following provision of necessary technical information by the Philippines Bureau of Plant Industry (BPI) in May 2000.

BPI in their submission requested a risk analysis of a proposal to export fresh mature hard green banana fruit to Australia. BPI proposed exports of four varieties of Cavendish (Extra Dwarf, Giant Cavendish, Grand Nain and Williams) and Gros Michel from the Mindanao region (Davao, Cotabato and Bukidnon) in the Philippines.

An IRA team (then referred to as a Risk Analysis Panel) was established to conduct the IRA. The members are:

Dr Cheryl McRae	Chair Senior Manager — Biosecurity Development and Evaluation Biosecurity Australia
Dr Sharan Singh	Manager — Plant Biosecurity Biosecurity Australia
Dr Rob Allen	Principal Policy Officer — Plant Health Queensland Department of Primary Industries
Dr Bryan Cantrell	Principal Policy Officer — Plant Health Queensland Department of Primary Industries
Mr Bob Paton	Policy Officer — Market Access New South Wales Agriculture
Mr David Peasley	Horticultural Consultant
Mr Mike Robbins	Manager — Grain, Seed and Nursery Stock Australian Quarantine and Inspection Service

The IRA team established three technical working groups to assist its consideration of pathogen, arthropod, and horticulture, environment and operational issues relevant to the IRA. In May 2001, Biosecurity Australia released an *Issues Paper* on the BPI proposal for stakeholder comment. In October 2001, following stakeholder comments on the *Issues Paper* and discussions with the Chairs of technical working groups during their visit to the Philippines, BPI clarified that the proposed export area of Davao means Davao del Sur, Davao del Norte and Davao Oriental and Cotabato means South Cotabato, North Cotabato and Sarangani. At the same time, BPI also advised Biosecurity Australia that the cultivar Gros Michel was no longer produced in their banana plantations.

In June 2002, Biosecurity Australia released a *Draft IRA Report* for stakeholder comment. Twenty submissions were received on the draft report, including substantial comments from the Philippines Government and industry, the Australian Banana Growers' Council (ABGC) and the Western Australian Government. In addition to stakeholder submissions on the June 2002 *Draft IRA Report*, supplementary comments and reports relevant to the IRA were received from ABGC and the Philippines Government.

Given the substantial nature of the various submissions and reports, and the widely varying technical viewpoints, the IRA team considered it appropriate to undertake an extensive review of the technical information concerning each of the quarantine pests identified in the IRA. Additionally, the IRA team reviewed the various other technical issues arising from the submissions and reports.

As a consequence, the IRA team identified the need to make significant changes to the analysis as reported in the June 2002 *Draft IRA Report*. For this reason this report is issued as a *revised Draft IRA Report* which takes into account the stakeholder submissions and reports, and technical information available to the IRA team.

This *revised Draft IRA Report* describes the procedures followed to identify and assess the biosecurity risks associated with the importation into Australia of fresh mature hard green Cavendish banana fruit of four varieties (Extra Dwarf, Giant Cavendish, Grand Nain and Williams) from specified areas of Davao (Davao del Sur, Davao del Norte and Davao Oriental), Cotabato (South Cotabato, North Cotabato and Sarangani) and Bukidnon in the Mindanao region, the Philippines. The report also considers and evaluates, as appropriate, risk management measures. It presents recommendations on proposed biosecurity measures sufficient to ensure that Australia's appropriate level of protection (ALOP) is maintained.

This report contains the following:

- Australia's framework for biosecurity policy and IRAs, information on the background to this IRA, a summary of banana industries in the Philippines and Australia, and Australia's biosecurity policies for fresh bananas;
- An outline of the methodology and results of pest categorisation, risk assessment and risk management;
- An assessment of contaminants of banana shipments from the Philippines;
- Draft quarantine import conditions for fresh mature hard green banana fruit from the Philippines;
- Further steps in the IRA process.

Australia's current biosecurity policies for fresh bananas

Fresh banana fruit for human consumption are not currently imported by Australia.

Fresh banana fruit may be imported for *in-vitro* laboratory work under secure quarantine conditions, and at Quarantine Approved Premises. Strict quarantine conditions are observed for these imports, including a requirement that packaging materials and containers be disposed of by incineration, autoclaving or other methods approved by the Director of Animal and Plant Quarantine. The goods in each consignment must be packaged securely and transported directly to a facility approved by AQIS for laboratory analysis. Samples must be in clean, new packaging and must be free from quarantine pests and other regulated articles (eg soil).

The importation of certain 'banana products' from several countries, including the Philippines, is permitted. Banana products include cooked, dried and canned or preserved product.

Movement of banana fruit and banana planting material within Australia may also be subject to intrastate and interstate quarantine restrictions dependent on State and Territory plant health concerns.

Import risk analysis

The technical component of an import risk analysis for plants or plant products is termed a 'pest risk analysis', or PRA[6]. As stated in the International Plant Protection Convention's International Standards for Phytosanitary Measures Publication Number 11 (ISPM 11 – Rev. 1) — *Pest Risk Analysis for Quarantine Pests including analysis of environmental risks*, a PRA comprises three discrete stages:

- initiation of the PRA;
- risk assessment; and
- risk management.

Initiation of this PRA

As described above, this IRA Report was initiated by a proposal from the Philippines to export fresh hard green Cavendish banana fruit to Australia. The following PRA flows from that proposal and is the technical component of the IRA Report. The PRA area considered in this report is Australia.

International standards to address the specific quarantine concerns associated with imports of bananas do not exist, nor has Australia completed a risk analysis of this commodity. In addition, Australia does not import fresh hard green Cavendish bananas for consumption from other countries, nor does it have existing import conditions upon which to base a response to the Philippines proposal.

In consideration of these issues, an analysis of the biosecurity risk associated with fresh hard green bananas from the Philippines was required.

A list of pests likely to be associated with fresh hard green bananas from the Philippines (i.e. the biosecurity risk pathway) was generated from information supplied by the Philippines Government and banana industry, literature searches, databases and expert consultation. This list was used in the risk assessment stage of the PRA.

Pest Categorisation

Ninety-nine pests of bananas were categorised according to their presence or absence in Australia, their association with banana fruit, their potential to become established in Australia, and the potential consequences of establishment. From these, 22 were identified as quarantine pests and were the focus of individual risk assessments.

These pests are:

- Banana bract mosaic virus
- Banana bunchy top virus
- *Ralstonia solanacearum* Race 2 (Moko)
- *Guignardia musae* (freckle)
- *Mycosphaerella fijiensis* (black Sigatoka)
- *Fusarium oxysporum* f.sp. *cubense* (Panama disease)
- Mealybugs — *Dysmicoccus neobrevipes*; *Pseudococcus jackbeardsleyi*; *Rastrococcus*

[6] PRA is used throughout this document as an abbreviation of Pest Risk Analysis. The Australian Government Department of Agriculture, Fisheries and Forestry uses the term PRA to describe the technical component of an import risk analysis on plants or their products.

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- Weevils — *Philicoptus demissus*; *P. iliganus*; *P. stringifrons*; *P.* sp.1; *P.* sp.2
- Hard scales — *Aspidiotus excisus*; *A. coryphae*; *Pinnaspis musae*
- Fruit flies — *Bactrocera occipitalis*; *B. philippinensis*
- Spider mites — *Oligonychus orthius*; *O. velascoi*; *Tetranychus piercei*

Additionally, other organisms that may enter Australia with shipments of Philippines bananas – 'contaminants of banana shipments' (as opposed to those quarantine pests that were identified as being pests of banana fruit) were considered to be of quarantine concern. Of these, 52 weeds were classified as quarantine pests. It was considered that other quarantine pests might also be found among five groups of possible non-weed contaminants of banana shipments (mammals, amphibians, reptiles, molluscs and arthropods).

Assessment and management of risk

The unrestricted biosecurity risk[7] was assessed by combining the estimates of the likelihoods of entry, establishment or spread of each quarantine pest or group of pests with the consequences of their entry, establishment or spread. Evaluation of consequences included harm to the environment, including impacts on native species.

In relation to **Moko**, **freckle**, **banana bract mosaic virus** and two species of **mealybugs** (*Dysmicoccus neobrevipes*; *Pseudococcus jackbeardsleyi*) the unrestricted biosecurity risk was assessed as being too high to meet Australia's ALOP. For all other pests of Philippines banana fruit, the unrestricted risk was assessed as being sufficiently low as to meet Australia's ALOP.[8]

The 2002 *Draft IRA Report* assessed the unrestricted biosecurity risk of black Sigatoka as being too high to meet Australia's ALOP. However, the IRA team, on review of the scientific evidence, considered because black Sigatoka is a *leaf* pathogen and not a pathogen of banana *fruit*, that the unrestricted risk associated with black Sigatoka was in fact acceptable. The finding that risk management is not required for black Sigatoka is based on a detailed assessment of, among other things, the likelihood of particulate leaf trash being associated with packed fruit, the likelihood of the fungus being on these tiny pieces of trash and the likelihood that the fungus would be viable, as well as the likelihood that the fungus, if present, would be distributed to a susceptible host.

Summary of risk management measures

Risk management describes the process of identifying and implementing measures to mitigate risks so as to achieve ALOP, or tolerance for loss, while ensuring that any negative effects on trade are minimised.

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[7] Unrestricted risk estimates are those derived in the absence of specific risk management measures; or using only internationally accepted baseline risk management strategies. In contrast, restricted or mitigated risk estimates are those derived when 'risk management' is applied. In the case of this *Draft IRA Report*, unrestricted risk is the risk associated with fruit produced to the standard achieved through risk management practices used in the production, processing, quality control, packing, transport and shipment of fruit from the specified areas, as described in documentation provided by the Philippines, as well as pre-export and on-arrival quarantine inspections.

[8] Note that fruit of all kinds entering Australia is subject to AQIS on-arrival inspection procedures. These procedures are focussed on both the commodity (packed fruit) and any packing materials that may be associated with it.

Various possible biosecurity measures to manage the identified risks for Moko, freckle, banana bract mosaic virus and mealybugs were considered, with key areas of focus being the need to reduce the risks associated with:

- symptomless infection for Moko, freckle and banana bract mosaic virus, and hence potential entry, establishment or spread of these diseases through imported fruit;
- transmission of freckle in particulate trash; and
- mealybug infestation, particularly in the spaces between banana fruit.

Moko

Two feasible risk management measures were identified for Moko: sourcing fruit for export from areas of low pest prevalence (ALPP); and restricting the distribution of Philippines bananas in Australia.

Bananas from the Philippines could be granted access if they were sourced from an Australian approved plantation area, which can demonstrate that the prevalence of Moko is below a level deemed acceptable by Australia – an ALPP. The low pest prevalence (LPP) level for Moko in an approved ALPP would not exceed 0.003 cases (infected mats) per hectare per week, which is about 1 case per 7 hectares per year – i.e. no more than one infected mat in 11,900 mats per year. This LPP level would be demonstrated by weekly surveys over a minimum period of 2 years immediately preceding harvest of fruit intended for export to Australia. If the prevalence of Moko exceeded the set LPP level, the affected area would be suspended for a minimum period of 2 years.

As an alternative to sourcing fruit from LPP areas within the Philippines, Philippines banana fruit could be granted access if the port of importation and the distribution of that fruit in Australia were restricted to those parts where commercial banana production does not occur. This measure would be in addition to the risk management practices used in the production and processing, quality control, packing, transport and shipment of fruit from the specified areas in the Philippines, as described in documentation provided by Philippines Department of Agriculture and described in this *Draft IRA Report*. Restricting the distribution of Philippines bananas in Australia could be implemented by the Australian Commonwealth Government using the *Quarantine Act 1908* and its subordinate legislation.

Each of these measures would provide security sufficient to meet Australia's ALOP. The major difference between sourcing fruit for export from areas of LPP and restricting the port of importation and the distribution of Philippines bananas in Australia is likely to be the time required and the administrative complexity of providing for their implementation. The administration of the restriction on the movement of Philippines banana fruit would require additional arrangements and resources to address such issues as monitoring, auditing and non-compliance. The cost of these arrangements and resources would be borne by importers or wholesalers also necessitating the need to develop infrastructure for cost recovery.

It was considered that the time required to develop the suite of legal, administrative and operational arrangements that would be necessary to give the restricted distribution of Philippines banana fruit practical application in Australia is likely to be longer than the time required to demonstrate areas with Moko prevalence at or below the specified LPP level. On this basis, the use of ALPP was considered to be the least trade restrictive of the two risk management options and is the recommended measure.

Freckle

Two feasible risk management measures were identified for freckle: sourcing fruit for export from areas of low pest prevalence; and restricting the distribution of Philippines bananas in Australia.

Bananas from the Philippines could be access if they were sourced from an Australian approved plantation area, which can demonstrate that the prevalence of freckle is below a level deemed acceptable by Australia – an ALPP. The low pest prevalence (LPP) level for freckle in an approved ALPP would not exceed 1 case per hectare per week – i.e. no more than one case per 1700 plants per week where a case is defined as the detection of freckle symptoms on any part of a mat from which a bunch could be harvested. This LPP would be demonstrated by weekly survey data over a minimum period of 4 weeks immediately preceding fruit harvest intended for export to Australia. If the prevalence of freckle exceeds the set level, the affected area shall be suspended for a minimum period of 4 weeks.

As an alternative to sourcing fruit from low pest prevalence areas within the Philippines, Philippines banana fruit could be granted access if the port of importation and the distribution of that fruit in Australia was restricted to those parts where commercial banana production does not occur. This measure would be in addition to the risk management practices used in the production, processing, quality control, packing, transport and shipment of fruit from the specified areas in the Philippines, as described in documentation provided by Philippines Department of Agriculture and described in this *Draft IRA Report*. Restricting the distribution of Philippines bananas in Australia could be implemented by the Commonwealth Government using the *Quarantine Act 1908* and its subordinate legislation.

Each of these measures would provide security sufficient to meet Australia's ALOP. The major difference between using ALPPs and restricting the distribution of Philippines banana fruit in Australia is likely to be the time required and the administrative complexity of providing for their implementation. The administration of the restriction on the movement of Philippines banana fruit would require additional arrangements and resources to address such issues as monitoring, auditing and non-compliance. The cost of these arrangements and resources would be borne by importers or wholesalers also necessitating the need to develop infrastructure for cost recovery.

It was considered that the time required to develop the suite of legal, administrative and operational arrangements that would be necessary to give the restricted distribution of Philippines banana fruit practical application in Australia is likely to be longer than the time required to demonstrate areas with freckle prevalence at or below the specified LPP level. On this basis, the use of ALPP was considered to be the least trade restrictive of the two risk management options and is the recommended measure.

Banana bract mosaic virus

Two feasible risk management measures were identified for bract mosaic virus: sourcing fruit for export from areas of low pest prevalence (ALPP); and restricting the distribution of Philippines bananas in Australia.

Bananas from the Philippines could be granted access if they were sourced from an Australian approved plantation area, which can demonstrate that the prevalence of bract mosaic virus is below a level deemed acceptable by Australia – an ALPP. The low pest prevalence (LPP) level for banana bract mosaic virus in an approved ALPP would not exceed 0.05 cases (infected mats) per hectare per week, which is about 3 cases per hectare per year – i.e. no more than one infected mat in 567 plants per year. This LPP level would be demonstrated by weekly surveys over a minimum period of 7 weeks immediately preceding

harvest of fruit intended for export to Australia. If the prevalence of bract mosaic virus exceeded the set LPP level, the affected area would be suspended for a minimum period of 7 weeks.

As an alternative to sourcing fruit from LPP areas within the Philippines, Philippines banana fruit could be granted access if the port of importation and the distribution of that fruit in Australia were restricted to those parts where commercial banana production does not occur. This measure would be in addition to the risk management practices used in the production and processing, quality control, packing, transport and shipment of fruit from the specified areas in the Philippines, as described in documentation provided by Philippines Department of Agriculture and described in this *Draft IRA Report*. Restricting the distribution of Philippines bananas in Australia could be implemented by the Australian Commonwealth Government using the *Quarantine Act 1908* and its subordinate legislation.

Each of these measures would provide security sufficient to meet Australia's ALOP. The major difference between sourcing fruit for export from areas of LPP and restricting the port of importation and the distribution of Philippines bananas in Australia is likely to be the time required and the administrative complexity of providing for their implementation. The administration of the restriction on the movement of Philippines banana fruit would require additional arrangements and resources to address such issues as monitoring, auditing and non-compliance. The cost of these arrangements and resources would be borne by importers or wholesalers also necessitating the need to develop infrastructure for cost recovery.

It was considered that the time required to develop the suite of legal, administrative and operational arrangements that would be necessary to give the restricted distribution of Philippines banana fruit practical application in Australia is likely to be longer than the time required to demonstrate areas with banana bract mosaic virus prevalence at or below the specified LPP level. On this basis, the use of ALPP was considered to be the least trade restrictive of the two risk management options and is the recommended measure.

Mealybugs

Additional packing station measures would be required to reduce the biosecurity risk associated with the mealybugs *D. neobrevipes* and *P. jackbeardsleyi* to meet Australia's ALOP. While no individual risk management measures were identified, a combination of targeted sponging and brushing between banana fingers by packing station staff and an insecticide treatment with proven high efficacy against mealybugs as part of the routine procedures undertaken within the packing station was considered to be the least trade restrictive risk management measure combination that would bring the risk within Australia's ALOP.

Weeds and other contaminants of banana shipments

Risk assessments were carried out for the 52 weeds identified as quarantine pests. Eleven weeds were identified as requiring risk management to reduce the risks of entry, establishment or spread to an acceptable level. These risks could be managed by a suite of practical measures discussed in this report, relating to the packaging materials used and to packing and transport procedures.

Because likelihood of entry, establishment or spread of non-weed contaminant organisms of banana shipments from the Philippines was considered negligible, the overall risk was not considered sufficient to require management beyond that already proposed for weeds, except that fruit, packing materials and transport vehicles must also be free from the groups of non-weed contaminants (mammals, amphibians, reptiles, molluscs and arthropods).

Quarantine conditions

The *revised Draft IRA Report* outlines a set of conditions for the importation of Philippines bananas. The quarantine conditions described in the report are based on the risk assessment and risk management conclusions from this IRA. Specifically, they flow from the evaluation of risk management options. The conditions are in addition to the risk management practices used in the production, processing, quality control, packing, transport and shipment of fruit from the specified areas in the Philippines, as described in documentation provided by Philippines Department of Agriculture.

The quarantine conditions proposed for the importation of Philippines bananas deal comprehensively with the risks identified in the IRA. A rigorous though-chain systems approach, dealing with all key points in the import pathway, is applied to protect Australia's favourable plant health status and to verify the integrity of the measures applied.

Biosecurity Australia considers that the quarantine conditions i.e. the risk management measures proposed in this report are the least trade restrictive means of ensuring that Australia's ALOP would be met and are commensurate with the identified risks. Biosecurity Australia invites technical comments on their economic and practical feasibility. Alternative measures for managing risk may be accepted, generally or on a case-by-case basis if the proponent can demonstrate that they provide an equivalent level of quarantine protection. Those seeking to propose alternative risk management measures should provide a submission for consideration. Such proposals are welcome and should include supporting scientific information and describe how the alternative measures would meet Australia's ALOP.

Conclusion

This *revised Draft IRA Report* recommends that import of fresh hard green bananas from the Philippines be permitted subject to certain conditions.

In accordance with the process for conducting IRAs as outlined in the *Import Risk Analysis Handbook*, established by the Australian Government Department of Agriculture, Fisheries and Forestry's Biosecurity Australia, comments are invited on this *revised Draft IRA Report* and its Addendum. Submissions should reach Biosecurity Australia within 60 days of publication of the Addendum to this report. The *Final IRA Report* will take into account any comments received on this draft as well as any new information that may come to hand. The *Final IRA Report* will be open to appeal for a period of 30 days after its release.