Australian Government

Department of Agriculture, Fisheries and Forestry

Longan and lychee fruit from the People's Republic of China and Thailand

Final Import Risk Analysis Report

Part A

February 2004

CONTENTS

TABLES

LIST OF TABLES

GLOSSARY OF TERMS AND ABBREVIATIONS

ALGA	Australian Lychee Growers Association
ALOP	appropriate level of protection
AQIS	Australian Quarantine and Inspection Service
AQSIQ	General Administration for Quality Supervision and Inspection and Quarantine of the People's Republic of China
ARD	Agricultural Regulatory Division of the Department of Agriculture, Thailand
Area	an officially defined country, part of a country or all or parts of several countries
Biosecurity Australia	a major operating group within the Australian Government Department of Agriculture, Fisheries and Forestry
China	The People's Republic of China
CIQ	China Inspection and Quarantine
Control (of a pest)	suppression, containment or eradication of a pest population
DAFF	Australian Government Department of Agriculture, Fisheries and Forestry
DAWA	Department of Agriculture Western Australia
DOA	Department of Agriculture, Thailand
Endangered area	an area where ecological factors favour the establishment of a pest whose presence in the area will result in economically important loss
Entry (of a pest)	movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled
Establishment	the perpetuation, for the foreseeable future, of a pest within an area after entry

FAO	Food and Agriculture Organization of the United Nations
Fresh	not dried, deep-frozen or otherwise conserved
ICA	Interstate Certification Assurance
ICON	AQIS Import Conditions database
Introduction	entry of a pest resulting in its establishment
IPPC	International Plant Protection Convention, as deposited in 1951 with FAO in Rome and as subsequently amended
IRA	import risk analysis
ISPM	International Standard for Phytosanitary Measures
LAA	Longan Association of Australia
National Plant Protection Organisation	official service established by a government to discharge the functions specified by the IPPC
NPPO	National Plant Protection Organisation
Non-quarantine pest	pest that is not a quarantine pest for an area
Official	established, authorised or performed by a National Plant Protection Organisation
Official control (of a regulated pest)	the active enforcement of mandatory phytosanitary regulations and the application of mandatory phytosanitary procedures with the objective of eradication or containment of quarantine pests or for the management of regulated non-quarantine pests
OIE	Office International des Epizooties
Pathway	any means that allows the entry or spread of a pest
PBPM	Plant Biosecurity Policy Memorandum
Pest	any species, strain or biotype of plant, animal, or pathogenic agent, injurious to plants or plant products
Pest categorisation	the process for determining whether a pest has or has not the characteristics of a quarantine pest or those of a regulated non-quarantine pest

Pest free area .... an area in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained

Pest risk analysis .... the process of evaluating biological or other scientific evidence to determine whether a pest should be regulated and the strength of any phytosanitary measures to be taken against it

Phytosanitary measure .... any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests

Phytosanitary regulation .... official rule to prevent the introduction and/or spread of quarantine pests, by regulating the production, movement or existence of commodities or other articles, or the normal activity of persons, and by establishing schemes for phytosanitary certification

PQPM .... Plant Quarantine Policy Memorandum

PRA .... pest risk analysis

PRA area .... area in relation to which a pest risk analysis is conducted

QDPI .... Queensland Department of Primary Industries

Quarantine pest .... a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled

Regulated non-quarantine pest .... a non-quarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable consequence and which is therefore regulated within the territory of the importing contracting party

SAIQ .... State Administration for Entry and Exit Inspection and Quarantine of the People's Republic of China

Spread .... expansion of the geographical distribution of a pest within an area

SPS	Sanitary and Phytosanitary
SPS Agreement	WTO Agreement on the Application of Sanitary and Phytosanitary Measures
Stakeholders	Government agencies, individuals, community or industry groups or organisations, whether in Australia or overseas, including the proponent/applicant for a specific proposal
WTO	World Trade Organization

EXECUTIVE SUMMARY

The Department of Agriculture, Fisheries and Forestry (DAFF) has considered the importation of fresh longan and lychee fruit from the People's Republic China and Thailand. An Import Risk Analysis (IRA) was initiated in April 2000. In October 2000, Biosecurity Australia, a group within DAFF, was established to take responsibility for assessing the quarantine risks associated with commodity imports. Biosecurity Australia circulated the Technical Issues Paper in March 2003 and the Draft Import Risk Analysis Report in August 2003.

This *Final Import Risk Analysis (IRA) Report* contains the following:

- Australia's framework for biosecurity policy and for import risk analysis, the international framework for trade in plants and plant products, Australia's current policy for importation of longan and lychee and information on the background to this IRA;
- an outline of the methodology and results of pest categorisation, risk assessment and risk management;
- import conditions for fresh longan and lychee fruit from China and Thailand;
- further steps in the IRA process; and
- a synopsis of stakeholder comments received on the Draft IRA Report and Biosecurity Australia's response.

Detailed risk assessment was conducted for those pests that were categorised as quarantine pests to determine an unrestricted risk estimate for each organism. For those pests for which the risk was considered to be above Australia's appropriate level of protection (ALOP), risk management measures have been developed. Consultation with the General Administration for Quality Supervision and Inspection and Quarantine of the People's Republic of China (AQSIQ) and Thailand's Department of Agriculture (DOA), and input from stakeholders on the draft import conditions has resulted in the adoption of a set of risk management measures that form the basis of import conditions and will maintain Australia's ALOP for fresh longan and lychee fruit from China and Thailand.

The risk assessment identified eight arthropod pests associated with the importation of longan and lychee from China and Thailand that require risk management measures to reduce the risk to an acceptable level. The risks associated with the importation of fresh longan and lychee fruit from China and Thailand will be managed by applying a combination of risk management measures and phytosanitary procedures, specifically:

- registration of export orchards and packinghouses;
- option of cold disinfestation treatment/vapour heat treatment for *Bactrocera cucurbitae* and *B. dorsalis* (fruit flies);

- option of cold disinfestation treatment/approved orchard control program and inspection for freedom from *Conopomorpha sinensis* (litchi fruit borer);
- inspection for freedom from mealybugs and soft scales;
- targeted pre-export inspection by the National Plant Protection Organisation (NPPO);
- packing, labelling and storage compliance;
- phytosanitary certification by the NPPO; and
- targeted on-arrival quarantine inspection and clearance by the Australian Quarantine and Inspection Service (AQIS).

Details on the risk management measures, including their objectives, and the resulting import conditions are provided within this final IRA report.

To assist the reader this final IRA report is presented in two separate parts. Part A includes key components of the risk assessment, the risk management measures, the import conditions and a summary of the stakeholder comments on the draft IRA report and Biosecurity Australia's response. Part B contains detailed technical components of the risk assessment.

This final IRA report has now been released to stakeholders, together with a Plant Biosecurity Policy Memorandum (PBPM) containing the Executive Manager of Biosecurity Australia's recommendation for a policy determination. The Executive Manager has recommended that the importation of fresh longan and lychee from the People's Republic of China be permitted subject to the application of phytosanitary measures as specified in the 'Import Conditions' section of this document.

Stakeholders have 30 days from the publication of this document to lodge an appeal in writing, before the final policy determination is made by the Director of Animal and Plant Quarantine.

BIOSECURITY FRAMEWORK

INTRODUCTION

This section outlines:

- The legislative basis for Australia's biosecurity regime;
- Australia's international rights and obligations;
- Australia's appropriate level of protection;
- Import risk analysis; and
- Policy determination.

AUSTRALIAN LEGISLATION

The *Quarantine Act 1908* and its subordinate legislation, including the *Quarantine Proclamation 1998*, are the legislative basis of human, animal and plant biosecurity in Australia.

Some key provisions are set out below.

Quarantine Act: Scope

Sub section 4 (1) of the *Quarantine Act 1908* defines the scope of quarantine as follows.

> *In this Act, quarantine includes, but is not limited to, measures:*
>
> *for, or in relation to:*
>
> *(i) the examination, exclusion, detention, observation, segregation, isolation, protection, treatment and regulation of vessels, installations, human beings, animals, plants or other goods or things; or*
>
> *(ii) the seizure and destruction of animals, plants, or other goods or things; or*
>
> *(iii) the destruction of premises comprising buildings or other structures when treatment of these premises is not practicable; and*
>
> *having as their object the prevention or control of the introduction, establishment or spread of diseases or pests that will or could cause significant damage to human beings, animals, plants, other aspects of the environment or economic activities.*

Section 5D of the *Quarantine Act 1908* covers the level of quarantine risk.

> *A reference in this Act to a level of quarantine risk is a reference to:*
>
> *(a) the probability of:*

(i) a disease or pest being introduced, established or spread in Australia or the Cocos Islands; and

(ii) the disease or pest causing harm to human beings, animals, plants, other aspects of the environment, or economic activities; and

(b) the probable extent of the harm.

Section 5D of the *Quarantine Act 1908* includes harm to the environment as a component of the level of quarantine risk.

Environment is defined in Section 5 of the *Quarantine Act 1908,* in that it:

> *includes all aspects of the surroundings of human beings, whether natural surroundings or surroundings created by human beings themselves, and whether affecting them as individuals or in social groupings.*

Quarantine Proclamation

The *Quarantine Proclamation 1998* is made under the under the *Quarantine Act 1908*. It is the principal legal instrument used to control the importation into Australia of goods of quarantine (or biosecurity) interest. The Proclamation empowers a Director of Quarantine to grant a permit to import.

Section 70 of the *Quarantine Proclamation 1998* sets out the matters to be considered when deciding whether to grant a permit to import:

Things a Director of Quarantine must take into account when deciding whether to grant a permit for importation into Australia

(1) In deciding whether to grant a permit to import a thing into Australia or the Cocos Islands, or for the removal of a thing from the Protected Zone or the Torres Strait Special Quarantine Zone to the rest of Australia, a Director of Quarantine:

(a) must consider the level of quarantine risk if the permit were granted; and

(b) must consider whether, if the permit were granted, the imposition of conditions on it would be necessary to limit the level of quarantine risk to one that is acceptably low; and

(ba) for a permit to import a seed of a kind of plant that was produced by genetic manipulation -- must take into account any risk assessment prepared, and any decision made, in relation to the seed under the Gene Technology Act; and

(c) may take into account anything else that he or she knows that is relevant.

DEVELOPMENT OF BIOSECURITY POLICY

As can be seen from the above extracts, the legislation establishes the concept of the level of biosecurity (quarantine) risk as the basis of decision-making under Australian quarantine legislation.

Import risk analyses are a significant contribution to the information available to the Director of Animal and Plant Quarantine - a decision maker for the purposes of the Quarantine Proclamation. Import risk analysis is conducted within an administrative process – known as the IRA process (described in the *IRA Handbook*[1])

The purpose of the IRA process is to deliver a policy recommendation to the Director of Animal and Plant Quarantine that is characterised by sound science and by transparency, fairness and consistency. The key elements of the IRA process are covered in “Import Risk Analysis” below.

AUSTRALIA’S INTERNATIONAL RIGHTS AND OBLIGATIONS

It is important that import risk analysis conforms to Australia’s rights and obligations as a WTO Member country. These rights and obligations derive principally from the World Trade Organization’s *Agreement on the Application of Sanitary and Phytosanitary Measures* (SPS Agreement), although other WTO agreements may also be relevant. Specific international guidelines on risk analysis developed under the International Plant Protection Convention (IPPC) and by the Office International des Epizooties (OIE) are also relevant.

The SPS Agreement recognises the right of WTO Member countries to determine the level of sanitary and phytosanitary protection they deem appropriate, and to take the necessary measures to achieve that protection. Sanitary (human and animal health) and phytosanitary (plant health) measures typically apply to trade in, or movement of, animal and plant based goods within or between countries. The SPS Agreement applies to measures that may directly or indirectly affect international trade and that protect human, animal or plant life or health from pests and diseases or a Member’s territory from a pest.

The SPS Agreement provides for the following:

- The right of WTO Member countries to determine the level of sanitary and phytosanitary protection (its appropriate level of protection, or ALOP) they deem appropriate;

[1] Biosecurity Australia (2003) *Import Risk Analysis Handbook*. Australian Government Department of Agriculture, Fisheries and Forestry, Canberra

- An importing Member has the sovereign right to take measures to achieve the level of protection it deems appropriate to protect human, animal or plant life or health within its territory;
- An SPS measure must be based on scientific principles and not be maintained without sufficient scientific evidence;
- An importing Member shall avoid arbitrary or unjustifiable distinctions in levels of protection, if such distinctions result in discrimination or a disguised restriction on international trade;
- An SPS measure must not be more trade restrictive than required to achieve an importing Member's ALOP, taking into account technical and economic feasibility;
- An SPS measure should be based on an international standard, guideline or recommendation where these exist, unless there is a scientific justification for a measure which results in a higher level of SPS protection to meet the importing Member's ALOP;
- An SPS measure conforming to an international standard, guideline or recommendation is deemed to be necessary to protect human, animal or plant life or health, and to be consistent with the SPS Agreement;
- Where an international standard, guideline or recommendation does not exist or where, in order to meet an importing Member's ALOP, a measure needs to provide a higher level of protection than accorded by the relevant international standard, such a measure must be based on a risk assessment; the risk assessment must take into account available scientific evidence and relevant economic factors;
- Where the relevant scientific evidence is insufficient, an importing Member may provisionally adopt SPS measures on the basis of available pertinent information. In such circumstances, Members shall seek to obtain the additional information necessary for a more objective assessment of risk and review the SPS measure accordingly within a reasonable period of time;
- An importing Member shall accept the measures of other countries as equivalent, if it is objectively demonstrated that the measures meet the importing Member's ALOP.

AUSTRALIA'S APPROPRIATE LEVEL OF PROTECTION (ALOP)

The SPS Agreement defines the concept of an 'appropriate level of sanitary or phytosanitary protection (ALOP)' as the level of protection deemed appropriate by the WTO Member establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory.

Like many other countries, Australia expresses its ALOP in qualitative terms. Australia's ALOP, which reflects community expectations through government policy, is currently expressed as providing a high level of sanitary or phytosanitary protection aimed at reducing risk to a very low level, but not to zero.

ALOP can be illustrated using a 'risk estimation matrix' Table 1. The cells of this matrix describe the product of likelihood[2] and consequences — termed 'risk'. When interpreting the risk estimation matrix, it should be remembered that, although the descriptors for each axis are similar ('low', 'moderate', 'high', etc), the vertical axis refers to *likelihood* and the horizontal axis refers to *consequences*.

Table 1. Risk estimation matrix

Likelihood of entry, establishment or spread	Negligible impact	Very low	Low	Moderate	High	Extreme impact
High likelihood	Negligible risk	Very low risk	Low risk	Moderate risk	High risk	Extreme risk
Moderate	Negligible risk	Very low risk	Low risk	Moderate risk	High risk	Extreme risk
Low	Negligible risk	Negligible risk	Very low risk	Low risk	Moderate risk	High risk
Very low	Negligible risk	Negligible risk	Negligible risk	Very low risk	Low risk	Moderate risk
Extremely low	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very low risk	Low risk
Negligible likelihood	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very low risk

Consequences of entry, establishment or spread

The band of cells in Table 1 marked 'very low risk' represents Australia's ALOP, or tolerance of loss.

Risk Management and SPS Measures

Australia's plant and animal health status is maintained through the implementation of measures to facilitate the importation of products while protecting the health of people, animals and plants.

Australia bases its national measures on international standards where they exist and where they deliver the appropriate level of protection from pests and diseases. However, where such standards do not achieve Australia's level of biosecurity protection, or relevant standards do not exist, Australia exercises its right under the SPS Agreement to take appropriate measures, justified on scientific grounds and supported by risk analysis.

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[2] The terms "likelihood" and "probability" are synonymous. "Probability" is used in the *Quarantine Act 1908* while "likelihood" is used in the WTO SPS Agreement. These terms are used interchangeably in this IRA Report.

Australia's approach to addressing requests for imports of animals, plants and their products where there are biosecurity risks, is, where appropriate, to draw on existing sanitary and phytosanitary measures for similar products with comparable risks. However, where measures for comparable biosecurity risks have not previously been established, further action would be required to assess the risks to Australia and determine the sanitary and phytosanitary measures needed to achieve Australia's ALOP.

IMPORT RISK ANALYSIS

Description

In animal and plant biosecurity, import risk analysis identifies the pests and diseases relevant to an import proposal, assesses the risks posed by them and, if those risks are unacceptable, specifies the measures that could be taken to reduce those risks to an acceptable level. These analyses are conducted via an administrative process (described in the *IRA Handbook*) that involves, among other things, notification to the WTO, consultation and appeal.

Undertaking IRAs

Biosecurity Australia may undertake an IRA if:

- there is no relevant existing biosecurity measure for the good and pest/disease combination; or
- a variation in established policy is desirable because pests or diseases, or the likelihood and/or consequences of entry, establishment or spread of the pests or diseases could differ significantly from those previously assessed.

Environment and human health

When undertaking an import risk analysis, Biosecurity Australia takes into account harm to the environment as part of its assessment of biosecurity risks associated with the potential import.

Under the *Environment Protection and Biodiversity Conservation Act 1999*, Environment Australia may assess proposals for the importation of live specimens and their reproductive material. Such an assessment may be used or referred to by Biosecurity Australia in its analyses.

Biosecurity Australia also consults with other Commonwealth agencies where they have responsibilities relevant to the subject matter of the IRA, e.g. Food Standards Australia New Zealand (FSANZ) and the Department of Health and Ageing.

The IRA Process in summary

The process consists of the following major steps:

***Initiation*:** This is the stage where the identified need for an IRA originates.

***Scheduling and Scoping*:** At this stage, Biosecurity Australia considers all the factors that affect scheduling. Consultation with States, Territories and other Commonwealth agencies is involved. There is opportunity for appeal by stakeholders at this stage.

***Risk Assessment and Risk Management*:** Here, the major scientific and technical work relating to risk assessment is performed. There is detailed consultation with stakeholders.

***Reporting*:** Here, the results of the IRA are communicated formally. There is consultation with States and Territories. The Executive Manager of Biosecurity Australia then delivers the biosecurity policy recommendation arising from the IRA to the Director of Animal and Plant Quarantine. There is opportunity for appeal by stakeholders at this stage.

POLICY DETERMINATION

The Director of Animal and Plant Quarantine makes the policy determination, which is notified publicly.

METHOD FOR PEST RISK ANALYSIS

The technical component of an IRA for plants or plant products is termed a 'pest risk analysis', or PRA. Biosecurity Australia conducts PRA in accordance with the International Standard for Phytosanitary Measure (ISPM) 11 *Pest Risk Analysis for Quarantine Pests.* A summary of the requirements of ISPM 11 is given in this section plus descriptions of the methodology used to meet these requirements in this IRA. This summary is given to provide a description of the methodology used for this IRA and to provide a context for the technical information that is provided later in this document.

A PRA comprises three discrete stages:

- Stage 1: initiation of the PRA.
- Stage 2: risk assessment.
- Stage 3: risk management.

The *initiation* of a risk analysis involves the identification of the pest(s) and pathways of concern that should be considered for analysis. *Risk assessment* comprises pest categorisation, assessment of the probability of introduction or spread, and assessment of the potential consequences (including environmental consequences). *Risk management* describes the evaluation and selection of options to reduce the risk of introduction and spread of a pest.

STAGE 1: INITIATION

The aim of the initiation stage is to identify the pest(s) and pathways (e.g. commodity imports) which are of quarantine concern and should be considered for risk analysis in relation to the identified PRA area. This PRA was initiated by a proposal from China's SAIQ (now AQSIQ) and subsequently Thailand's DOA to export fresh longan and lychee fruit from China and Thailand into Australia for human consumption.

STAGE 2: PEST RISK ASSESSMENT

The process for pest risk assessment can be broadly divided into three interrelated steps:

- pest categorisation;
- assessment of the probability of introduction or spread; and
- assessment of potential consequences (including environmental consequences).

Pest risk assessment needs to be only as complex as is technically justified by the circumstances. ISPM 11 allows a specific PRA to be judged against the principles of necessity, minimal consequence, transparency, equivalence, risk analysis, managed risk and non-discrimination.

Pest categorisation

Pest categorisation is a process to examine for each pest whether the criteria in the definition of a quarantine pest are satisfied. That is, whether the pests identified in Stage 1 (Initiation of the PRA) are 'quarantine pests' or not.

The categorisation of a pest as a quarantine pest includes the following primary elements:

- *Identity of the pest*. The identity of the pest should be clearly defined to ensure that the assessment is being performed on a distinct organism, and that biological and other information used in the assessment is relevant to the organism in question. If this is not possible because the causal agent of particular symptoms has not yet been fully identified, then it should have been shown to produce consistent symptoms and to be transmissible.

  The taxonomic unit for the pest is generally species. The use of a higher or lower taxonomic level should be supported by scientifically sound rationale. For levels below the species, this should include evidence demonstrating that factors such as differences in virulence, host range or vector relationships are significant enough to affect phytosanitary status.

  Where a vector is involved, the vector may also be considered a pest to the extent that it is associated with the causal organism and is required for transmission of the pest.
- *Presence or absence in the endangered area*. The pest should be absent from all or part of the endangered area.
- *Regulatory status*. If the pest is present but not widely distributed in the PRA area, it should be under official control or be expected to be under official control in the near future.
- *Potential for establishment and spread in the PRA area*. Evidence should be available to support the conclusion that the pest could become established or spread in the PRA area. The PRA area should have ecological/climatic conditions including those in protected conditions suitable for the establishment and spread of the pest where relevant, host species (or near relatives), alternate hosts and vectors should be present in the PRA area.
- *Potential for consequences in the endangered area*. There should be clear indication that the pest is likely to have an unacceptable consequence (including environmental consequence) in the PRA area.

Pest categorisation was carried out in two stages for this IRA.

In the technical issues paper released in March 2003 (*Technical Issues Paper: Import Risk Analysis (IRA) for the importation of fresh longan and lychee fruit from the People's Republic of China*) a list of pests of longan and lychee was categorised according to the presence or absence of each pest in Australia, and the association of each pest with mature longan or lychee fruit. This step represents an assessment of the potential for entry of the identified pests.

The second stage of pest categorisation was documented in the draft IRA report (*Draft Import Risk Analysis Report: Longan and lychee fruit from the People's Republic of China and Thailand, Parts A and B*) released in August 2003. This stage was based on the categorisation of each pest absent from Australia (or part(s) of Australia) and associated with longan or lychee fruit according to (a) its potential to become established or spread in Australia, and, (b) the potential for consequences. Categorisation of potential for establishment or spread and potential for consequences was dichotomous, and expressed using the terms 'feasible' / 'not feasible', and 'significant' / 'not significant', respectively. A summary of the results of pest categorisation for this IRA is given in the 'Pest Categorisation' section of this document.

Pests found to have potential for entry, establishment or spread and potential for consequences satisfy the criteria for a quarantine pest. Further background and methodology for the detailed assessments conducted on the quarantine pests is provided below.

Assessment of the probability of introduction or spread

Details on assessing the 'probability of entry', 'probability of establishment' and 'probability of spread after establishment' of a pest are given in ISPM 11. A synopsis of these details is given below, followed by a description of the qualitative methodology used in this IRA.

Pest introduction is comprised of both entry and establishment. Assessing the probability of introduction requires an analysis of each of the pathways with which a pest may be associated from its origin to its establishment in the PRA area. In a PRA initiated by a specific pathway, the probability of pest entry is evaluated for the pathway in question. The probabilities for pest entry with other pathways, if any, need to be investigated as well.

The assessment of probability of spread is based primarily on biological considerations similar to those for entry and establishment.

Probability of entry

The probability of entry of a pest depends on the pathways from the exporting country to the destination, and the frequency and quantity of the pests associated with them. The greater the number of pathways, the higher the probability of the pest entering the PRA area.

Steps identified in ISPM 11 relevant to PRA initiated by a pathway are:

- *Probability of the pest being associated with the pathway at origin* – e.g. prevalence in the source area, occurrence of life stages that would be associated with the commodity, volume and frequency of movement along the pathway, seasonal timing, pest management, cultural and commercial procedures applies at the place of origin.
- *Probability of survival during transport or storage* – e.g. speed and conditions of transport and duration of the lifecycle, vulnerability of the life-stages during transport or storage, prevalence of the pest, commercial procedures applied.
- *Probability of pest surviving existing pest management procedures*.
- *Probability of transfer to a suitable host* – e.g. dispersal mechanisms, whether the imported commodity is sent to few or many destination points in the PRA area, time of year at which import takes place, intended use of the commodity, risks from by-products and waste.

Probability of establishment

In order to estimate the probability of establishment of a pest, reliable biological information (life cycle, host range, epidemiology, survival, etc.) should be obtained from the areas where the pest currently occurs. The situation in the PRA area can then be compared with that in the areas where it currently occurs and expert judgement used to assess the probability of establishment. Examples provided in ISPM 11 of factors to consider are:

- Availability, quantity and distribution of hosts in the PRA area;
- Environmental suitability in the PRA area;
- Potential for adaptation of the pest;
- Reproductive strategy of the pest;
- Method of pest survival; and
- Cultural practices and control measures.

Probability of spread after establishment

In order to estimate the probability of spread of the pest, reliable biological information should be obtained from areas where the pest currently occurs. The situation in the PRA area can then be carefully compared with that in the areas where the pest currently occurs and expert judgement used to assess the probability of spread. Examples provided in ISPM 11 of factors to consider are:

- Suitability of the natural and/or managed environment for natural spread of the pest;

- Presence of natural barriers;
- The potential for movement with commodities or conveyances;
- Intended use of the commodity;
- Potential vectors of the pest in the PRA area; and
- Potential natural enemies of the pest in the PRA area.

Method for evaluating the probability of entry, establishment or spread in this IRA

Evaluation and reporting of likelihoods can be done qualitatively, semi-quantitatively or quantitatively. For qualitative evaluation, likelihoods assigned to steps in the scenarios are categorised according to a descriptive scale – eg ‘low’, ‘moderate’, ‘high’, etc –where no attempt has been made to equate descriptors with numeric values or scores. For semi-quantitative evaluation, likelihoods are given numeric ‘scores’ (eg. 1, 2, 3), or probabilities and/or probability intervals (eg. 0–0.0001, 0.0001–0.001, 0.001–0.01, 0.01–1). For quantitative evaluation, likelihoods are described in purely numeric terms.

Each of these three approaches to likelihood evaluation has its advantages and constraints and the choice of approach depends on both technical and practical considerations. For this IRA, likelihood was evaluated and reported qualitatively using the terms described in Table 2.

Table 2. Nomenclature for qualitative likelihoods

Likelihood	Descriptive definition
High	The event would be very likely to occur
Moderate	The event would occur with an even probability
Low	The event would be unlikely to occur
Very low	The event would be very unlikely to occur
Extremely low	The event would be extremely unlikely to occur
Negligible	The event would almost certainly not occur

Qualitative likelihoods can be assigned to individual steps in scenarios, or to the probability that the entire scenario will occur. If the likelihoods have been assigned to individual steps then some form of ‘combination rule’ is needed for calculating the probability that all steps will occur. For this IRA the likelihoods were combined using a tabular matrix, as shown in Table 3.

Table 3. A matrix of 'rules' for combining descriptive likelihoods

	High	**Moderate**	**Low**	**V. Low**	**E. Low**	**Negligible**
High	High	Moderate	Low	V. Low	E. Low	Negligible
Moderate		Low	Low	V. Low	E. Low	Negligible
Low			V. Low	V. Low	E. Low	Negligible
Very low				E. Low	E. Low	Negligible
E. low					Negligible	Negligible
Negligible						Negligible

In this IRA, qualitative likelihoods were assigned to the probability of entry (comprising an importation step and a distribution step), the probability of establishment and the probability of spread. In other IRAs it may be considered relevant to assign qualitative likelihoods to additional steps. This would depend on the complexity of the issue and the information that was available. For example, within the importation step, separate qualitative likelihoods could be assigned to the probabilities that source fruit is infested, that the pest survives packinghouse procedures and that it survives storage and transport.

The procedure for combining likelihoods is illustrated in Table 4. A likelihood is assigned to the probability of importation (low) and the probability of distribution (moderate) then they are combined to give the probability of entry (low). The likelihoods are combined using the 'rules' provided in Table 3. The probability of entry is then combined with the likelihoods assigned to the probability of establishment (high) and probability of spread (very low) to give the overall probability of entry, establishment and spread (very low).

Table 4. Qualitative evaluation of the imported fruit scenario

Step	Qualitative descriptor	Product of likelihoods
Probability of importation	Low	
Probability of distribution	Moderate	
...... ➔ Probability of entry	………......... ➔	Low
Probability of establishment	High .... ➔	Low
Probability of spread	V. Low	
...... ➔ Probability of entry, establishment and spread	………......... ➔	V. Low

Assessment of consequences

The basic requirements for the assessment of consequences are described in the SPS Agreement with Article 5.3 stating that

> *"Members shall take into account as relevant economic factors: the potential damage in terms of loss of production or sales in the event of the entry, establishment or spread of a pest or disease; the costs of control or eradication in the territory of the importing Member; and the relative cost-effectiveness of alternative approaches to limiting risks"*

Assessment of consequences is also referred to Annex A of the SPS Agreement in the definition of risk assessment:

> *"The evaluation of the likelihood of entry, establishment or spread of a pest or disease within the Territory of an importing Member according to the sanitary or phytosanitary measures which might be applied, and of the associated potential biological and economic consequences"*

Further detail on assessing these "relevant economic factors" or "associated potential biological and economic consequences" for plant-based analysis is given under the "potential economic consequences" section in ISPM 11[3]. This ISPM separates the consequences into "direct" and "indirect" and provides examples of factors to consider within each. These examples are listed below under the headings where they may be considered in an IRA. This is followed by a description of the methodology used in this IRA.

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[3] A revised version of ISPM 11 was released in April 2003. The supplement on analysis of environmental risks endorsed by the ICPM has been integrated into ISPM 11 to produce ISPM No. 11 Rev. 1.

In this IRA, the term "consequence" is used to reflect the "relevant economic factors"/ "associated potential biological and economic consequences" and "potential economic consequences" terms as used in the SPS Agreement and ISPM 11 respectively.

Direct pest effects

Plant life or health

Examples from ISPM 11 that could be considered for the direct consequences on plant life or health:

- Known or potential host plants;
- Types, amount and frequency of damage;
- Crop losses, in yield and quality;
- Biotic factors (e.g. adaptability and virulence of the pest) affecting damage and losses;
- Abiotic factors (e.g. climate) affecting damage and losses;
- Rate of spread;
- Rate of reproduction;
- Control measures (including existing measures), their efficacy and cost;
- Effect of existing production practices; and
- Environmental effects.

Any other aspects of the environment

Examples from ISPM 11 that could be considered for the direct consequences on any other aspects of the environment:

- Environmental effects *(listed as a general example in ISPM 11);*
- Reduction of keystone plant species;
- Reduction of plant species that are major components of ecosystems (in terms of abundance or size), and endangered native plant species (including effects below species level where there is evidence of such effects being significant); and
- Significant reduction, displacement or elimination of other plant species.

Indirect pest effects

Eradication, control etc

Examples from ISPM 11 that could be considered for the indirect consequences on eradication, control etc:

- Changes to producer costs or input demands, including control costs;
- Feasibility and cost of eradication or containment;
- Capacity to act as a vector for other pests; and

- Resources needed for additional research and advice.

Domestic trade & International trade

Examples from ISPM 11 that could be considered for the indirect consequences on domestic and international trade (the two are considered separately):

- Effects on domestic and export markets, including particular effects on export market access; and
- Changes to domestic or foreign consumer demand for a product resulting from quality changes.

Environment

Examples from ISPM 11 that could be considered for the indirect consequences on the environment:

- Environmental and other undesired effects of control measures;
- Social and other effects (e.g. tourism);
- Significant effects on plant communities;
- Significant effects on designated environmentally sensitive or protected areas;
- Significant change in ecological processes and the structure, stability or processes of an ecosystem (including further effects on plant species, erosion, water table changes, increased fire hazard, nutrient cycling, etc);
- Effects on human use (e.g. water quality, recreational uses, tourism, animal grazing, hunting, fishing); and
- Costs of environmental restoration.

Method for assessing consequences in this IRA

The relevant examples of direct and indirect consequences from ISPM 11 are considered for each of the broad groups (as listed above) and estimates of the consequences are assigned. The broad groups are shown in table form in the 'Risk Assessments for Quarantine Pests' section of this document.

The direct and indirect consequences are estimated based on four geographic levels. The terms 'local', 'district', 'regional' and 'national' are defined as:

Local: an aggregate of households or enterprises — e.g. a rural community, a town or a local government area

District: a geographically or geopolitically associated collection of aggregates — generally a recognised section of a state, such as the 'North West Slopes and Plains' or 'Far North Queensland'

Region: a geographically or geopolitically associated collection of districts — generally a state, although there may be exceptions with larger states such as Western Australia

National: Australia-wide

The consequence is described as 'unlikely to be discernible', of 'minor significance', significant' or 'highly significant':

- an '*unlikely to be discernible*' consequence is not usually distinguishable from normal day-to-day variation in the criterion;
- a consequence of '*minor significance*' is not expected to threaten economic viability, but would lead to a minor increase in mortality/morbidity or a minor decrease in production. For non-commercial factors, the consequence is not expected to threaten the intrinsic 'value' of the criterion — though the value of the criterion would be considered as 'disturbed'. Effects would generally be reversible;
- a '*significant*' consequence would threaten economic viability through a moderate increase in mortality/morbidity, or a moderate decrease in production. For non-commercial factors, the intrinsic 'value' of the criterion would be considered as significantly diminished or threatened. Effects may not be reversible; and
- a '*highly significant*' consequence would threaten economic viability through a large increase in mortality/morbidity, or a large decrease in production. For non-commercial factors, the intrinsic 'value' of the criterion would be considered as severely or irreversibly damaged.

The values are translated into a qualitative score (A–F) using the schema outlined in Table 5).

Table 5. The assessment of local, district, regional and national consequences

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

Level

The overall consequence for each pest was achieved by combining the qualitative scores (A–F) for each direct and indirect consequence using a series of decision rules. These rules are mutually exclusive, and were addressed in the order that they appeared in the list — for example, if the first rule did not apply, the second rule was considered. If the second rule did not apply, the third rule was considered and so on until one of the rules applied:

- Where the consequences of a pest with respect to any direct or indirect criterion is ‘F’, the overall consequences are considered to be ‘extreme’.
- Where the consequences of a pest with respect to more than one criterion is ‘E’, the overall consequences are considered to be ‘extreme’.
- Where the consequences of a pest with respect to a single criterion is ‘E’ and the consequences of a pest with respect to each remaining criterion is ‘D’, the overall consequences are considered to be ‘extreme’.
- Where the consequences of a pest with respect to a single criterion is ‘E’ and the consequences of a pest with respect to remaining criteria is not unanimously ‘D’, the overall consequences are considered to be ‘high’.
- Where the consequences of a pest with respect to all criteria is ‘D’, the overall consequences are considered to be ‘high’.
- Where the consequences of a pest with respect to one or more criteria is ‘D’, the overall consequences are considered to be ‘moderate’.
- Where the consequences of a pest with respect to all criteria is ‘C’, the overall consequences are considered to be ‘moderate’.
- Where the consequences of a pest with respect to one or more criteria are considered ‘C’, the overall consequences are considered to be ‘low’.
- Where the consequences of a pest with respect to all criteria are ‘B’, the overall consequences are considered to be ‘low’.
- Where the consequences of a pest with respect to one or more criteria are considered ‘B’, the overall consequences are considered to be ‘very low’.
- Where the consequences of a pest with respect to all criteria is ‘A’, the overall consequences are considered to be ‘negligible’.

Method for determining the unrestricted risk estimate

The unrestricted risk estimate for each pest is determined by combining the likelihood estimates of entry, of establishment and of spread with the overall potential consequences. This is done using the risk estimation matrix (see Table 1). The unrestricted risk is then compared with Australia's ALOP to determine the need for appropriate risk management measures.

STAGE 3: PEST RISK MANAGEMENT

The conclusions from pest risk assessment are used to decide whether risk management is required and if so, the strength of measures to be used. Since zero-risk is not a reasonable option, the guiding principle for risk management is to manage risk to achieve the required degree of safety that can be justified and is feasible within the limits of available options and resources. Pest risk management (in the analytical sense) is the process of identifying ways to react to a perceived risk, evaluating the efficacy of these actions, and identifying the most appropriate options.

Overall risk is determined by the examination of the outputs of the assessments of the probability of entry, establishment or spread and the consequence. If the risk is found to be unacceptable, then the first step in risk management is to identify possible phytosanitary measures that will reduce the risk to, or below, an acceptable level.

ISPM 11 provides details on the identification and selection of appropriate risk management options and notes that the choice of measures should be based on their effectiveness in reducing the probability of introduction of the pest.

Examples given of measures commonly applied to traded commodities include:

- *Options for consignments* – e.g. inspection or testing for freedom, prohibition of parts of the host, a pre-entry or post-entry quarantine system, specified conditions on preparation of the consignment, specified treatment of the consignment, restrictions on end use, distribution and periods of entry of the commodity.
- *Options preventing or reducing infestation in the crop* – e.g. treatment of the crop, restriction on the composition of a consignment so it is composed of plants belonging to resistant or less susceptible species, harvesting of plants at a certain age or specified time of the year, production in a certification scheme.
- *Options ensuring that the area, place or site of production or crop is free from the pest* – e.g. pest-free area, pest-free place of production or pest-free production site.
- *Options for other types of pathways* – e.g. consider natural spread, measures for human travellers and their baggage, cleaning or disinfestation of contaminated machinery.
- *Options within the importing country* – e.g. surveillance and eradication programs.
- *Prohibition of commodities* – e.g. if no satisfactory measure can be found.

The result of the pest risk management procedure will be either that no measures are identified which are considered appropriate or the selection of one or more management options that have been found to lower the risk associated with the pest(s) to an acceptable level. These management options form the basis of phytosanitary regulations or requirements.

Method for pest risk management in this IRA

The unrestricted risk estimate for each pest is determined by combining the overall estimate for ‘entry, establishment and spread potential’ with the overall expected consequence using a risk estimate matrix (Table 1). The requirement for risk management is then determined by comparing the unrestricted risk estimate with Australia’s ALOP. Australia’s ALOP is represented in this matrix by the row of cells marked ‘very low risk’.

Where the estimate of unrestricted risk does not exceed Australia’s ALOP, risk management is not required. Where the unrestricted risk estimate exceeds Australia’s ALOP, risk management measures are required to reduce the risk to an acceptable level. Using this risk estimation matrix, risk management measures are required when the unrestricted risk estimate is low, moderate, high or extreme. Risk management measures are not required when the unrestricted risk estimate is very low or negligible.

Risk management measures are identified for each pest as required and are presented in the ‘Risk Management’ section of this document. The phytosanitary regulations based on these measures are presented in the ‘Import Conditions’ section of this document.

PROPOSAL TO IMPORT FRESH LONGAN AND LYCHEE FRUIT FROM CHINA AND THAILAND

BACKGROUND

Plant Quarantine Policy Memorandum (PQPM) 2000/05 of 28 April 2000 advised stakeholders that an IRA for the importation of fresh longan and lychee fruit from the People's Republic of China had commenced.

Biosecurity Australia notified stakeholders of the availability of a technical issues paper for this IRA in Plant Biosecurity Policy Memorandum (PBPM) 2003/08 of 14 March 2003, and invited comments from stakeholders. The technical issues paper included background to the IRA and preliminary results of pest categorisation.

In May 2003, the Thailand Department of Agriculture (DOA), formally requested that Biosecurity Australia consider access for fresh longan and lychee fruit from Thailand and provided a comprehensive technical market access submission, including detailed pest lists.

Biosecurity Australia conducted a preliminary assessment of the pest lists provided by Thailand and concluded that they were sufficiently similar to the Chinese lists to be considered within the existing IRA. PBPM 2003/17 of 23 June 2003 advised stakeholders of the inclusion of Thailand's access request in the IRA on fresh longan and lychee fruit from China.

A draft IRA report was released on 29 August 2003 (PBPM 2003/25) and stakeholders were requested to provide comments within 60 days of release. Biosecurity Australia received comments from six stakeholders. Stakeholder comments were considered and incorporated into the final IRA report where appropriate and relevant.

Biosecurity Australia held a meeting with stakeholders in Cairns, Queensland on 30 September 2003 to discuss the draft IRA report for fresh longan and lychee fruit from China and Thailand. Biosecurity Australia provided stakeholders with a copy of the minutes of this workshop in PBPM 2003/31 of 24 October 2003.

ADMINISTRATION

Timetable

The section “Further steps in the Import Risk Analysis process” presented later in this report lists the steps for completion of this IRA.

Scope

This IRA considers quarantine risks that may be associated with fresh longan and lychee fruit imported from China and Thailand into Australia for human consumption. In the IRA, fresh longan fruit is defined as mature detached fruit or mature fruit on the panicle (fruiting stems 10-15 cm in length and 3-4 mm in diameter (USDA, 1999)) of *Dimocarpus longan* Lour., and fresh lychee fruit as mature detached fruit of *Litchi chinensis* Sonn., excluding other plant parts. The produce will have been cultivated, harvested, packed and transported to Australia under commercial conditions.

AUSTRALIA’S CURRENT QUARANTINE POLICY FOR IMPORTS OF FRESH LONGAN AND LYCHEE FRUIT

International arrangements

Currently, Australia allows the importation of fresh lychee fruit from South Africa.

The import conditions for South African lychees are that the fruit must have been cold treated with the flesh temperature at -0.5°C ± 0.5°C for not less than 24 consecutive days.

A Phytosanitary Certificate containing the following statement must accompany each consignment:

> “*The fruit has been cold treated at -0.5°C for 24 days*”.

If live quarantine pests or contaminants are found, the imported consignment must be treated, re-exported or destroyed using an AQIS-approved method.

Further details of the import requirements for lychee from South Africa are available on the AQIS Import Conditions (ICON) website http://www.aqis.gov.au/icon.

Australia currently has no quarantine policy for the importation of fresh longan fruit from any country.

Domestic arrangements

The Commonwealth Government is responsible for regulating the movement of plants and plant products into and out of Australia. However, the State and Territory Governments are primarily responsible for plant health controls within Australia. Legislation relating to resource management or plant health may be used by State and Territory Government agencies to control the interstate movement of plants and their products.

A number of regulations have specific conditions or restrictions on the interstate movement of fresh longan and lychee fruit within Australia. States accept that longan and lychee with unbroken skin are conditional non-hosts for Queensland fruit fly (*Bactrocera tryoni*) under the Interstate Certification Assurance (ICA)-13 scheme. ICA-13 covers approved fruit of durian, jaboticaba, jackfruit, longan, lychee, mangosteen, rambutan and pomegranate with unbroken skin. [Broken skin means any crack, split, pulled stem, puncture or other break of skin that penetrates through to the flesh.]

PEST CATEGORISATION

For this IRA, pest categorisation was conducted using the method described in the 'Method for Pest Risk Analysis' section of this document. Pests of longan and lychee were categorised according to their presence or absence in Australia, their association with the pathway under consideration in this IRA (i.e. in association with mature, detached longan fruit or mature longan fruit on the panicle, or mature detached lychee fruit) (Appendix 1 in part B of this final IRA report). Potential quarantine pests were then considered further on their potential for establishment and spread and their potential consequences (Appendix 2 in part B of this final IRA report). These criteria were used to categorise and subsequently identify the quarantine pests of longan and lychee fruit from China and Thailand.

Following comments received from stakeholders on the draft IRA report and further review of available literature, the list of potential quarantine pests was revised (Appendix 1). Plant pests (weeds) were not considered to be potential pests for orchard tree crops of longan or lychee as the structure of the fruit is not a receptacle for weed seeds. A number of pests listed in Appendix 1 are considered to be present in Australia but absent from Western Australia.

Table 6 presents a list of the twenty-six quarantine pests for longan and lychee from China and Thailand. The detailed risk assessments for these quarantine pests are presented in the next section.

Table 6. Quarantine pests for longan and lychee from China and Thailand

Scientific name	Common name	Host	Distribution
ARTHROPODA			
Coleoptera (beetles)			
Maladera castanea (Arrow) [Coleoptera: Scarabaeidae]	Asiatic garden beetle	Longan Lychee	China
Oxycetonia jucunda Faldermann [Coleoptera: Scarabaeidae]	Citrus flower chafer	Longan Lychee	China
Popillia mutans Newman [Coleoptera: Scarabaeidae]	Scarab beetle	Longan Lychee	China
Popillia quadriguttata Fabricius [Coleoptera: Scarabaeidae]	Scarab beetle	Longan Lychee	China
Potosia brevitarisis Lewis [Coleoptera: Scarabaeidae]	Flower beetle	Lychee	China
[*]*Protaetia fusca* (Herbst)	Mango flower beetle	Longan	China

Scientific name	Common name	Host	Distribution
[Coleoptera: Scarabaeidae]		Lychee	
Protaetia nitididorsis (Fairmaire) [Coleoptera: Scarabaeidae]	Scarab beetle	Longan Lychee	China
Xylotrupes mniszechi Thomson [Coleoptera: Scarabaeidae]	Rhinoceros beetle	Longan Lychee	China
Diptera (true flies; mosquitoes)			
Bactrocera cucurbitae Coquillet [Diptera: Tephritidae]	Melon fly	Lychee	China Thailand
Bactrocera dorsalis (Hendel) [Diptera: Tephritidae]	Oriental fruit fly	Longan Lychee	China Thailand
Hemiptera (aphids; leafhoppers; mealybugs; psyllids; scales; true bugs; whiteflies)			
**Coccus viridis* Green [Hemiptera: Coccidae]	Green coffee scale	Longan Lychee	China
Drepanococcus chiton [Hemiptera: Coccidae]	Wax scale	Longan	Thailand
**Ferrisia virgata* Cockerell [Hemiptera: Pseudococcidae]	Striped mealybug	Lychee	China
Nezara antennata Scott [Hemiptera: Pentatomidae]	Green stink bug	Longan Lychee	China
Planococcus litchi Cox [Hemiptera: Pseudococcidae]	Litchi mealybug	Lychee	China Thailand
**Pulvinaria psidii* (Maskell) [Hemiptera: Coccidae]	Green shield scale	Longan Lychee	China
Tessaratoma papillosa (Drury) [Hemiptera: Pentatomidae]	Litchi stink bug	Longan Lychee	China Thailand
Lepidoptera (butterflies; moths)			
Adoxophyes cyrtosema Meyrick [Lepidoptera: Tortricidae]	Citrus leaf roller	Longan Lychee	China
Adoxophyes orana Fisher von Röeslerstamm [Lepidoptera: Tortricidae]	Smaller tea tortrix	Longan Lychee	China
Conopomorpha sinensis Bradley [Lepidoptera: Gracillariidae]	Litchi fruit borer	Longan Lychee	China Thailand
**Deudorix epijarbas* Moore [Lepidoptera: Lycaenidae]	Lycaenid fruit borer	Longan Lychee	China Thailand
PATHOGENS			
Cylindrocladiella peruviana (Bat., Bez., & Herrera) [Mitosporic fungi: Hyphomycetes]	Cylindrocladiella disease	Longan	China

Scientific name	Common name	Host	Distribution
Peronophythora litchii Chen ex Ko *et al*. [Pythiales: Pythiaceae]	Litchi brown blight	Lychee	China Thailand
Phomopsis longanae Chi & Jiang [Diaporthales: Valsaceae]	Fruit blotch, branch canker	Longan Lychee	China
**Phytophthora palmivora* [Pythiales: Pythiaceae]	Phytophthora fruit rot, leaf blight, root rot	Longan Lychee	Thailand
DISEASES OF UNKNOWN AETIOLOGY			
LWBD Mycoplasma like / filamentous virus	Longan witches' broom disease	Longan Lychee	Thailand China

* WA only – this species is a quarantine pest for the State of Western Australia due to its absence from this State.

CHANGES TO PEST CATEGORISATION

The list of pests in Table 6 differs slightly from that presented in the draft IRA report. This is due to the receipt of additional scientific/technical information on the status of various species in China and Thailand, as well as a reassessment of available scientific literature.

Additional pests for further consideration

The taxon, *Xylotrupes gideon* (Linnaeus) (rhinoceros beetle), has recently been reclassified to include five additional distinct species (Rowland, 2003). The species *X. mnsizechi* Thomson occurs in south-east Asia and China and is the likely species found on longan and lychee in China and Thailand. The species found in Australia is *X. ulysses* (Guérin-Méneville). Therefore the species is now a quarantine pest for all of Australia and not only WA, as reported in the draft IRA.

Pests removed from further consideration

The following arthropod species were removed from the list of pests for further consideration, as Biosecurity Australia concluded after reassessment that they were not associated with fresh longan or lychee fruit in China and/or Thailand.

Hemiptera: Mealybugs *Planococcus lilacinus* and *Pseudococcus jackbeardsleyi* are not present in China (Taiwan only) (ScaleNet, 2001) and there are no records of these mealybugs on longan or lychee in Thailand. Therefore, they have been removed from the pest list. *Ferrisia virgata*, although recorded on longan and lychee in China, is not recorded specifically on lychee in Thailand and has been removed as a quarantine pest for Thailand.

Similarly, there are no records of soft scale *Coccus viridis* on longan and lychee in Thailand and so it has been removed as quarantine pests for Thailand.

RISK ASSESSMENTS FOR QUARANTINE PESTS

Detailed risk assessments were conducted for quarantine pests identified in the pest categorisation stage. Where pests shared similar biological characteristics, risk assessments were based on groupings of such pests (e.g. fruit flies). The risk management measures were also developed for these groups of pests. Some groups only contain one species but the “group” terminology was used for consistency.

The risk assessments were conducted on the basis of standard cultivation, harvesting and packing activities involved in the commercial production of longan and lychee (e.g. in-field hygiene and management of pests and cleaning and hygiene during packing).

Risk assessments are provided for the following groups of pests: scarab beetles (eight species), fruit flies (two species), mealybugs (two species), soft scales (three species), stink bugs (two species), lycaenid fruit borer, litchi fruit borer, tortricid leaf rollers (two species), cylindrocladiella disease, litchi brown blight, fruit blotch, phytophthora leaf spot and fruit rot, and longan witches’ broom disease.

As the quarantine pests are not all present in both countries and associated with both commodities (Table 6), each of the risk assessment groups relates to a particular combination of country and commodity. Each risk assessment includes a summary of supporting evidence with each likelihood estimate. Technical information used in the detailed risk assessments on each quarantine pest is provided in the datasheets in Appendix 3 (in Part B of this final IRA report).

A species identified with an asterisk (*) in the risk assessments is a quarantine pest for the State of Western Australia due to its absence from this State.

SCARAB BEETLES

Scarab beetles are usually stout-bodied beetles of moderate to large size and are occasionally brightly coloured (Lawrence and Britton, 1991). They always live in concealed habitats, feeding on roots, dung or decaying vegetable matter (Lawrence and Britton, 1991). However, they can also feed on living plant tissues. The scarab beetles [Coleoptera: Scarabaeidae] examined in this import risk analysis are:

- *Maladera castanea* (Arrow) – Asiatic garden beetle
- *Oxycetonia jucunda* Faldermann – citrus flower chafer
- *Popillia mutans* Newman – scarab beetle
- *Popillia quadriguttata* Fabricius – scarab beetle
- *Potosia brevitarisis* Lewis – flower beetle
- **Protaetia fusca* (Herbst) – mango flower beetle
- *Protaetia nitididorsis* (Fairmaire) – scarab beetle
- *Xylotrupes mniszechi* Thomson – rhinoceros beetle.

Introduction and spread potential

Probability of importation

The likelihood that scarab beetles will arrive in Australia with the importation of fresh longan or lychee fruit from China: **Very low**.

- Scarab beetle larvae generally live in the soil and feed on roots, humus or rotting wood and are not associated with fruit. The adults may feed on leaves, flowers and occasionally fruit (CABI, 2002). AQSIQ (2003b) reports adult scarab beetles occasionally feeding externally on the pericarp of longan and lychee fruit.
- Damage to fruit by scarab beetles can result in subsequent rotting (Waite and Elder 2000) so infested fruit are unlikely to be packed for export.
- Adult scarab beetles are moderate to large in size (Lawrence and Britton, 1991). The scarab beetles listed above range in size (length) from 7-10 mm up to 5-7 cm and are easily discernible on the fruit surface.

Probability of distribution

The likelihood that scarab beetles will be distributed to the endangered area as a result of the processing, sale or disposal of longan or lychee from China: **Moderate.**

- Adults are likely to survive storage and transport and are unlikely to be associated with infested waste but may be present in packaging.

- Adults survive for a relatively long time in the environment and are highly mobile, so are likely to move directly to a suitable host plant.

Probability of entry

The likelihood that scarab beetles will arrive in Australia as a result of trade in fresh longan or lychee fruit from China, and be distributed to the endangered area: **Very low**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that scarab beetles will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **Moderate**.

- Scarab beetles have a wide host range and host plants are common in Australia, including citrus, apples, stone fruit and a number of exotic and native species (CABI, 2002). For example, *Maladera castanea* feeds on over 100 species of plants (Shetlar and Niemczyk, 1999).
- Scarab beetles have a low reproductive rate with only one or two generations per year (Shetlar and Niemczyk, 1999; Wallace, 2001; Park *et al*., 1994). Females of most species produce relatively small numbers of eggs, usually less than 100. For example *M. castanea* lays clusters of 3-15 eggs (Shetlar and Niemczyk, 1999; Chew, 2003).

Probability of spread

The likelihood that scarab beetles will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- Adults are capable of independent movement and are able to fly to new host plants. Larvae remain beneath the soil, so are unlikely to spread.
- The Australian climate is likely to be suitable for the establishment of scarab beetles, as most are recorded from temperate and tropical environments.
- The relevance of natural enemies is not known.

Probability of entry, establishment or spread

The overall likelihood that scarab beetles will enter Australia as a result of trade in fresh longan or lychee fruit from China or Thailand, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Very low**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Consequences

Consideration (direct and indirect) of scarab beetles: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — Scarab beetles can cause direct harm to a wide range of economically important host plants, including apples, pears and stone fruit.
Any other aspects of the environment	**A** — There are no known direct consequences of these pests on other aspects of the environment.
Indirect consequences	
Eradication, control etc.	**B** — Scarab beetles are difficult to control and often require manual removal, which is costly and laborious.
Domestic trade	**B** — The presence of scarab beetles in commercial production areas can have a significant effect at the local level due to any resulting interstate trade restrictions on a wide range of commodities. These restrictions can lead to a loss of markets.
International trade	**B** — The presence of scarab beetles in commercial production areas can have a significant effect at the local level due to any limitations to access to overseas markets where these pests are absent.
Environment	**A** — Pesticides required to control exotic scarab beetles are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the local level.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the ‘Method for assessing consequences’ section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall ‘probability of entry, establishment or spread’ with the ‘consequences’ using the risk estimation matrix (Table 1): **Negligible**.

FRUIT FLIES

Fruit flies are serious pests of a wide variety of fruit and vegetable crops grown for fresh food markets and are of major economic importance. The fruit flies [Diptera: Tephritidae] examined in this import risk analysis are:

- *Bactrocera dorsalis* (Hendel) – Oriental fruit fly
- *Bactrocera cucurbitae* Coquillet – Melon fly.

Introduction and spread potential

Probability of importation

The likelihood that fruit flies will arrive in Australia with the importation of fresh longan or lychee fruit from China or Thailand: **High**.

- *Bactrocera cucurbitae* is associated with lychee fruit (Waite and Hwang, 2002), while *B. dorsalis* is associated with both longan and lychee fruit (CABI, 2002; Liang *et al*., 1999).
- Females oviposit their eggs through the skin of longan and/or lychee fruit. Fruit flies prefer to lay their eggs in mature, particularly ripened fruit, and several eggs may be laid below the skin of a single fruit. Although both fruit fly species are capable of ovipositing through the skin of lychee, some cultivars have a thicker skin that prevents successful oviposition (Waite and Hwang, 2002).
- Fruit flies often lay their eggs in damaged fruit (AQSIQ, 2003a; Waite and Hwang, 2002), which is unlikely to be packed for export.
- Fruit fly larvae can survive in picked fruit and therefore are likely be present in fruit that is packed for export. As fruit fly eggs are laid internally, infested fruit are not likely to be detected during sorting, packing and inspection procedures.
- It is likely that fruit fly larvae would survive storage and transportation due to their ability to tolerate cold temperatures and the availability of an ample food supply. Adult flies cannot survive more than a few days without feeding.

Probability of distribution

The likelihood that fruit flies will be distributed to the endangered area as a result of the processing, sale or disposal of longan or lychee from China or Thailand: **High**.

- Fruit infested with eggs and larvae are likely to be distributed throughout Australia for retail sale. Adults, larvae and eggs are likely to be associated with infested waste.
- Fruit flies also have the capacity to complete their development in discarded fruit and transfer to suitable hosts.

- Eggs can develop into larvae within stored fruit, at the point of sale or after purchase by consumers.
- Larvae can develop into adult flies, which are strong fliers (Fletcher, 1989) and able to move directly from fruit into the environment to find a suitable host.

Probability of entry

The likelihood that fruit flies will arrive in Australia as a result of trade in fresh longan or lychee fruit from China or Thailand, and be distributed to the endangered area: **High**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that fruit flies will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- For pests to establish and spread, a threshold limit must be reached. This threshold limit is the smallest number of pests capable of establishing a colony. One infested fruit is likely to contain many fruit fly larvae e.g. clutch sizes of 3-30 eggs have been recorded for *B. dorsalis* (Fletcher, 1989).
- Surviving female flies must then be successful in locating suitable mating partners and fruiting hosts to lay eggs. The mating behaviour of *B. dorsalis* requires that males gather to form aggregations or leks (Shelly and Kaneshiro, 1991). Females fly to such male aggregations to increase their chances of mating. However, there will be a limited number of males available to form a lek, therefore reducing the probability of a successful mating. Shelly (2001) reported that *B. dorsalis* females were observed more frequently at larger leks (of 18 males or more). There is a likelihood of many suitable hosts for fruit fly species around the vicinity of the port of entry and other suburban areas around Australia. *B. cucurbitae* would have similar mating behaviour to *B. dorsalis* as they are species from the same genus.
- There have been exotic fruit fly incursions in Australia, all of which have been eradicated. *B. papayae* was detected around Cairns, northern Queensland in 1995. It was eradicated from Queensland by implementing an eradication programme using male annihilation and protein bait spraying (SPC, 2002). This example demonstrates that fruit fly species from the *B. dorsalis* complex could establish in Australia.

Probability of spread

The likelihood that fruit flies will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **High**.

- Fruit flies possess many characteristics that facilitate successful colonisation. These include their high reproductive rate, longevity of adult flies, broad environmental tolerances and host range of both commercial and wild species that are widespread in Australia.
- The incidence of *B. papayae* in northern Australia in 1995 is indicative of the ability of introduced fruit fly species to spread. Initially, the infested area covered 4,500 km² (Allwood, 1995), and was centred around Cairns. The declared pest quarantine area later expanded to include 78,000 km² of north Queensland, including urban areas, farms, rivers, coastline and a large part of the Wet Tropics World Heritage Area (Cantrell *et al*., 2002). *B. carambolae* and *B. dorsalis* would have a similar capacity to spread in Australia due to their close biological relationship to *B. papayae* as members of the *B. dorsalis* complex, and in view of their wide host range.

Probability of entry, establishment or spread

The overall likelihood that fruit flies will enter Australia as a result of trade in fresh longan or lychee fruit from China or Thailand, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **High**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Consequences

Consideration (direct and indirect) of fruit flies: **High**.

Criterion	Estimate
Direct consequences	
Plant life or health	**D** — Fruit flies can cause direct harm to a wide range of plant hosts and are estimated to have consequences of minor significance at the national level.
Any other aspects of the environment	**A** — Fruit flies introduced into a new environment will compete for resources with the native species. They are estimated to have consequences which are unlikely to be discernible at the national level and of minor significance at the local level.
Indirect consequences	
Eradication, control etc.	**E** — A control program would add considerably to the cost of production of the host fruit, costing between $200-900 per ha depending on the variety of

	fruit produced and the time of harvest (Anon., 1991). In 1995, the *B. papayae* (Papaya fruit fly) eradication program using male annihilation and protein bait spraying cost AU$35 million (SPC, 2002). Fruit flies are estimated to have significant consequences at the national level and highly significant consequences at the regional level.
Domestic trade	**D** — The presence of fruit flies in commercial production areas will have a significant effect at the regional level due to any resulting interstate trade restrictions on a wide range of commodities.
International trade	**D** — Fruit flies are regarded as the most destructive horticultural pests in the world. While they can cause considerable yield losses in orchards and suburban backyards, the major consequence facing Australian horticultural industries is the negative effect they have on gaining and maintaining export markets. When the Papaya fruit fly outbreak occurred in north Queensland, the whole of Australia experienced trade effects. Fruit flies are estimated to have consequences of minor significance at the national level.
Environment	**A** — Pesticides required to control exotic fruit flies are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the local level.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the ‘Method for assessing consequences’ section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall ‘probability of entry, establishment or spread’ with the ‘consequences’ using the risk estimation matrix (Table 1): **High**.

MEALYBUGS

Mealybugs injure the plant by sucking plant sap through their tubular stylets. Heavy infestations may damage plants directly, while indirect damage may result from the ability of some mealybugs to vector plant viruses. Many mealybug species pose particularly serious problems to agriculture when introduced into new areas of the world without their specific natural enemies (Miller *et al*., 2002). The mealybugs [Hemiptera: Pseudococcidae] examined in this import risk analysis are:

- **Ferrisia virgata* Cockerell – striped mealybug
- *Planococcus litchi* Cox – litchi mealybug.

Introduction and spread potential

Probability of importation

The likelihood that mealybugs will arrive in Australia with the importation of fresh or lychee fruit from China or Thailand: **High**.

- Mealybugs are known to be associated with lychee in China and Thailand (Ben-Dov, 1994). *Ferrisia virgata* is associated with lychee in China and *Planococcus litchi* is associated with lychee in China and Thailand (ScaleNet, 2001; Ben-Dov, 1994).
- Mealybugs have limited mobility, are small (1.4-3 mm) and often inconspicuous, but may be present in significant populations on fruit.
- Mealybugs are likely to be present within bunches of fruit, and are likely to be difficult to remove during cleaning, sorting and packing especially at low population levels.
- As these pests are small in size, they are unlikely to be detected during routine visual quality inspection procedures within the packinghouse. Inspection procedures carried out in the packing station are concerned primarily with quality standards of fruit as regards to blemishes, premature ripening and visible cracks, splits, pulled stem, puncture or break of the skin. Although all fruit are visually inspected, the procedures are not specifically directed at the detection of small arthropod pests present on the fruit surface.
- Routine washing procedures undertaken within the packinghouse may not totally remove all pests from the fruit surface. While mealybugs may be affected by the washing solution, they are unlikely to be destroyed by it. This is particularly true of those adult females or nymphs that are protected by waxy cocoons.

Probability of distribution

The likelihood that mealybugs will be distributed to the endangered area as a result of the processing, sale or disposal of fresh lychee fruit from China or Thailand: **Moderate**.

- The pests are likely to survive storage and transportation. Evidence regarding the tolerance of adult mealybugs or nymphs to a prolonged period of modified atmosphere and cool storage for these particular mealybug species could not be found. However, the pseudococcid species *Pseudococcus affinis* can survive for up to 42 days storage at 0°C (Hoy and Whiting, 1997). There is a high likelihood that viable mealybugs present on fruit would remain viable on arrival in Australia.
- Adults and crawlers are likely to survive storage and transport and be associated with infested waste. Mealybugs can enter the environment in three ways: adults may be discarded with longan or lychee skin, first instar nymphs (crawlers) may be discarded with waste carton and liners, or crawlers may be blown by wind (Ben-Dov, 1994), or carried by other vectors, from the point of sale or after purchase by consumers. Long-range dispersal would require movement of adults and nymphs with vegetative material. Shorter-range dispersal would occur readily through the random movement of crawlers with wind currents or biological or mechanical vectors.
- Adult female mealybugs would need to be carried onto hosts by vectors such as people or other insects. Adult males are winged but fragile and short-lived and do not persist for more than several days (Mau and Kessing, 2000). Crawlers can be dispersed by wind or other vectors (Rohrbach *et al*., 1998). Because all stages of these pests survive in the environment for some time, they are likely to be transferred to a susceptible host.

Probability of entry

The likelihood that mealybugs will arrive in Australia as a result of trade in fresh longan or lychee fruit from China or Thailand, and be distributed to the endangered area: **Moderate**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that mealybugs will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- Mealybugs are highly polyphagous and host plants are common in Australia (e.g. citrus, mango and pineapple), particularly in the warmer subtropical and tropical regions of Australia.

- Mealybugs have a moderate to high reproductive rate. For example, a single adult female of *Ferrisia virgata* lays an average of 64-78 eggs and *Planococcus lilacinus* 600-800 eggs. First instars or 'crawlers' disperse to suitable feeding sites on their hosts or new plants. Nymphs are active during the first instar stage and may travel some distance to a new plant where they become sessile for the remaining nymphal (larval) instars (Mau and Kessing, 2000).
- Although mealybugs imported with fruit are likely to be at non-mobile stages, they can be transported to suitable hosts by ants. Adult females can live for several months and produce up to several hundred offspring. Adult males are short-lived (Mau and Kessing, 2000).
- Many mealybugs are considered invasive and have been introduced into new areas and established (Miller *et al*., 2002). These two species are regarded as pests and have shown that they have the ability to establish after being introduced into new environments. For example, *F. virgata* is native to the Neotropicals (Miller *et al*., 2002) but has now established in North America, South America, Southeast Asia and the Pacific.

Probability of spread

The likelihood that mealybugs will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **High**.

- Once second and then subsequent generations of mealybugs are established on commercial, susceptible household and wild host plants, mealybugs are likely to persist indefinitely and to spread progressively over time. This spread would be assisted by wind dispersal, vectors and by the movement of plant material. It is very unlikely that mealybugs would be contained by management practices or by regulation.
- Tropical or subtropical areas of Australia would be suitable for the spread of mealybugs because they are recorded from such environments.
- Adults and nymphs may be moved within and between plantations with the movement of equipment and personnel, and crawlers may be dispersed by wind (Rohrbach *et al*., 1988).
- The relevance of natural enemies in Australia is not known.

Probability of entry, establishment or spread

The overall likelihood that mealybugs will enter Australia as a result of trade in fresh longan or lychee from China or Thailand, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Moderate**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Consequences

Consequences (direct and indirect) of mealybugs: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — Mealybugs can cause direct harm to a wide range of plant hosts and have also been reported as disease vectors (Ben-Dov, 1994). Fruit quality can be reduced by the presence of secondary sooty mould. Mealybugs are highly polyphagous and host plants are common in Australia e.g. citrus, mango, pineapple. Mealybugs are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Any other aspects of the environment	**A** — Mealybugs introduced into a new environment will compete for resources with the native species. They are estimated to have consequences which are unlikely to be discernible at the national level and of minor significance at the local level.
Indirect consequences	
Eradication, control etc.	**B** — Programs to minimise the impact of these pests on host plants are likely to be costly and include pesticide applications and crop monitoring. Existing control programs (eg. broad spectrum pesticide applications) may be effective to control mealybugs on some hosts, but may not be effective on hosts where specific integrated pest management programs are used. Mealybugs are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the district level.
Domestic trade	**B** — The presence of these pests in commercial production areas is likely to have a significant effect at the local level due to any resulting interstate trade restrictions on a wide range of commodities. These restrictions may lead to a loss of markets, which in turn would be likely to require industry adjustment.
International trade	**B** – The presence of *Ferrisia virgata* in commercial production areas of a wide range of commodities (e.g. citrus, mango) could have a significant effect at the local level due to any limitations to access to overseas markets where these pests are absent. These pests are all associated with citrus. Australia exports citrus fruit worth $40-60 million to the USA from the Riverland-Sunraysia-Riverina (R-S-R) area. Extension of this area has also been negotiated for the USA market. Consideration for export of citrus from areas in Queensland and New South Wales to the USA market is also underway. *Ferrisia virgata* has been reported in the USA (ScaleNet, 2001) and therefore will not be likely to affect citrus trade with the USA if they became established in Australia. *Planococcus litchi* has a limited host range and is therefore unlikely to have a significant effect on international trade in plant commodities.
Environment	**A** — Although additional pesticide applications would be required to control these pests on susceptible crops, this is not considered to have significant consequences for the environment.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix (Table 1): **Low**.

SOFT SCALES

Soft scales damage the host plant by sucking nutrients from plant parts, and excreting large amounts of sugary honeydew onto fruit and leaves, leading to sooty mould growth (Smith *et al*., 1997). The main economic damage caused by scales is from the downgrading of fruit quality because of sooty mould fungus growing on the honeydew (Smith *et al*., 1997). The soft scales [Hemiptera: Coccidae] examined in this import risk analysis are:

- **Coccus viridis* Green – green coffee scale
- *Drepanococcus chiton* (Green) – wax scale
- **Pulvinaria psidii* Maskell (syn. *Chloropulvinaria psidii* Maskell) – green shield scale.

Introduction and spread potential

Probability of importation

The likelihood that soft scales will arrive in Australia with the importation of fresh longan or lychee fruit from China or Thailand: **High**.

- Soft scale species are frequently reported in longan and lychee orchards in China and Thailand (Waite and Hwang, 2002). *Coccus viridis* and *Pulvinaria psidii* are both associated with longan and lychee in China (ScaleNet, 2001), while *Drepanococcus chiton* is associated with longan fruit in Thailand (DOA, 2003a).
- Soft scales are sessile after the first nymphal stage and small (1.4-3 mm), but may be present in significant populations on the fruit surface (Waite and Elder, 1999).
- Soft scales are likely to be hidden within bunches of fruit, and are likely to be difficult to remove during fruit cleaning, sorting and packing, especially at low population levels.
- As these pests are small in size, they are unlikely to be detected during routine visual quality inspection procedures within the packinghouse. Inspection procedures carried out in the packing station are concerned primarily with quality standards of fruit as regards to blemishes, premature ripening and visible cracks, splits, pulled stem,

puncture or break of the skin. Although all fruit are visually inspected, the procedures are not specifically directed at the detection of small arthropod pests present on the fruit surface.

- Routine washing procedures undertaken within the packinghouse will not totally remove all pests from the fruit surface. While soft scales may be affected by the washing solution, they are unlikely to be destroyed by it. This is particularly true of those adult females or nymphs that are protected by hard, waxy secretions.
- Soft scales are likely to survive storage and transportation.
- Scales are frequently detected on pre-export inspection in Australian export fruit.

Probability of distribution

The likelihood that soft scales will be distributed to the endangered area as a result of the processing, sale or disposal of fresh longan or lychee fruit from China or Thailand: **Moderate**.

- Adults and crawlers are likely to survive storage and transport and be associated with infested waste. Soft scales may enter the environment in three ways: adults may be discarded with fruit, first instar nymphs (crawlers) may be discarded with waste carton and liners, or nymphs may be blown by wind, or carried by other vectors, from the point of sale or after purchase by consumers. Long-range dispersal would require movement of adults and nymphs with vegetative material. Shorter-range dispersal would occur readily through the random movement of crawlers with wind currents or biological or mechanical vectors.
- The commodity is likely to be distributed throughout Australia for retail sale. The intended use of the commodity is human consumption but waste material would be generated (eg. longan or lychee skin and longan panicles).
- Because soft scales are polyphagous and all life stages survive in the environment for some time, they could be transferred to a susceptible host.

Probability of entry

The likelihood that soft scales will arrive in Australia as a result of trade in fresh longan or lychee fruit from China or Thailand, and be distributed to the endangered area: **Moderate**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that soft scales will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- Soft scales are highly polyphagous and host plants are common in Australia (e.g. citrus and mango) particularly in the warmer subtropical and tropical regions of Australia.
- Existing control programs (eg. broad spectrum pesticide applications) may be effective to control soft scales on some hosts, but may not be effective on hosts where specific integrated pest management programs are used.
- Soft scales have a high reproductive rate (e.g. *P. psidii* reproduces parthogenetically and has 3-4 generations per year). In laboratory conditions, adult females laid an average of 200 eggs on pumpkin fruits (El-Minshawy and Moursi, 1976). Crawlers move on to flower panicles, and later on to young fruit (Waite and Hwang, 2002).

Probability of spread

The likelihood that soft scales will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **High**.

- Tropical or subtropical areas of Australia would be suitable for the spread of soft scales because they are recorded from such environments.
- Adults and nymphs may be moved within and between plantations with the movement of equipment and personnel, and crawlers may be dispersed by wind (Greathead, 1997).
- The relevance of natural enemies in Australia is not known.

Probability of entry, establishment or spread

The overall likelihood that soft scales will enter Australia as a result of trade in fresh longan or lychee from China or Thailand, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Moderate**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Consequences

Consequences (direct and indirect) of soft scales: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — Scale insects can cause direct harm to a wide range of plant hosts, affecting fruit quality and whole plant health. Fruit quality can be reduced by the presence of secondary sooty mould.
Any other aspects of the environment	**A** — Soft scales introduced into a new environment will compete for resources with the native species. They are estimated to have consequences which are unlikely to be discernible at the national level and of minor significance at the local level.
Indirect consequences	
Eradication, control etc.	**B** — Programs to minimise the impact of these pests on host plants are likely to be costly and include pesticide applications and crop monitoring. Existing control programs (eg. broad spectrum pesticide applications) may be effective to control soft scales on some hosts, but may not be effective on hosts where specific integrated pest management programs are used. Soft scales are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the district level.
Domestic trade	**B** — The presence of these pests in commercial production areas is likely to have a significant effect at the local level due to any resulting interstate trade restrictions on a wide range of commodities. These restrictions may lead to a loss of markets, which in turn would be likely to require industry adjustment.
International trade	**C** – The presence of these pests in commercial production areas of a range of export commodities (eg. citrus, mango) may have a significant effect at the district level due to any limitations to access to overseas markets where these pests are absent.
Environment	**A** — Although additional pesticide applications would be required to control these pests on susceptible crops, this is not considered to have significant consequences for the environment.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the ‘Method for assessing consequences’ section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall ‘probability of entry, establishment or spread’ with the ‘consequences’ using the risk estimation matrix (Table 1): **Low**.

STINK BUGS

Stink bugs injure a wide range of plants, from vegetables to trees. They damage the host plant by sucking nutrients from plant parts using their stylets (Panizzi *et al*., 2000). This causes injury to plant tissues, and results in plant wilt and, in many cases, abortion of fruits and seeds (Panizzi *et al*., 2000). During the feeding process, they may also transmit plant pathogens, which increases their damage potential. The stink bugs [Hemiptera: Pentatomidae] examined in this import risk analysis are:

- *Nezara antennata* Scott – green stink bug
- *Tessaratoma papillosa* (Drury) – litchi stink bug.

Introduction and spread potential

Probability of importation

The likelihood that stink bugs will arrive in Australia with the importation of fresh longan or lychee fruit from China or Thailand: **Very low**.

- Female stink bugs lay eggs on leaves. Both nymphs and adults cause damage by feeding on young shoots, flower clusters, developing fruits and occasionally on mature fruits (Tan *et al*., 1997; Waite and Hwang, 2002). Feeding results in brown spotting followed by flower and fruit abscission (Zhang, 1997).
- The adults will fly away when disturbed and nymphs are mobile. The nymphs may exhibit a defensive response, emitting a foul smelling fluid and then falling to the ground (Waite and Hwang, 2002). This means that they are unlikely to be included in consignments of fruit packed for export.
- Both nymphs (>5mm) and adults (up to 2.8 cm) are easily visible.

Probability of distribution

The likelihood that stink bugs will be distributed to the endangered area as a result of the processing, sale or disposal of longan or lychee from China or Thailand: **High**.

- Stink bugs are likely to survive storage and transportation because the nymphs are highly resistant to starvation and can live without feeding for up to 12 days. Adults can live for over one year (Waite and Hwang, 2002).
- Adults and nymphs are likely to survive storage and transport and be associated with infested waste. Stink bugs are likely to enter the orchard environment in one or two ways: nymphs may be discarded with longan or lychee skin, mature into adults and fly to a suitable host plant, or adults can fly directly to suitable hosts.

Probability of entry

The likelihood that stink bugs will arrive in Australia as a result of trade in fresh longan or lychee fruit from China or Thailand, and be distributed to the endangered area: **Very low**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that stink bugs will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **Moderate**.

- Stink bugs can infest a moderate range of plants that include lychee, longan, loquat, plum, peach, pear, pomegranate, castor oil plant, rose, canna, citrus and *Eucalyptus* species (Waite and Hwang, 2002). Stink bugs are likely to survive and find suitable hosts, especially in the warmer subtropical and tropical regions of Australia.
- Stink bugs have a low reproductive rate of one generation per year, but the females lay up to 14 egg masses, each containing about 14 eggs, on the back of leaves. Adults can live up to a year (Waite and Hwang, 2002).

Probability of spread

The likelihood that stink bugs will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- Tropical or subtropical environments of Australia would be suitable for the spread of these stink bugs because they are recorded from such environments.
- Eggs are laid on the back of leaves (Waite and Hwang, 2002) and may be moved long distances on planting material.
- Adults and nymphs are mobile and can spread short distances (Waite and Hwang, 2002).
- The relevance of natural enemies is not known.

Probability of entry, establishment or spread

The overall likelihood that stink bugs will enter Australia as a result of trade in fresh longan or lychee fruit from China or Thailand, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Very low**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Consequences

Consequences (direct and indirect) of stink bugs: **Low**.

Criterion	Estimate

Direct consequences	
Plant life or health	**C** — Stink bugs can cause direct harm to a moderate range of plant hosts. *T. papillosa* has been reported as a possible vector of longan witches' broom disease (Chen *et al*., 2001).
Any other aspects of the environment	**A** — There are no known consequences of these pests on other aspects of the environment.
Indirect consequences	
Eradication, control etc.	**B** — Programs to minimise the impact of these pests on host plants are likely to be costly and include pesticide applications and crop monitoring.
Domestic trade	**B** — The presence of these pests in commercial production areas can have a significant effect at the local level due to any resulting interstate trade restrictions on a wide range of commodities. These restrictions can lead to a loss of markets
International trade	**B** — The presence of these pests in commercial production areas of a range of commodities (e.g. stonefruit and pomefruit) can have a significant effect at the local level due to any limitations to access to overseas markets where these pests are absent.
Environment	**A** — Although additional pesticide applications would be required to control these pests on susceptible crops, this is unlikely to affect the environment.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix (Table 1): **Negligible**.

LYCAENID FRUIT BORER

Lycaenid fruit borers are pests of fruit of lychee, longan, rambutan and pomegranate. The larvae tunnel through and feed on the fruit and seed forming a neat hole at the surface (Waite and Hwang, 2002). The fruit borer [Lepidoptera: Lycaenidae] examined in this import risk analysis is:

**Deudorix epijarbas* Moore (Syn. *Deudorix epijarbas amatius* Fruhstorfer) – Lycaenid fruit borer.

Introduction and spread potential

Probability of importation

The likelihood that *Deudorix epijarbas* will arrive in Australia with the importation of fresh longan or lychee fruit from China or Thailand: **Moderate**.

- *Deudorix epijarbas* lays a single egg on the fruit of host plants and the larva bores inside, completely destroying the flesh and seed. A neat hole is chewed on the skin and the larva plugs this. The larvae also produce a substance that is attractive to ants, which are often seen in attendance (Waite and Hwang, 2002).
- The fruit borer is a minor pest of longan and lychee.
- Infestation by this pest can result in rotting of fruit or premature fruit drop so infested fruit are unlikely to be packed for export.
- Infested fruit can be detected by the neat hole and plug as well as the presence of ants in vicinity of the bored hole.
- The presence of the larva on fruit can be easily discerned as the stout-bodied, slug-like larva is purplish brown with orange and green markings (Herbison-Evans and Crossley, 2002).
- Although the signs of insect infestation on fruits can be detected, it is likely that recently infested fruit would be exported as the larva can remain inside the fruit.
- The larvae of the borer in the shipment must survive for at least 12-14 days before emerging from fruit to pupate upon arrival.

Probability of distribution

The likelihood that *Deudorix epijarbas* will be distributed to the endangered area as a result of the processing, sale or disposal of longan or lychee from China or Thailand: **Moderate**.

- The commodity is likely to be distributed throughout Australia for retail sale. The intended use of the commodity is human consumption but waste material would be generated (eg. longan or lychee skin and longan panicles).
- If adults and larvae were to survive storage and transport, they may enter the environment in two ways: larvae may be discarded with longan or lychee fruit, or adults may fly directly to a suitable host plant.

Probability of entry

The likelihood that *Deudorix epijarbas* will arrive in Australia as a result of trade in fresh longan or lychee fruit from China or Thailand, and be distributed to the endangered area: **Low**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that *Deudorix epijarbas* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **Moderate**.

- Larva can attack several fruit, but each infested fruit will only contain a single larva (Waite & Hwang, 2002).
- Surviving female borers must then be successful in locating suitable mating partners and fruiting hosts to lay eggs.
- This pest has a relatively narrow host range including lychee, longan, macadamia, pomegranate, kulandoi (*Caryota albertii*), shell vine (*Connarus conchocarpus),* Saptrangi (*Salacia chinensis*), *Salacia dispepala* and *Sarcopteryx martyana* and narrow environmental tolerances (i.e. tropical and sub-tropical environments) (Herbison-Evans and Crossley, 2002).
- *Deudorix epijarbas* is already established in tropical and sub-tropical parts of eastern Australia.

Probability of spread

The likelihood that *Deudorix epijarbas* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- Tropical or subtropical environments of Australia would be suitable for the spread of *D. epijarbas* because it is recorded from these environments.
- The adult moths are able to fly so are likely to spread to other host plants.
- The relevance of natural enemies is not known.

Probability of entry, establishment or spread

The overall likelihood that *Deudorix epijarbas* will enter Australia as a result of trade in fresh longan or lychee fruit from China or Thailand, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Very low**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Consequences

Consequences (direct and indirect) of *Deudorix epijarbas*: **Very Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**B** — *Deudorix epijarbas* can cause direct harm to a small range of plant species.
Any other aspects of the environment	**A** — There are no known consequences of this pest on other aspects of the environment.
Indirect consequences	
Eradication, control etc.	**B** — A control program would have to be implemented in infested orchards to reduce fruit damage and yield losses, thereby increasing production costs.
Domestic trade	**A** — The presence of this pest in commercial production areas is of minor significance at the local level as the pest is already present in eastern Australia and is unlikely to result in additional interstate trade restrictions on host commodities.
International trade	**B** — The presence of this pest in commercial longan and lychee production areas can have a significant effect at the local level due to any limitations to access to overseas markets where this pest is absent.
Environment	**B** — Pesticides required to control this fruit borer may have a significant consequence at a local level.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the ‘Method for assessing consequences’ section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall ‘probability of entry, establishment or spread’ with the ‘consequences’ using the risk estimation matrix (Table 1): **Negligible**.

LITCHI FRUIT BORER

Litchi fruit borer is a pest of both lychee and longan, preferentially attacking lychee. The larvae tunnel through and feed on the fruit and seed and the adults feed externally on the fruit (Waite and Hwang, 2002). Larvae can also survive by feeding on young leaves and shoots. The litchi fruit borer is a major pest of longan and lychee in China and Thailand. The litchi fruit borer [Lepidoptera: Gracillariidae] examined in this import risk analysis is:

Conopomorpha sinensis Bradley– litchi fruit borer.

Introduction and spread potential

Probability of importation

The likelihood that *Conopomorpha sinensis* will arrive in Australia with the importation of fresh longan or lychee fruit from China or Thailand: **High**.

- *C. sinensis* is a common and major pest in longan and lychee orchards in both China and Thailand.
- *C. sinensis* lays yellow, scale-like eggs on the fruit anytime after fruit set as well as on new leaves and shoots of lychee and longan (Waite and Hwang, 2002).
- After hatching, the larvae bore into the fruit, tunnelling through the flesh and seed of the fruit (FAO 2001; Waite and Hwang, 2002).
- It is unlikely that all *C. sinensis* inside fruit will be detected during sorting and packing procedures. Inspection procedures carried out in the packing station are concerned primarily with quality standards of fruit as regards to blemishes, premature ripening and visible cracks, splits, pulled stem, puncture or break of the skin.
- Although the tunnel does not close over and contains visible frass, recent tunnel holes that have not yet predisposed the fruit to rot may be overlooked.

Probability of distribution

The likelihood that *Conopomorpha sinensis* will be distributed to the endangered area as a result of the processing, sale or disposal of longan or lychee from China or Thailand: **Moderate**.

- The commodity is likely to be distributed throughout Australia for retail sale. The intended use of the commodity is human consumption but waste material would be generated (eg. longan or lychee skin and longan panicles).
- If adults and larvae were to survive storage and transport, they may enter the environment in two ways: larvae may be discarded with longan or lychee skin, or adults may fly directly to a suitable host plant.
- Adults emerge from the pupae after 5-7 days and live for 5-8 days (Waite and Hwang, 2002).

Probability of entry

The likelihood that *Conopomorpha sinensis* will arrive in Australia as a result of trade in fresh longan or lychee fruit from China or Thailand, and be distributed to the endangered area: **Moderate**.

This overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that *Conopomorpha sinensis* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **Low**.

- The host range for litchi fruit borer is limited and is only known to include longan and lychee (CABI, 2002).
- This species has a high reproductive rate and is known to have up to eleven generations per year in China (Zhang *et al*., 1997).
- Female borers must be successful in locating suitable mating partners and fruiting hosts to lay eggs.

Probability of spread

The likelihood that *Conopomorpha sinensis* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- Tropical or subtropical environments of Australia would be suitable for the spread of *C. sinensis* because it is recorded from these environments.
- The adult moths are able to fly so are likely to spread.
- The relevance of natural enemies is not known.

Probability of entry, establishment or spread

The overall likelihood that *Conopomorpha sinensis* will enter Australia as a result of trade in fresh longan or lychee fruit from China or Thailand, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Low**.

This probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Consequences

Consequences (direct and indirect) of *Conopomorpha sinensis* : **Moderate**.

Criterion	Estimate

Direct consequences	
Plant life or health	**B** — Litchi fruit borer can cause direct harm to a narrow range of plant hosts such as lychee and longan.
Any other aspects of the environment	**A** — There are no known direct consequences of this pest on other aspects of the environment.
Indirect consequences	
Eradication, control etc.	**B** — A control program would have to be implemented in infested orchards to reduce fruit damage and yield losses and this may increase production costs.
Domestic trade	**B** — The presence of this pest in commercial production areas may have a significant effect at the local level due to any resulting interstate trade restrictions on a wide range of commodities. These restrictions can lead to a loss of markets.
International trade	**D** – *C. sinensis* is considered an important pest of lychee and longan (Waite and Hwang, 2002). Therefore the presence of this pest in longan and lychee production areas may have a significant effect at the regional level in subtropical areas of Australia, due to any limitations to access to overseas markets for where these pests are absent. The USA requires risk management measures for this pest in imports of longan and lychee from China and Taiwan.
Environment	**B** — Pesticides required to control litchi fruit borer may have a significant consequence at a local level.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the ‘Method for assessing consequences’ section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall ‘probability of entry, establishment or spread’ with the ‘consequences’ using the risk estimation matrix (Table 1): **Low**.

TORTRICID LEAF ROLLERS

Tortricid leaf roller larvae cause damage to fruits by chewing large holes or small, superficial holes resulting in, scarring, desiccation or rotting fruit. They are infrequent in longan and lychee orchards in China.

The leaf rollers [Lepidoptera: Tortricidae] examined in this import risk analysis are:

Adoxophyes cyrtosema Meyrick - citrus leaf roller

Adoxophyes orana (Fischer von Röeslerstamm) - smaller tea tortrix.

Introduction and spread potential

Probability of importation

The likelihood that tortricid leaf rollers will arrive in Australia with the importation of fresh longan or lychee fruit from China: **Very low**.

- *Adoxophyes* spp. rarely occur in longan and lychee orchards in China (AQSIQ, 2003b).
- Larvae often spin leaves against the fruit and hide underneath on the fruit surface. Fruit damage mostly occurs at sites where a leaf is attached to the fruit with a silken thread. Larvae damage the fruit by chewing large, visible holes, which usually causes fruit rot or desiccation.
- Damage to young fruits caused by *Adoxophyes* spp. usually results in premature drop. On mature fruits, the damage causes scarring and pitting, giving the fruit a corky like appearance and abnormal shape. Frass is externally visible (CABI, 2002).
- The larvae are green in colour, with a yellow head, and the larvae and eggs are easily discernible on fruit (CABI, 2002). Furthermore, the presence of leaves and silken webbing on the fruit indicates the presence of *Adoxophyes* spp. When disturbed, the larvae typically drop from the tree by the silken threads (CABI, 2002).
- It is likely that infested fruit will be detected during packing and culled from export consignments.

Probability of distribution

The likelihood that tortricid leaf rollers will be distributed to the endangered area as a result of the processing, sale or disposal of longan or lychee from China: **Low**.

- The pests are unlikely to survive commercial storage and transportation because *Adoxophyes* spp. do not tolerate cold temperatures. Egg development stops at temperatures below 9ºC and temperatures of above 10ºC are required for egg laying (CABI, 2002).
- If adults and larvae were to survive storage and transport, they may enter the environment in two ways: larvae may be discarded with longan or lychee skin, or adults may fly up to 400m from their initial location (CABI, 2002).
- The skin of infested fruit is likely to be discarded, therefore these pests may survive and find suitable hosts especially in the warmer subtropical and tropical regions of Australia.
- Long-range migration is not possible without vectors (CABI, 2002).

Probability of entry

The likelihood that tortricid leaf rollers will arrive in Australia as a result of trade in fresh longan or lychee fruit from China, and be distributed to the endangered area: **Very low**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that tortricid leaf rollers will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **Moderate**.

- *Adoxophyes* spp. have a high reproductive rate and lay masses of 25-150 eggs. A single female may deposit more than 300 eggs (Waite and Hwang, 2002). The eggs are laid on the leaves, fruit and bark (CABI, 2002).
- Warmer temperatures are required for mating and egg development, so the Australian environment is suitable for establishment of *Adoxophyes* spp.
- *Adoxophyes* spp. have a wide host range, many of which are common in temperate regions of Australia, including apples, pears and a number of *Prunus* spp. (Waite and Hwang, 2002).

Probability of spread

The likelihood that tortricid leaf rollers will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- Tropical or subtropical environments of Australia would be suitable for the spread of *Adoxophyes* spp. because higher temperatures are required for reproduction (CABI, 2002).
- Adults may fly short distances, and larvae may be blown short distances on their spun thread or moved within and between plantations with the movement of equipment and personnel.
- The relevance of natural enemies in Australia is not known.

Probability of entry, establishment or spread

The overall likelihood that tortricid leaf rollers will enter Australia as a result of trade in fresh longan or lychee fruit from China, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Very low**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Consequences

Consequences (direct and indirect) of tortricid leaf rollers: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	C — *Adoxophyes* spp. can cause direct harm to a wide range of economically important plant hosts, including apples, pears and stone fruit.
Any other aspects of the environment	A — There are no known direct consequences of these pests on other aspects of the environment.
Indirect consequences	
Eradication, control etc.	B — Programs to minimise the impact of these pests on host plants are likely to be costly and include pesticide applications and crop monitoring.
Domestic trade	C — The presence of these pests in commercial production areas can have a significant effect at the district level due to any resulting interstate trade restrictions on a wide range of commodities. These restrictions can lead to a loss of markets.
International trade	C — The presence of these pests in commercial production areas of a range of commodities (e.g. longan and lychee, stonefruit, pomefruit) can have a significant effect at the district level due to any limitations to access to overseas markets where these pests are absent.
Environment	A — Although additional pesticide applications would be required to control these pests on susceptible crops, this is unlikely to affect the environment.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix (Table 1): **Negligible**.

CYLINDROCLADIELLA DISEASE

Cylindrocladiella disease is caused by a fungal pathogen causing root rot, leaf spot or fruit rot of longan , mango, tea and a range of shrubs and trees.

The Cylindrocladiella disease pathogen examined in this import risk analysis is:

Cylindrocladiella peruviana (Batista, Bezerra & Herrera) Boesewinkel ['Mitosporic fungi': Hyphomycetes] - root rot; leaf spot; fruit rot.

Introduction and spread potential

Probability of importation

The likelihood that *Cylindrocladiella peruviana* will arrive in Australia with the importation of fresh longan fruit from China: **Low**.

- Generally *Cylindrocladiella peruviana* is recorded in the soil as a root rot, and occasionally as a leaf spot. Longan fruit can be infected from contact with the ground or by wind or rain splash to low branches.
- *Cylindrocladiella peruviana* has been recorded on longan fruit in China (CIQ, 2000).
- Damage on fruit is recorded as low in China (AQSIQ, 2003a) and infected fruit is easily visible due to the presence of white mycelium and decay (Zhang *et al*., 1997).
- Visibly infected fruit are unlikely to be picked or would be discarded during routine inspection and sorting. However, it is possible that infected fruit with minor symptoms might be exported.

Probability of distribution

The likelihood that *Cylindrocladiella peruviana* will be distributed to the endangered area as a result of the processing, sale or disposal of longan fruit from China: **Moderate**.

- The pathogen is likely to survive storage and transportation even at cool temperatures with growth possible at 5°C (Crous and Wingfield, 1993).
- Fruit infected are likely to be distributed throughout Australia for retail sale and the pathogen likely to be associated with infested waste.

Probability of entry

The likelihood that *Cylindrocladiella peruviana* will arrive in Australia as a result of trade in fresh longan from China and be distributed to the endangered area: **Low**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that *Cylindrocladiella peruviana* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- The host range includes mango and tea and a variety of native and exotic shrub and tree species in addition to longan (SBML, 2000).
- Conducive conditions exist in Australia in temperate and tropical regions with other *Cylindrocladiella* spp. recorded on *Rosa* spp. and *Mangifera indica. C. camelliae*, which was previously considered a synonym, is present in Australia on *Synoun* spp., *Rubus rugosus*, *Durio zibethinus, Banksia* spp. and *Camellia* spp. (APPD, 2003).
- *Cylindrocladiella peruviana* is well adapted with a temperature range from 5°C to 30°C and an optimum of 25°C (Crous and Wingfield, 1993).
- The skin of infected longan fruit and panicles is likely to be discarded, so the pathogen is likely to be able to survive in the soil near a suitable host.

Probability of spread

The likelihood that *Cylindrocladiella peruviana* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- The pathogen has a relatively wide host range and is well adapted to a range of temperatures.
- *Cylindrocladiella peruviana* has extensive sporulation on aerial mycelium and may be spread locally by wind or rain splash.
- The pathogen has been isolated from ants (Batista *et al.,* 1965) so can be spread mechanically by insects.

Probability of entry, establishment or spread

The overall likelihood that *Cylindrocladiella peruviana* will enter Australia as a result of trade in fresh longan fruit from China, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Low**.

The probability of entry, establishment or spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Consequences

Consequences (direct and indirect) of *Cylindrocladiella peruviana:* **Very low**

Criterion	Estimate
Direct consequences	
Plant life or health	**B** — *Cylindrocladiella peruviana* can cause significant direct harm to longan, mango and tea production and a range of native and exotic shrubs and trees at the local level.

Any other aspects of the environment	**A** — There are no known direct consequences of this disease on the environment.
Indirect consequences	
Eradication, control etc.	**A** — Programs to minimise the impact of this disease on host plants are not likely to be more costly than existing pre- and post-harvest treatments but may affect chemical free produce.
Domestic trade	**A** — The presence of this disease in commercial production areas may have a minor effect at the local level due to any resulting interstate trade restrictions on longans.
International trade	**B** — The presence of this disease in commercial production areas of longan may have a significant effect at the local level due to any limitations to access to overseas markets where this disease are absent.
Environment	**A** — Although additional pre- and post-harvest fungicide applications might be required to control this disease on longan and lychee, this is unlikely to affect the environment.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix (Table 1): **Negligible**.

LITCHI BROWN BLIGHT

Litchi brown blight is a disease of lychee, causing browning of flowers and dessication of panicles; attacking young and ripe fruits causing brown lesions and white downy growth and/or premature fruit drop. The disease is the most important disease of lychee in China and Thailand. The litchi brown blight disease examined in this import risk analysis is caused by:

Peronophythora litchii Chen ex Ko. Chang, Su, Chen & Leu. [Pythiales: Pythiaceae] - litchi downy blight. Other names for the disease include: litchi brown blight and downy blossom blight of lychee. The fungus also causes root rot in lychee.

Introduction and spread potential

Probability of importation

The likelihood that *Peronophythora litchii* will arrive in Australia with the importation of fresh lychee fruit from China or Thailand: **Moderate**.

- Lychee orchards in both Thailand and China are frequently infected with *Peronophythora litchii* at the blossom and fruiting stage (DOA, 2003b; Ou, 2001).
- Early symptoms of infected fruit are necrosis – irregular brown lesions with an unclear border and hyphal growth on the surface (Ann and Ko, 1984). Infected fruit turn brown and become enveloped in a white downy growth of hyphae, sporangiophores and sporangia (Vien *et al*., 2001).
- Due to the visible symptoms of the disease at the flower budding and fruitlet stage, control measures can be applied before fruit maturity.
- In China, optimal temperatures of 22-25°C for mycelial growth, sporulation and germination of sporangia of *P. litchii* coincide with the maturing stage of lychee fruit (Li, 1997).
- Most infected developing fruit will have fallen from the tree prematurely.
- Visibly infected fruit are unlikely to be picked or would be discarded during routine inspection and sorting; however, it is possible that infected fruit with minor symptoms may be overlooked could be exported.

Probability of distribution

The likelihood that *Peronophythora litchii* will be distributed to the endangered area as a result of the processing, sale or disposal of lychee fruit from China or Thailand: **High**.

- The pathogen is likely to survive storage and transportation, even at cool dry temperatures, and is unlikely to progress to visible decay before distribution.
- Fruit infected are likely to be distributed throughout Australia for retail sale and the pathogen likely to be associated with infested waste.

Probability of entry

The likelihood that *Peronophythora litchii* will arrive in Australia as a result of trade in fresh lychee from China or Thailand, and be distributed to the endangered area: **Moderate.**

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that *Peronophythora litchii* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **Low.**

- The host range is limited to lychee and in Australia lychees are only grown commercially in northern NSW and Queensland.

- Conducive conditions for the establishment of *Peronophythora litchii* occur in some production areas in Australia during the growing season.
- The skin of infected fruit is likely to be discarded, therefore the pathogen is likely to move into the soil, survive on roots and find a suitable lychee host nearby.

Probability of spread

The likelihood that *Peronophythora litchii* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Low**.

- Tropical or subtropical environments of Australia would be suitable for the spread of *Peronophythora litchii* if lychee hosts were available.
- The pathogen is present in the soil, which would limit the possible mode of spread; however, it can remain on infected fruit skins, germinate and spread as sporangia.
- Sporangia are not liberated by moving air, but are readily dispersed in splash droplets, suggesting a rain-splash mechanism (CMI, 1989).

Probability of entry, establishment or spread

The overall likelihood that *Peronophythora litchii* will enter Australia as a result of trade in fresh lychee fruit from China or Thailand, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Very Low**.

The probability of entry, establishment or spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Consequences

Consequences (direct and indirect) of *Peronophythora litchii:* **Low.**

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — *Peronophythora litchii* can cause significant direct harm to lychee production at the district level.
Any other aspects of the environment	**A** — There are no known direct consequences of this disease on the environment.
Indirect consequences	
Eradication, control etc.	**B** — Programs to minimise the impact of this disease on host plants are likely to be required and would incur costs for fungicide sprays and additional crop monitoring.
Domestic trade	**B** — The presence of this disease in commercial production areas may have a significant effect at the local level due to any resulting interstate trade

	restrictions on lychees.
International trade	**B** — The presence of this disease in commercial production areas of lychee may have a significant effect at the local level due to any limitations to access to overseas markets where this disease is absent.
Environment	**B** — Additional soil and foliar fungicide applications would be required to control this disease on lychee, this could affect the environment significantly at the local level.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix (Table 1): **Negligible**.

FRUIT BLOTCH

Fruit blotch is a minor disease of longan and lychee in China causing fruit blotch and branch canker. *Phomopsis* spp. are implicated with other pathogens as common causal agents of stem-end rot in longan, lychee and rambutan resulting in brown discolouration of the rind at the stem end and expand rapidly rotting the fruit (Coates *et al*., 2003).

The fruit blotch disease examined in this import risk analysis is caused by:

Phomopsis longanae Chi & Jiang – fruit blotch; branch canker [Diaporthales: Valsaceae]

Introduction and spread potential

Probability of importation

The likelihood that *Phomopsis longanae* will arrive in Australia with the importation of fresh longan or lychee fruit from China: **Moderate**

- *Phomopsis* spp. are often recorded on longan and lychee (Coates *et al*., 2003) and are mostly post-harvest disorders. *Phomopsis longanae* has been recorded as a new disease on longan in China (Lin and Chi, 1992).
- Damage on fruit is recorded to be low in China (AQSIQ, 2003a).
- Controlling insect pests in the orchards can help reduce skin injuries and therefore potential infection sites for many pathogens (Coates *et al*., 2003).
- Infected fruit are likely to show visible lesions on the surface, with the developing rot penetrating into the flesh and commonly occurring at the stem end (Coates *et al*.,

2003). Visibly affected fruit is likely to be discarded during quality sorting and inspection processes but symptomless fruit or latent infections could be overlooked and exported.

Probability of distribution

The likelihood that *Phomopsis longanae* will be distributed to the endangered area as a result of the processing, sale or disposal of longan or lychee fruit from China: **Moderate**.

- Post harvest refrigeration is essential for post-harvest disease suppression and disease can develop if fruit is held at ambient temperature (Coates *et al*., 2003). However, as the pathogen is not killed by refrigeration, it could sporulate when infected fruit is brought out from cool storage into ambient temperature.
- Fruit infected are likely to be distributed throughout Australia for retail sale and the pathogen likely to be associated with infested waste.

Probability of entry

The likelihood that *Phomopsis longanae* will arrive in Australia as a result of trade in fresh longan or lychee from China and be distributed to the endangered area: **Low.**

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that *Phomopsis longanae* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **Low.**

- The host range is limited to longan and lychee, which are only grown commercially in northern NSW and Queensland.
- The skin of infected fruit is likely to be discarded, therefore the pathogen is likely to survive, especially in the warmer subtropical and tropical regions of Australia.
- *Phomopsis* spp. affecting longan, lychee and rambutan are already present in Australia.

Probability of spread

The likelihood that *Phomopsis longanae* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Low**.

- Tropical or subtropical environments of Australia would be suitable for the spread of *Phomopsis* spp. if longan or lychee hosts were available.

- The process of infection of *Phomopsis* spp. that causes stem end rot on longan and lychee has not been clearly established. Symptoms probably arise from quiescent infections in the skin and at the stem end of fruit (Coates *et al*. 2003). *Phomopsis* spp. have also been isolated as an endophyte from longan, lychee and rambutan stem tissue, suggesting another mode of infection (Johnson *et al*., 1998).
- A related pathogen, *Phomopsis caricae-papayae*, which causes a post-harvest rot on mango has been reported to spread by spores on stalks spreading to fruit in wet weather; however, the spread from fruit to fruit after harvest is not significant in mango (DPI, 1993).

Probability of entry, establishment or spread

The overall likelihood that *Phomopsis longanae* will enter Australia as a result of trade in fresh longan or lychee fruit from China, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Very low**.

The probability of entry, establishment or spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Consequences

Consequences (direct and indirect) of *Phomopsis longanae:* **Very low**.

Criterion	**Estimate**
Direct consequences	
Plant life or health	**B** — *Phomopsis longanae* can cause significant direct harm to longan and lychee production at the local level.
Any other aspects of the environment	**A** — There are no known direct consequences of this disease on the environment.
Indirect consequences	
Eradication, control etc.	**A** — Programs to minimise the impact of this disease on host plants are not likely to be more costly than existing fungicidal dips and post-harvest treatments but may affect chemical free produce.
Domestic trade	**A** — The presence of this disease in commercial production areas may have a minor effect at the local level due to any resulting interstate trade restrictions on lychees.
International trade	**B** — The presence of this disease in commercial production areas of lychee may have a significant effect at the local level due to any limitations to access to overseas markets where this pathogen is absent.
Environment	**A** — Although additional pre- and post-harvest fungicide applications might be required to control this disease on longan and lychee, this is unlikely to affect the environment.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix (Table 1): **Negligible**.

PHYTOPHTHORA FRUIT ROT

Phytophthora fruit rot is a disease of longan and lychee. The pathogen also causes root rot and leaf blight. The Phytophthora fruit rot disease examined in this import risk analysis is caused by:

**Phytophthora palmivora* MF4 (E. J. Butler) E. J. Butler [Pythiales: Pythiaceae] (Phytophthora leaf blight and fruit rot)

Introduction and spread potential

Probability of importation

The likelihood that *Phytophthora palmivora* will arrive in Australia with the importation of fresh longan or lychee fruit from Thailand: **Moderate**.

- *Phytophthora palmivora* is present in the Northern Territory and Queensland; however, *P. palmivora* is not recorded from Western Australia and is therefore a quarantine pest for Western Australia (DAWA, 2003).
- *Phytophthora palmivora* is recorded as a root rot, present in the soil, but can also affect shoots, leaves, fruits and pods (DOA, 2003a,b). Longan and lychee fruit are likely to be infected from contact with the ground or by wind or rain splash to low branches.
- Symptoms on fruit appear as irregular brown lesions and visibly infected fruit is unlikely to be picked or would be discarded during packing and sorting. However, it is possible that infected fruit with no or minor symptoms might be overlooked and be exported.
- Damage on fruit in Thailand can be serious in cool weather conditions after rainfall more prevalent where fruit is induced to set out of season (Visitpanich *et al*., 2000).

Probability of distribution

The likelihood that *Phytophthora palmivora* will be distributed to the endangered area as a result of the processing, sale or disposal of longan or lychee fruit from Thailand: **Moderate**.

- Although a tropical pathogen, *P. palmivora* is likely to survive storage and transportation even at dry cool temperatures, as chlamydospores in the fruit are the most important survival structure.
- Fruit infected are likely to be distributed throughout Australia for retail sale and the pathogen likely to be associated with infested waste.

Probability of entry

The likelihood that *Phytophthora palmivora* will arrive in Australia as a result of trade in fresh longan or lychee from Thailand, and be distributed to the endangered area: **Low**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that *Phytophthora palmivora* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- The pathogen has a wide host range (over 200 species) including many subtropical and tropical fruits grown in Australia such as longan, lychee, papaya, coconut, durian, mango, palm, avocado, pineapple, fig and *Annona* spp. (Ploetz *et al*., 2003).
- The pathogen is already established in tropical fruit growing areas in the Northern Territory and Queensland.
- The skins of infected fruit and the panicles are likely to be discarded, therefore the pathogen is likely to survive and move into the soil or carried by insects to susceptible hosts.
- Low levels of inoculum can build up rapidly due to a short regeneration time with the release of zoospores in the presence of free moisture (DOA, 2003a, b).

Probability of spread

The likelihood that *Phytophthora palmivora* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **High**.

- The dormant chlamydospores, oospores and mycelium can survive dry periods (CABI, 2002). Movement of soil, infected plant material or machinery could result in spread to other orchards.
- Wind dispersal of inoculum and windblown rain permits spread and development of epidemics amongst plantations and orchards under optimal conditions once the disease is established (CABI, 2002).

Probability of entry, establishment or spread

The overall likelihood that *Phytophthora palmivora* will enter Australia as a result of trade in fresh longan or lychee fruit from Thailand, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Low**.

The probability of entry, establishment or spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Consequences

Consequences (direct and indirect) of *Phytophthora palmivora:* **Low**.

Criterion	**Estimate**
Direct consequences	
Plant life or health	**C** — *Phytophthora palmivora* can cause significant direct harm to production of a number of subtropical and tropical fruits at the district level.
Any other aspects of the environment	**A** — There are no known direct consequences of this disease on the environment.
Indirect consequences	
Eradication, control etc.	**A** — Programs to minimise the impact of this disease on host plants are not likely to be more costly than existing management and fungicide application accept in chemical free produce.
Domestic trade	**A** — The presence of this disease in commercial production areas will have a minor effect at the local level due to any resulting interstate trade restrictions on tropical or subtropical fruit as the pest is already present in subtropical and tropical parts of eastern Australia.
International trade	**A** — The presence of this disease in commercial production areas of longan or lychee will have a minor effect at the local level due to any limitations to access to overseas markets where these pests are absent.
Environment	**A** — Although additional post-harvest fungicide applications might be required to control this disease on longan and lychee, this is unlikely to affect the environment.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall ‘probability of entry, establishment or spread’ with the ‘consequences’ using the risk estimation matrix (Table 1): **Very low**.

LONGAN WITCHES’ BROOM DISEASE

Longan witches’ broom disease of longan in China and Thailand causes stunting and deformity of leaves of infected shoots and abnormal development of flowers and panicles resulting in ‘broom-like’ appearance of the inflorescences (Menzel *et al*., 1989). The disease examined in this import risk analysis is:

Longan witches’ broom (disease of unconfirmed aetiology – reported causal agents include: filamentous virus; phytoplasma; mycoplasma; mites).

Introduction and spread potential

Probability of importation

The likelihood that longan witches’ broom will arrive in Australia with the importation of fresh longan or lychee fruit from China or Thailand: **Very low**.

- In China, there is only limited experimental evidence to suggest that longan witches’ broom disease can be transmitted by seed (Li, 1955; Chen *et al*., 1992; Chen *et al*., 2001).
- In Thailand, witches’ broom disease has not been found to be seed-borne or transmissible by seed. Thailand only exports longan varieties that are resistant to longan witches’ broom disease (DOA, pers. comm. 2003).
- Longan witches’ broom symptoms appear on the branches and leaves of affected longan trees but fruit do not show any symptoms.
- Symptoms of longan witches’ broom disease on lychee are reported (Chen *et al.,* 1996); however there is limited evidence that the disease infects lychee fruit or occurs in lychee in China (AQSIQ, 2003a). It is not recorded in association with lychee fruit in Thailand or elsewhere.
- *Tessaratoma papill*osa (litchi stink bug) is a vector of longan witches’ broom disease and has been identified as a quarantine pest for Australia.

Probability of distribution

The likelihood that longan witches' broom will be distributed to the endangered area as a result of the processing, sale or disposal of longan or lychee fruit from China or Thailand: **Moderate**.

- Adults and nymphs of the vector *Tessaratoma papillosa* are likely to survive storage and transportation because the nymphs are highly resistant to starvation and can live without feeding for up to 12 days, and adults live for up to 311 days (Waite and Hwang, 2002).
- Stink bugs may enter the orchard environment in one or two ways: nymphs may be discarded with longan or lychee skin, mature into adults and fly to a suitable host plant, or adults being mobile may fly directly to suitable hosts.

Probability of entry

The likelihood that longan witches' broom will arrive in Australia as a result of trade in fresh longan or lychee from China or Thailand, and be distributed to the endangered area: **Very low**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that longan witches' broom will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **Low**.

- The host range is thought to be limited to longan and in Australia longan is only grown commercially in northern NSW and Queensland but susceptible varieties do exist.
- An infected vector would be required to enable establishment of the disease on a host longan tree
- Other arthropods not on the pathway can vector the disease in China and Thailand and there may be species in Australia that could be vectors.

Probability of spread

The likelihood that longan witches' broom will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- There could be potential vectors amongst Australian species of sucking insects/mites found on longan and or lychee such as litchi stink bug (*Lyramorpha rosea),* and the mites *Polyphatarsonemus latus* and *Aceria litchii*.
- The disease can be spread in nursery stock through grafting from diseased material onto susceptible varieties, such as ‘Biew Kiew’, that are grown in Australia.

Probability of entry, establishment or spread

The overall likelihood that longan witches’ broom will enter Australia as a result of trade in fresh longan or lychee fruit from China or Thailand, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Very low**.

The probability of entry, establishment or spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Consequences

Consequences (direct and indirect) of longan witches’ broom*:* **Low**.

Criterion	**Estimate**
Direct consequences	
Plant life or health	**C** — Longan witches’ broom disease can cause significant harm to longan production at the district level. The disease causes losses of 10-20% annually in China and up to 50% in severe cases (Chen *et al*, 1999).
Any other aspects of the environment	**A** — There are no known direct consequences of this disease on the environment.
Indirect consequences	
Eradication, control etc.	**C** — Programs to minimise the impact of this disease on host plants are likely to be costly and include quarantine and/or destruction of infected trees, breeding resistant cultivars, selective nursery practices and additional control of pest vectors.
Domestic trade	**C** — The presence of this disease in commercial production areas may have a significant effect at the district level due to any resulting interstate trade restrictions on longan grafting/planting material.
International trade	**C** — The presence of this disease in commercial production areas of longan may have a significant effect at the district level due to any limitations to access to overseas markets for Australian longan nursery stock where this organism on longans is absent.
Environment	**A** — Although some control might be required to control this disease on longan, this is unlikely to affect the environment.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the ‘Method for assessing consequences’ section for details on the approach taken to consequence assessment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall ‘probability of entry, establishment or spread’ with the ‘consequences’ using the risk estimation matrix (Table 1): **Negligible**.

CONCLUSIONS: RISK ASSESSMENTS

The results of the risk assessments are summarised in Table 7. Some of the probabilities for entry, establishment or spread differ from those presented in the draft IRA report. They have been reassessed based on additional information received and available scientific literature. None of the changes (indicated in bold type in Table 7) have altered the overall unrestricted risk for any of the quarantine pests.

The results show that unrestricted risk estimates for fruit flies, mealybugs, soft scales and litchi fruit borer exceed the ALOP. Risk management measures are required for these pests. The risk management measures are described in the following section.

Table 7. Results of the risk assessments

NB. Probabilities in **bold type** indicate a change from the draft IRA report

Pest Name	Probability of			Overall probability of entry, establishment and spread	Consequences	Unrestricted Risk
	Entry	Establishment	Spread			
Arthropods						
Scarab beetles (8)	**Very Low**	**Moderate**	**Moderate**	**Very low**	**Low**	Neglibile
Fruit flies (2)	High	**High**	High	**High**	High	High
Mealybugs (2)	Moderate	High	High	Moderate	Low	Low
Soft scales (3)	Moderate	High	High	Moderate	Low	Low
Stink bugs (2)	Very Low	Moderate	Moderate	Very Low	Low	Negligible
Lycaenid fruit borer	Low	**Moderate**	Moderate	Very Low	Very Low	Negligible
Litchi fruit borer	Moderate	Low	Moderate	Low	Moderate	Low
Leaf rollers (2)	Very Low	Moderate	Moderate	Very Low	Low	Negligible
Pathogens						
Cylindrocladiella disease	Low	High	**Moderate**	Low	Very Low	Negligible
Litchi brown blight	Moderate	Low	Low	Very Low	Low	Negligible
Fruit blotch	Low	**Low**	Low	Very Low	Very Low	Negligible
Phytophthora leaf blight and fruit rot	Low	High	High	Low	Low	Very Low
Longan witches' broom disease	Very Low	Low	Moderate	Very Low	Low	Negligible

RISK MANAGEMENT

Pest risk management evaluates and selects options for measures to reduce the risk of entry, establishment or spread of quarantine pests assessed to pose an unacceptable level of risk to Australia via the importation of commercially produced longan or lychee fruit from China or Thailand i.e. fruit sourced from commercial production sites subjected to standard cultivation, harvesting and packing activities.

INTRODUCTION

Biosecurity Australia considers that the risk management measures examined below for fruit flies, litchi fruit borer, mealybugs and soft scales together with the necessary phytosanitary procedures required to implement the measures are commensurate with the identified risks. As a result, the measures and phytosanitary procedures described form the basis of import conditions for fresh longan and/or lychee fruit from China and/or Thailand, detailed in the 'Import Conditions' section of this document.

It is important to note that it is only appropriate for the unrestricted risk assessments to take into account the minimum border procedures used by relevant government agencies and not those measures approved by such agencies that are intended to mitigate risks associated with the commodity itself. The minimum procedures include verifying that the commodity is as described in the shipping documents and identifying external and internal contaminations of containers and packaging. In order to have least trade restrictive measures, the starting point for evaluation of the restricted risk management options first considered the use of a 600-unit inspection in detecting quarantine pests requiring risk management, and the subsequent remedial actions or treatments that might be applied if a pest is intercepted.

The standard AQIS sampling protocol requires inspection of 600 units, for quarantine pests in systematically selected random samples per homogeneous consignment or lot. The unit for longan is defined as one detached longan fruit or one panicle of longan fruit depending on the nature of the consignment. The unit for lychee is defined as one detached lychee fruit. Biometrically, if no pests are detected by the inspection, this size sample achieves a confidence level of 95% that not more than 0.5% of the units in the consignment are infested/infected. The level of confidence depends on each fruit in the consignment having about the same likelihood of being affected by a quarantine pest and the inspection technique being able to reliably detect all quarantine pests in the sample. If no live quarantine pests are detected in the sample, the consignment is considered to be free from quarantine pests and would be released from quarantine. Where a quarantine pest is intercepted in a sample, the remedial actions or treatments may (depending on the location of the inspection) include:

- withdrawing the consignment from export to Australia;
- re-export of the consignment from Australia;
- destruction of the consignment ; or
- treatment of the consignment to ensure that the pest is no longer viable.

It should be emphasised that inspection is not a measure that mitigates the risk of a pest. It is the remedial actions or treatment that can be taken based on the results of the inspection that would reduce a pest risk.

RISK MANAGEMENT MEASURES AND PHYTOSANITARY PROCEDURES

There are four categories of measures to manage the risks identified in the pest risk assessment:

1. cold disinfestation treatment or vapour heat treatment for the management of fruit flies;
2. cold disinfestation treatment or orchard control, inspection and remedial action for the management of litchi fruit borers;
3. inspection and remedial action for the management of mealybugs and soft scales; and
4. supporting operational maintenance systems and verification of phytosanitary status.

[1] Options for the management of fruit flies

Fruit flies, *Bactrocera cucurbitae* and *B. dorsalis*, have been assessed to have an unrestricted risk estimate of high, and measures are therefore required to mitigate the risk. As clear visual signs of infestation (particularly in recently infested fruit) may not be present, visual inspection alone is not considered to be an appropriate risk management option. If infested fruit was not detected at inspection, fruit flies may enter, establish and spread. Biosecurity Australia has identified the following phytosanitary risk management options: [1a] cold disinfestation treatment (CT) or [1b] vapour heat treatment (VHT).

Both measures are known to reduce the risk associated with fruit flies to an acceptable level due to the proven efficacy of the treatment applied.

Other postharvest disinfestation treatments for fruit flies (e.g. hot water treatment and irradiation) were identified as in-principle options for these pests but were considered to be no more effective and less technically and economically feasible than the proposed optional measures which are already implemented in commercial fruit production in China and Thailand.

In principle options:

- Hot water treatment is accepted as a phytosanitary measure against the risk of fruit flies in imports of longan and lychee fruit from the State of Hawaii to Mainland USA under USDA treatment schedule *T 102-d-1 Hot water immersion*: 120°F [49°C] for 20 minutes (USDA, 2004b).
- The International Plant Protection Convention (IPPC) acknowledges the application of ionising radiation as a phytosanitary treatment for regulated pests or articles (*ISPM No. 18).* Irradiation is accepted and used as a phytosanitary measure against the risk of fruit flies in imports of longan and lychee from the State of Hawaii to Mainland USA under the USDA treatment schedule *T105-a-1 Irradiation*. Irradiation is also a treatment option for longan fruit (including panicles) and lychee fruit from China to the USA under *T105-b-1 Irradiation* (USDA, 2004a). In both treatments the minimum absorbed dose of gamma radiation is 250 Gray (Gy).

  Biosecurity Australia accepts the recommendation of a treatment dose of 150 (Gy) for non-emergence of treated eggs and larvae of fruit flies (Hallman and Loaharanu, 2002; Corcoran and Waddell, 2003). In addition to addressing the risk of fruit flies, ionising radiation at the required dose could address the risk posed by other quarantine pests – fruit borers, mealybugs and soft scales (Corcoran and Waddell, 2003).

[1a] Cold treatment (CT)

Cold disinfestation efficacy trial data for *B. dorsalis* on longan and lychee was provided by China. Eggs and larvae of *B. dorsalis* were eliminated when fruit temperatures were maintained in longan fruit at 1°C for 13 days (Liang *et al*. 1999) and in lychee fruit at 2ºC for 13 days in a controlled atmosphere (1-5% oxygen: 5-6% carbon dioxide) (Liang *et al*. 1997).

These treatment regimes are consistent with those used by the USDA for disinfestation of *B. dorsalis* in longan and lychee fruit imported into mainland United States (USDA, 2004b) from China.

For longan, the USDA use treatment schedule *T107-j Cold treatment* against fruit fly pests as follows:

- 0.99°C or below for 13 days
- 1.38°C or below for 18 days

For lychee, the USDA use treatment schedule *T107-f Cold treatment* against fruit flies and a mite pest as follows:

- 0°C or below for 10 days
- 0.56°C or below for 11 days
- 1.11°C or below for 12 days

- 1.67°C or below for 14 days

Biosecurity Australia proposes the option of cold treatment as specified by the USDA above in treatment schedules T107-j for longan and T107-f for lychee to manage the risk of fruit flies.

These cold treatment measures have been demonstrated by efficacy trials and international export of longan and lychee to adequately disinfest the fruit of fruit flies and will mitigate the risk of fruit flies below Australia's ALOP.

[1b] Vapour heat treatment (VHT)

Vapour heat treatment is accepted, and used, as a phytosanitary measure against the risk of fruit flies in imports of lychee fruit from the State of Hawaii to Mainland USA under USDA treatment schedule *T106-f Vapour Heat*: 47.2°C or above for 20 minutes (USDA, 2004b). Taiwan exports lychee fruit to Japan using VHT. Taiwan data (Kuo *et al*., 1987) supported a treatment of 46.2°C or above for 20 minutes followed by a 48 hr cooling and storage regime at 2°C.

Biosecurity Australia accepts VHT to mitigate the risk of fruit flies for imported mango fruit. Australia also uses VHT to mitigate the risk of fruit flies for the export of Australian mangoes to Japan.

Biosecurity Australia proposes the option of a pre-export vapour heat treatment of 47.0 °C (fruit pulp temperature) or above for 15 minutes or 46.0 °C or above for 20 minutes. Treatment time will be for a minimum of two hours, including the warming and cooling periods to bring the fruit pulp to temperature. Treatment commences when the pulp core temperature of all probe monitored fruit reaches the required temperature, and this temperature is maintained for the required period.

VHT has been demonstrated by trials and international export of lychee to adequately disinfest the fruit of fruit flies and will mitigate the risk of fruit flies below Australia's ALOP.

[2] Options for the management of litchi fruit borers

The litchi fruit borer, *Conopomorpha sinensis*, has been assessed to have an unrestricted risk of low, and measures are therefore required to mitigate that risk. Standard visual inspection alone is not considered to be an appropriate risk management option in view of the level of risk identified and because these pests are internal borers and entry points and frass may not always be easily visible. If infested fruit was not detected at inspection, these fruit borers may enter, establish and spread.

Biosecurity Australia has identified the following phytosanitary risk management options: [2a] cold treatment or [2b] orchard control and inspection and remedial action. These measures are considered to reduce the risk associated with *Conopomorpha sinensis* to an acceptable level.

Other risk management options for fruit borers (e.g. pest free areas, vapour heat treatment and irradiation) were identified as in-principle options for these pests but were considered to be less economically and technically feasible than the proposed option of measures which are already implemented in commercial production in China and Thailand. Neither China nor Thailand has proposed longan and lychee export areas as pest free areas for litchi fruit borer. No efficacy data is available, or been provided, to Biosecurity Australia to show that vapour heat treatment is an effective measure to address the risk of this fruit borer.

[2a] Cold treatment (CT)

For the import of longan and lychee fruit from China, the USDA require cold disinfestation based on USDA treatment schedule *T107-h Cold treatment* for longan and lychee against fruit flies and *Conopomorpha sinensis* (litchi fruit borer) (USDA, 2004b):

- 0.77°C or below for 13 days,
- 1°C or below for 15 days, or
- 1.39°C or below for 18 days.

Biosecurity Australia proposes an option of pre-export/in-transit cold treatment at 1°C or below for 15 days or at 1.39°C or below for 18 days. This cold treatment option would manage the risk of both fruit flies and the litchi fruit borer in longan and lychee.

[2b] Orchard control, visual inspection and remedial action

Biosecurity Australia proposes an alternative option of implementing an NPPO approved orchard control program and inspection for freedom from litchi fruit borer. The orchard control program for litchi fruit borer may include an Integrated Pest Management (IPM) program using appropriate, effective and compatible measures at critical stages of development of the pest and crop. Measures should be based on pest monitoring through weekly orchard inspections and forecasts of infestations.

Information on the NPPO approved orchard control program for litchi fruit borer must be made available to BA/AQIS if requested.

Harvested fruit/panicles will be inspected specifically for evidence of litchi fruit borers.

The combination of orchard control and targeted visual inspection for freedom from this pest during pre-export inspection (4c) and on-arrival clearance (4g) would reduce the risk of litchi fruit borer associated with the importation of longan and lychee fruit from China and Thailand to an acceptable level. If litchi fruit borer is found during these inspections then remedial action must be taken as outlined in the 'Introduction' to this section.

The objective of these measures is to maintain a low pest prevalence in the orchard through monitoring and management and to verify fruit for export of Australia is free from the pest through targeted inspection. Additional measures 4a, 4b and 4c will ensure operational procedures are in place to maintain and verify the integrity of these measures.

[3] Inspection and remedial action for the management of mealybugs and soft scales

The mealybugs (*Ferrisia virgata* and *Planococcus litchi*) and the soft scales (*Coccus viridis*, *Drepanococcus chiton*, *Pulvinaria psidii*) have been assessed to have an unrestricted risk estimate of low, and measures are therefore required to mitigate that risk.

Biosecurity Australia proposes that a targeted visual inspection for freedom from mealybugs or soft scales is considered to be an appropriate risk management measure in view of the level of risk identified. Detached fruit of longan and lychee and longan fruit and the panicle (fruiting stem) will be inspected for the presence of mealybugs and soft scales during pre-export inspection (4c) and on-arrival clearance (4g). If infested fruit was not inspected and found free from these mealybugs and soft scales, mealybugs or soft scales may enter, establish and spread.

The objective of this measure is to ensure that the longan and lychee exported to Australia do not contain actionable mealybug or soft scale quarantine pests. Additional measures 4a, 4b and 4c will ensure operational procedures are in place to maintain and verify the integrity of these measures. If actionable mealybugs or soft scales are found during these inspections, then remedial action must be taken as outlined in the 'Introduction' to this section.

Together these measures and phytosanitary procedures will mitigate the risk of mealybugs and soft scales to an acceptable level.

[4] Supporting operational maintenance systems and verification of phytosanitary status

It is necessary to have a system of operational procedures in place to ensure that the phytosanitary status of fresh longan or lychee fruit from China or Thailand is maintained and verified during the process of production and export to Australia. This is to ensure that the objectives of the risk mitigation measures previously identified have been met and are being maintained.

The proposed system of operational maintenance for the production and export of fresh longan and lychee from China and Thailand to Australia consists of:

- registration of export orchards and, where relevant, registration of export orchards implementing an approved control program for litchi fruit borer;

- registration of packinghouses and auditing of procedures;
- pre-export inspection by the National Plant Protection Organisation (NPPO);
- packaging and labelling compliance;
- phytosanitary certification by the NPPO;
- specific conditions for storage and movement; and
- on-arrival quarantine clearance by AQIS.

[4a] Registration of export orchards

All longan and lychee fruit for export to Australia must be sourced from export orchards and growers registered with China or Thailand's NPPO. Copies of the registration records must be made available to AQIS if requested. The NPPO is required to register export orchards prior to commencement of exports. Additional registration is required for registered export orchards choosing to use the litchi fruit borer risk management option of approved orchard control program.

All export orchards are expected to produce commercial longan and lychee under standard cultivation, harvesting and packing activities.

The objective of this procedure is to ensure that orchards from which longan and lychee are sourced can be identified. This is to allow trace back to individual orchards and growers in the event of non-compliance and for audit (of control measures). For example, if live pests are intercepted, the ability to identify a specific orchard/grower allows the investigation and corrective action to be targeted rather than applying to all possible orchards/growers.

[4b] Registration of packinghouses and auditing of procedures

All packinghouses intending to export longan and lychee fruit to Australia need to be registered with the NPPO.

Pre-export cold treatment/vapour heat treatment for disinfestation of fruit flies and litchi fruit borer is to be done within the registered packinghouses in China and Thailand. Copies of the registration records for cold treatment/vapour heat treatment facilities in China and Thailand must be provided to AQIS.

The inspection for freedom from mealybugs and soft scales and inspection for freedom from the litchi fruit borer is to be done within the registered packinghouses.

Packinghouses will be required to identify the individual orchard with a numbering system and identify fruit from individual orchards by marking boxes or pallets/part pallets with the unique orchard number. The list of registered packinghouses must be kept by the NPPO and provided to AQIS if requested, with updates provided if packinghouses are added or removed from the list.

Registration of orchards and packinghouses is to include an audit program by the NPPO to ensure that orchards and packinghouses are suitably equipped to carry out the specified control measures and phytosanitary treatments. An audit is to be conducted prior to registration and then conducted at least annually.

The objective of this measure is to ensure that packinghouses at which treatment procedures are carried out can be identified. This is to allow trace back to individual packinghouses and orchards in the event of non-compliance.

[4c] Pre-export inspection and remedial action by NPPO

The NPPO will inspect all consignments in accordance with official procedures for all visually detectable quarantine pests and trash using sampling rates developed by the NPPO in consultation with Biosecurity Australia/AQIS or according to the AQIS standard sampling plan as outlined in the 'Introduction' to this section.

If actionable mealybugs or soft scales are found during these inspections, then remedial action must be taken as outlined in the 'Introduction' to this section.

Records of the interceptions made during these inspections (live or dead quarantine pests, and trash) are to be maintained by the NPPO and made available to Biosecurity Australia as requested. This information will assist in future reviews of this import pathway and consideration of the appropriateness of the phytosanitary measures that have been applied.

The objective of this procedure is to ensure that longan and lychee fruit exported to Australia do not contain quarantine pests or trash, are clean of any extraneous organic material on the surface of the fruit or panicle, and comply with packing and labelling requirements.

[4d] Packing and labelling

All packages of longan and lychee fruit for export will be free from contaminated plant materials including trash and weed seeds and would meet Australia's general import conditions for fresh fruits and vegetables (C6000 General Requirements for All Fruit and Vegetables, available at http://www.aqis.gov.au/icon/). Trash refers to soil, splinters, twigs, leaves and other plant materials but excludes longan panicles/fruiting stems 10-15 cm in length and 3-4 mm in diameter.

Inspected and treated fruits will be required to be packed in new boxes. Packing material would be synthetic or highly processed if of plant origin. No unprocessed packing material of plant origin, such as straw, will be allowed. All wood material used in packaging of longan and lychee must comply with the AQIS conditions (e.g. those in "Cargo containers: Quarantine aspects and procedures" (AQIS, 2003)).

All boxes will be labelled with the orchard registration number and packinghouse registration number for the purposes of trace back in the event that this is necessary. The pallets should be securely strapped only after phytosanitary inspection has been carried out following mandatory postharvest treatments. Palletised product is to be identified by attaching a uniquely numbered pallet card to each pallet or part pallet to enable trace back to registered orchards.

The objectives of this procedure are to ensure that:

- The longan and lychee exported to Australia are not contaminated by weeds or trash.
- Unprocessed packing material (which may vector pests identified as not on the pathway and pests not known to be associated with longan and lychee) is not imported with the longan or lychee.
- The packaged longan and lychee are labelled in such a way as to identify the orchard and packinghouse (see measures 4a,b).

[4e] Phytosanitary certification by the NPPO

The NPPO is required to issue a Phytosanitary Certificate for each consignment upon completion of pre-export phytosanitary inspection and treatment. The objective of this procedure is to provide formal documentation to AQIS verifying that the relevant measures have been performed offshore. Each Phytosanitary Certificate is to contain the following information:

Additional declarations

"*The longan/lychee in this consignment have been produced in China/Thailand in accordance with the conditions governing entry of fresh longan/lychee fruit to Australia and inspected and found to be free of quarantine pests*".

Distinguishing marks

The orchard registration number, packinghouse registration number, number of boxes per consignment, and container and seal numbers (as appropriate); (to ensure trace back to the orchard in the event that this is necessary).

A consignment is the quantity of longan or lychee fruit covered by one Phytosanitary Certificate that arrives at one port in one shipment. Consignments need to be shipped directly from one port or city in China or Thailand to a designated port or city in Australia.

Treatments

Details of cold treatment or vapour heat treatment (i.e. temperature, duration and packinghouse/facility number), where relevant, must be included in the treatment section on the Phytosanitary Certificate.

If the orchard management option for litchi fruit borer is taken, the following additional declaration must be included.

"The product in this consignment has been subjected to orchard control for litchi fruit borer in accordance with the conditions governing entry of fresh longan/lychee fruit to Australia."

[4f] Specific conditions for storage and movement

Packed product and packaging is to be protected from pest contamination during and after packing, during storage and during movement between locations (e.g. packinghouse to cool storage/depot, to inspection point, to export point).

Product for export to Australia that has been inspected and certified by the NPPO must be maintained in secure conditions that will prevent mixing with fruit for export to other destinations or the domestic market and kept in secure storage until export.

Security of the consignment is to be maintained until release from quarantine in Australia.

The objective of this procedure is to ensure that the phytosanitary status of the product is maintained during storage and movement.

[4g] On-arrival quarantine inspection and remedial action, and clearance by AQIS

On arrival in Australia, each consignment will be inspected by AQIS. AQIS would undertake a documentation compliance examination for consignment verification purposes at the port of entry in Australia prior to release from quarantine. Fruit from each consignment would be randomly sampled for inspection as outlined in the 'Introduction' part of this section. Such sampling methodology would provide 95% confidence that there is not more than 0.5% infestation in a consignment. If actionable quarantine pests are found during these inspections, then remedial action must be taken as outlined in the 'Introduction' to this section.

The objective of this procedure is to verify that the required measures have been undertaken.

Where consignments are found to be non-compliant with requirements on-arrival, the importer will be given the option to treat (if suitable treatments for the pests detected can be applied), re-export or destroy the consignment. If product continually fails inspection, AQIS reserves the right to conduct an audit of the Chinese or Thai longan or lychee risk management systems and ensure that appropriate corrective action has been taken.

Uncategorised pests

If an organism is detected on longan or lychee from China or Thailand that has not been categorised, it will require assessment to determine its quarantine status and if phytosanitary action is required. The detection of any pests of quarantine concern not already identified in the analysis may result in a review of trade to ensure that the existing measures continue to provide the appropriate level of phytosanitary protection for Australia.

IMPORT CONDITIONS

The import conditions described below are based on the conclusions of the pest risk analysis contained in this final IRA report. Specifically, they are based on the risk management measures described in the previous section.

The components of the quarantine conditions are summarised in dot point format below. The proposed risk management measure that links with each component is given in brackets ( ).

- Import Condition 1. Registration of export orchards (links with risk management measure 4a)
- Import Condition 2. Packinghouse registration and auditing of procedures (4b)
- Import Condition 3. Pre-export cold treatment (1a, 2a)
- Import Condition 4. Pre-export vapour heat treatment (1b)
- Import Condition 5. Orchard control for litchi fruit borers (2b)
- Import Condition 6. Targeted pre-export inspection by NPPO (2b, 3, 4c)
- Import Condition 7. Packing and labelling (4d)
- Import Condition 8. Phytosanitary certification by NPPO (4e)
- Import Condition 9. Storage (4f)
- Import Condition 10. Targeted on-arrival quarantine inspection and clearance by AQIS (2b, 3, 4g)
- Import Condition 11. Audit and review of policy.

IMPORT CONDITION 1. REGISTRATION OF EXPORT ORCHARDS

All longan and lychee fruit for export to Australia must be sourced from export orchards registered with China or Thailand's NPPO (AQSIQ/CIQ; ARD). Copies of the registration records must be made available to AQIS if requested. The NPPO is required to register all export orchards and growers prior to commencement of exports.

All export orchards are expected to produce commercial longan and lychee under standard cultivation, harvesting and packing activities.

IMPORT CONDITION 2. PACKINGHOUSE REGISTRATION AND AUDITING OF PROCEDURES

All packinghouses intending to export longan and lychee fruit to Australia need to be registered with the NPPO.

Cold treatment/vapour heat treatment for pre-export disinfestation of fruit flies and litchi fruit borer is to be conducted within the registered packinghouses in China and Thailand. Copies of the registration records for cold treatment/vapour heat treatment facilities in China and Thailand must be provided to AQIS.

The inspection for freedom from mealybugs and soft scales and inspection for freedom from the litchi fruit borer is to be done within the registered packinghouses.

Packinghouses will be required to identify the individual orchard with a numbering system and identify fruit from individual orchards by marking boxes or pallets or pallets/part pallets with the unique orchard number. The list of registered packinghouses must be kept by the NPPO and provided to AQIS if requested, with updates provided if packinghouses are added or removed from the list.

Registration of orchards and packinghouses is to include an audit program by the NPPO to ensure that orchards and packinghouses are suitably equipped to carry out the specified control measures and phytosanitary treatments. An audit is to be conducted prior to registration and then conducted at least annually.

IMPORT CONDITION 3. PRE-EXPORT/INTRANSIT COLD TREATMENT

If the cold treatment option is taken by the NPPO for fruit fly disinfestation/fruit fly and litchi fruit borer disinfestation, the following procedures must be followed:

a) Fruit fly disinfestation only

Longan fruit must be treated as follows:

- 0.99°C or below for 13 days, or
- 1.38°C or below for 18 days.

Lychee fruit must be treated as follows:

- 0°C or below for 10 days,
- 0.56°C or below for 11 days,
- 1.11°C or below for 12 days, or
- 1.67°C or below for 14 days.

b) Fruit fly and litchi fruit borer disinfestation

Longan/lychee fruit must be treated as follows:

- 1°C or below for 15 days or
- 1.39°C or below for 18 days

The pulp of the fruit must be at, or below, the indicated temperature at time of beginning treatment. Cold treatment may be conducted in China or Thailand in packinghouses or facilities at ports of dispatch that are registered with, and audited by, the NPPO to ensure they are suitably equipped to carry out the specified cold treatment, or in-transit in containers designated by the NPPO for such purposes. Temperature values need to be recorded to standards agreed between the NPPO and AQIS and monitored by the NPPO.

IMPORT CONDITION 4. PRE-EXPORT VAPOUR HEAT TREATMENT

If the vapour heat treatment option is taken by the NPPO for fruit fly disinfestation, the following procedures must be followed:

Vapour heat treatment may be conducted in China or Thailand. The treatment must be completed in packinghouse VHT facilities that are registered with, and audited by, the NPPO to ensure they are suitably equipped to carry out the specified VHT. Longan/lychee fruit needs to be treated at:

- 47°C (fruit core temperature) or above for 15 minutes, or
- 46°C (fruit core temperature) or above for 20 minutes.

Treatment time will be for a minimum of two hours, including the warming and cooling periods to bring the fruit pulp to temperature. Treatment commences when the pulp core temperature of all probe-monitored fruit reaches the required temperature. This temperature must be maintained for the required period.

Temperature and humidity values need to be recorded to standards agreed between the NPPO and AQIS and monitored by the NPPO.

IMPORT CONDITION 5. ORCHARD CONTROL FOR LITCHI FRUIT BORER

If the orchard control and inspection for freedom from litchi fruit borer option is taken by the NPPO instead of cold treatment (Import Condition 3b), the following procedures must be followed:

Registered export orchard growers must implement an orchard control program (i.e. good agricultural practice/integrated pest management (IPM) programs for export fruits) that has been approved by the NPPO, incorporating field sanitation and appropriate biocontrol and/or pesticide applications for the management of litchi fruit borer. Registered export orchard growers must have an additional registration number and need to keep records of control measures for auditing purposes by NPPO. The program would include:

- Monitoring of the litchi fruit borer throughout the year and inspection of fruit weekly from fruit set;
- Chemical control, using appropriate, effective and compatible insecticides for litchi fruit borer. Recommended withholding periods must be enforced for export fruit; and
- Field sanitation with all unparasitised fallen fruit to be removed from the orchards regularly (i.e. every 7 days) and destroyed or deep buried to prevent unparasitised larvae from accumulating.

Information on the NPPO approved orchard control program for litchi fruit borer must be made available to AQIS if requested.

IMPORT CONDITION 6. TARGETED PRE-EXPORT INSPECTION BY NPPO

The NPPO will inspect all consignments in accordance with official procedures for all visually detectable quarantine pests and trash using sampling procedures developed by the NPPO in consultation with Biosecurity Australia/AQIS.

The inspection procedures will ensure that detached longan fruit, longan panicles (10-15 cm in length and 3-4 mm in diameter) and detached lychee fruit are free from pests of quarantine concern to Australia, are free of any contaminant plant material (leaves, twigs, seed, etc.) and soil. The targeted inspection will ensure freedom from actionable mealybugs and soft scales and, where relevant to the risk management option, litchi fruit borers (in association with Import Condition 5). Consignments that do not comply with the above requirements will be rejected for export to Australia.

Records of the interceptions made during these inspections (live or dead quarantine pests, and trash) are to be maintained by the NPPO and made available to Biosecurity Australia/AQIS as requested. This information will assist in future reviews of this import pathway and consideration of the appropriateness of the phytosanitary measures that have been applied.

IMPORT CONDITON 7. PACKING AND LABELLING

All packages of longan and lychee fruit for export must be free from contaminated plant materials including trash and weed seeds and must meet Australia's general import conditions for fresh fruits and vegetables. (C6000 General Requirements for All Fruit and Vegetables, available at http://www.aqis.gov.au/icon/). Trash refers to soil, splinters, twigs, leaves and other plant materials. Longan panicles with fruit attached are permitted but must meet the specified size requirements.

Inspected and treated fruits will be required to be packed in new boxes. Packing material will be synthetic or highly processed if of plant origin. No unprocessed packing material of plant origin, such as straw, will be allowed. All wood material used in packaging of longan and lychee fruit must comply with the AQIS conditions (e.g. those in “Cargo containers: Quarantine aspects and procedures” (AQIS, 2003).

All boxes will be labelled with the orchard registration number and packinghouse registration number for the purposes of trace back in the event that this is necessary. The pallets should be securely strapped only after phytosanitary inspection has been carried out following mandatory postharvest treatments. Palletised product is to be identified by attaching a uniquely numbered pallet card to each pallet or part pallet to enable trace back to registered orchards.

IMPORT CONDITION 8. PHYTOSANITARY CERTIFICATION BY NPPO

The NPPO is required to issue a Phytosanitary Certificate for each consignment upon completion of pre-export inspection and treatment. Each Phytosanitary Certificate is to contain the following information:

Additional declarations

“The longans/lychees in this consignment have been produced in China/Thailand in accordance with the conditions governing entry of fresh longan/lychee fruit to Australia and inspected and found to be free of quarantine pests”.

Distinguishing marks

The orchard registration number, packinghouse registration number, number of cartons per consignment, and container and seal numbers (as appropriate); (to ensure trace back to orchard in the event that this is necessary).

A consignment is the quantity of longan and lychee fruit covered by one Phytosanitary Certificate that arrives at one port in one shipment. A consignment needs to be shipped directly from one port or city in China or Thailand to a designated port or city in Australia.

Treatment

Details of cold treatment or vapour heat treatment (i.e. temperature, duration and packinghouse/facility number), where relevant, must be included in the treatment section on the Phytosanitary Certificate.

If the orchard management option for litchi fruit borer is taken, the following additional declaration must be included.

“The product in this consignment has been subjected to orchard control for litchi fruit borer in accordance with the conditions governing entry of fresh longan/lychee fruit to Australia.”

IMPORT CONDITION 9. STORAGE

Packed product and packaging is to be protected from pest contamination during and after packing, during storage and during movement between locations (e.g., packing house to cool storage/depot, to inspection point, to export point).

Product for export to Australia that has been inspected and certified by the NPPO must be maintained in secure conditions that will prevent mixing with fruit for export to other destinations. This can be achieved through segregation of fruit for export to Australia in separate storage facilities, netting or shrink-wrapping pallets in plastic, or by placing sealed cartons in the low temperature cold storage before loading into a shipping container. Alternatively, packed fruit can be directly transferred at the packinghouse into a shipping container, which is to be sealed and not opened until the container reaches Australia.

Security of the consignment is to be maintained until release from quarantine in Australia.

IMPORT CONDITION 10. TARGETED ON-ARRIVAL QUARANTINE INSPECTION AND CLEARANCE BY AQIS

On arrival, each consignment would be inspected by AQIS and documentation examined for consignment verification purposes at the port of entry in Australia prior to release from quarantine. Sampling methodology would provide 95% confidence that there is not more than 0.5% infestation in a consignment.

An example of a sampling size for inspection of longan/lychee is given below. The unit for longan is defined as one detached longan fruit or one panicle of longan fruit depending on the nature of the consignment. The unit for lychee is defined as one detached lychee fruit.

Consignment size (Units)	Sample size (Units)
For ‘consignments’ of fruit of less than 1000 units	either 450 units or 100% of consignment (whichever is smaller)
For ‘consignments’ of fruit of greater than or equal to 1000 units	600 units

Where consignments are found to be non-compliant with requirements on-arrival, the importer will be given the option to treat (if suitable treatments for the pests detected can be applied), re-export or destroy the consignment. If product continually fails inspection, Biosecurity Australia/AQIS reserves the right to conduct an audit of the Chinese or Thai longan and lychee risk management systems and ensure that appropriate corrective action has been taken.

Uncategorised pests

If an organism that is detected on longan or lychee from China or Thailand has not been categorised, it will require assessment to determine its quarantine status and if phytosanitary action is required. The detection of any pests of quarantine concern not already identified in the analysis may result in a review of trade to ensure that the existing measures continue to provide the appropriate level of phytosanitary protection for Australia.

IMPORT CONDITION 11: AUDIT AND REVIEW OF POLICY

Biosecurity Australia reserves the right to review the adopted policy at any time after significant trade has occurred or where there is reason to believe the phytosanitary status of the exporting country has changed.

CONCLUSIONS

The findings of this final IRA report are based on a comprehensive analysis of relevant scientific literature.

Biosecurity Australia considers that the risk management measures described in this final IRA report will provide an appropriate level of protection against the pests identified in the risk assessment.

FURTHER STEPS IN THE IMPORT RISK ANALYSIS PROCESS[4]

This final IRA report has now been released to stakeholders, together with a Plant Biosecurity Policy Memorandum (PBPM) containing the Executive Manager's recommendation for a policy determination.

The IRA process will now proceed through the following steps:

- Stakeholders have 30 days from the publication of this document to lodge an appeal in writing on one or both of the following grounds:
    - There was a significant deviation from the process set out in the *Import Risk Analysis Handbook* that adversely affected the interests of the stakeholder
    - A significant body of scientific information relevant to the outcome of the IRA was not considered
- Determination of appeals, if required
- Final policy determination by the Director of Animal and Plant Quarantine and public notification
    - Notification being made to the proponent/applicant, registered stakeholders and the WTO
    - Notification being made to AQIS and liaison with AQIS on the implementation.

Stakeholders will be advised of any significant variations to this process.

[4] The process described here differs from that in *The AQIS Import Risk Analysis Process Handbook*. This is the new process as outlined in Biosecurity Australia's *Import Risk Analysis Handbook* 2003.

STAKEHOLDER COMMENTS ON THE DRAFT IRA REPORT AND RESPONSE FROM BIOSECURITY AUSTRALIA

A synopsis of the stakeholder comments and the response from Biosecurity Australia is given below. All stakeholder comments and Biosecurity Australia's response to the comments have been placed on the Public File for this IRA.

Biosecurity Australia circulated the draft import risk analysis report on 29 August 2003 and stakeholders were requested to provide comments within 60 days of release. Biosecurity Australia received written responses from the following six groups:

- Australian State Departments of Agriculture:
  - Queensland Department of Primary Industry (QDPI),
  - Victorian Department of Primary Industry (DPI), and
  - Department of Agriculture of Western Australia (DAWA);
- General Administration for Quality Supervision and Quarantine and Inspection of the People's Republic of China (AQSIQ);
- Longan Association of Australia (LAA); and
- Australian Lychee Growers Association (ALGA).

Comments and questions were also raised by stakeholders at the IRA workshop in Cairns.

Stakeholder comments were considered and incorporated into the final import risk analysis report where appropriate and relevant.

GENERAL COMMENTS

Initial request for import of fruit

Stakeholder comments: Who starts the procedure of requesting the import of fruit into Australia?

Biosecurity Australia's response: Requests can be made by importers or exporters as the result of an application to AQIS for an import permit but most usually come as formal requests through the National Plant Protection Organisation (NPPO) of a country to Biosecurity Australia. Access requests are often first raised at bilateral quarantine meetings with our trading partners. In the case of longan and lychee the import requests were made by the NPPO of China (AQSIQ) and of Thailand (DOA).

Adaptation of pests

Stakeholder comment: Is the adaptation of exotic pests to Australian conditions considered.

Biosecurity Australia's response: The ability of exotic pests to adapt to Australian conditions is considered in the risk assessment based on the biology of the quarantine pest and the conditions under which it is known to occur and survive. The adaptation of pests is considered under the assessment of the probability of establishment and spread.

Acts and regulations of quarantine policy

Stakeholder comment: What are the acts/regulations that govern the quarantine policy process?

Biosecurity Australia's response: Australia's quarantine policy process is underpinned by a number of acts and regulations, including the *Quarantine Act 1908* and its subordinate legislation in the *Quarantine Proclamation 1998* and the *Quarantine Regulations 2000*. Australia has international responsibilities and obligations under the World Trade Organisation (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement). Details of these and other regulations are given in the first section of the technical issues paper, draft IRA report, the final IRA report and in the 2003 IRA Handbook.

Final determination of policy

Stakeholder comment: During the IRA process, at what point do you decide whether or not fruit is allowed into Australia? Who has the final say in the determination of the import policy and what is the sequence of events in this process?

Biosecurity Australia's response: The Executive Manager of Biosecurity Australia releases the final IRA report and makes a policy recommendation. If there are no appeals, the Director of Quarantine makes the final policy determination and imports are allowed under the import conditions specified in the final IRA. The sequence of events in this process is described in the import risk analysis flowchart on page 30 of the 2003 IRA Handbook http://www.affa.gov.au/content/publications.cfm?ObjectID=D667DCE6-A412-4673-A6B49B7579CF4AD7

MRLs

Stakeholder comment: Are maximum residue limits (MRLs) considered in the import risk analysis? Is chemical residue testing of fruits conducted?

Biosecurity Australia's response: Biosecurity Australia does not specifically consider chemical residue issues as it is not a quarantine responsibility. Both domestically produced and imported commodities are tested by Food Safety Australia New Zealand (FSANZ) to ensure they are within Australia's maximum residue levels (MRLs). AQIS Food Imports performs this function on behalf of FSANZ. Products for human consumption are sampled and tested on a random basis in addition to items where there is reason to suspect that there may be residue issues. Importers are advised to ensure that commodities meet Australia's MRL standards.

Health issues

Stakeholder comment: Why doesn't Plant Biosecurity consider health issues?

Biosecurity Australia's response: Human health issues associated with pests and diseases are considered where relevant. However, this is more likely in Animal Biosecurity IRAs or with imported foods.

IRA Handbook

Stakeholder comment: Has this IRA been conducted according to the "old" process described in the 1998 Import Risk Analysis Handbook or the "new" process described in the 2003 version of the Handbook? Will the appeal process be conducted according to the 2003 Handbook?

Biosecurity Australia's response: This IRA was initiated under the process described in the 1998 AQIS Import Risk Analysis Handbook. After the release of the 2003 IRA Handbook in August 2003, the longan and lychee IRA has proceeded according to the "new" process. However, this has involved a process of transition. For example, a technical issues paper (TIP) for an IRA is not required under the 1998 Handbook, but Biosecurity Australia released a TIP for this IRA to increase the consultation with stakeholders. The appeal process will be conducted according to the 2003 IRA Handbook.

Peer review

Stakeholder comment: Longan Association of Australia (LAA) requests that the IRA for longans be subject to Peer Review for two reasons:

1. The whole process of evaluating risk while quantified as much as possible still relies on value judgements. A peer review provides validation or modification of these judgements.

2. The whole subject of Risk Assessments when production is induced out of normal season is new. Presently if no data is available it is assumed that it is because there was none to collect. In this case there has simply, except in one case, been insufficient time to collect data on new production and management systems. A peer review would allow wider input into this issue and its importance.

Biosecurity Australia's response:

The IRA team has the option to consult with independent scientific peer reviewers if considered necessary during the preparation of the draft or final IRA. In this final IRA report, Biosecurity Australia has considered all stakeholders comments, and where appropriate, has incorporated them in the relevant sections.

There is no new published evidence or scientific information that requires a revision of the draft IRA report or the publication of a second draft. Biosecurity Australia has reassessed published literature and is confident that no significant information pertaining to pests and diseases of longans and lychees in China and Thailand has been omitted.

The reports are already peer reviewed internally by Biosecurity Australia and DAFF. The IRA report will be peer reviewed by external experts if deemed necessary by the Executive Manager of Biosecurity Australia. As no significant and relevant technical information has been omitted, Biosecurity Australia does not consider that any additional work needs to be commissioned.

Biosecurity Australia is committed to ensuring that all IRAs are scientifically sound. This includes checking and verifying all scientific references used in these documents. The risk assessment has been conducted in accordance with the risk analysis guidelines and other current IRAs.

Comment is sought from the scientific community on pests and diseases during the process and state department of agriculture researchers provide further comments as stakeholders. Where pest information is relevant to off-season production it has been noted by the industry and scientific community and incorporated into the pest lists and risk assessment in the IRA. These are existing pests, some already present in Australia and either not on the pathway or already adequately considered in the IRA.

Economic factors

Stakeholder comment: The timing of longan import seasons especially Thai producers exporting outside the normal season may drive the Australian export and domestic prices down to uneconomic levels for Australian producers and cause the demise of the longan industry and growers in NSW and Queensland.

It is accepted that economic and social factors are not recognised as a basis for restricting imports; however, pest and disease risk associated with out of season production warrants import conditions limiting the season of import.

Biosecurity Australia's response: Economic factors resulting from the adverse impact caused by pests and diseases are considered under consequences in the IRA process. The IRA process is concerned with assessing the quarantine risks (i.e. pests and diseases) associated with the importation of plants and plant products into Australia and any consequences related to the entry, establishment or spread of a pest, not economic losses due to competition with the domestic industry. The economic/trade-related impact of imports on the Australian longan industry is not a quarantine issue nor within the scope of the import risk analysis process.

A response to limiting the import season is provided later in this section.

Methodology and exclusion of pests

Stakeholder comment: Citations in recent IRAs for presence on the pathway have not been restricted to direct references to the country of origin. For example, CAB International 2001 is used to show presence or absence from the pathway. The 2003 IRA Handbook states that Biosecurity Australia is committed to conservatively categorising pests and diseases and where there is any doubt they are to be included in the assessment. In order to be consistent, pests in this situation should be considered further. This type of inconsistency reduces transparency and scientific rigour of the documents and may reduce stakeholder confidence in the IRA process.

Biosecurity Australia's response: Biosecurity Australia uses a range of sources in determining known or likely pests associated with a commodity. Reliance on the current authenticity and reliability of these sources may vary subject to the commodity, the country under consideration and completeness of information about the pest group and particular species. Thus, some reference sources are more appropriate than others. Determining presence or absence from the pathway for a specific host from a specific country from a key source such as CAB International Crop Protection Compendium is not always possible if the pest has a wide unrelated host range and may affect different plant parts on different hosts. Where possible BA seeks and uses alternate references which relate specifically to the commodity, plant part affected and the country to substantiate the pathway association.

Justification of changes to pest categorisation

Stakeholder comment: The inclusion of the section 'Changes to pest categorisation' was a welcome addition to the draft IRA. The transparent manner and justification for differences between the pest list provided in the TIP and the draft IRA is greatly appreciated and such information should be included in future IRAs.

Biosecurity Australia's response: Biosecurity Australia will identify and justify changes made to the draft IRA report in the final IRA report where relevant in response to stakeholder comments.

Corrections and additions to pest lists and pest data sheets

Stakeholder comment: There were a number of suggested corrections and additional technical information provided on certain species of arthropod and fungal pests.

Biosecurity Australia's response: Biosecurity Australia appreciates the provision of the additional information on pests and omissions or corrections. This information was combined with the additional revisions undertaken by Biosecurity Australia on the pest lists, pest data sheets and pest risk assessments for the final IRA. A number of revisions have been made on the status of pests in Australia (including regional differences), China and Thailand and their presence on the pathway. Additional information has not been incorporated into the final IRA report where Biosecurity Australia did not consider it technically justified.

Volumes and season for imports

Stakeholder comment: Have China and Thailand given any indication of the volumes of fruit they intend to export or the times of year when the imports are most likely to occur?

Biosecurity Australia's response: Neither China nor Thailand has given any indication of the likely volumes of fruit for export. It is not feasible for the importing countries to provide this information at this stage. Seasonal fluctuations in yield, quality and price of fruit and available domestic and export market demand will influence volumes. The likely quantities of fruit to be imported is determined by commercial decisions based on market forces. Both countries would expect to export fruit within their respective harvest seasons, as specified in the draft IRA.

Inclusion of interception data and volumes of trade

Stakeholder comment: The inclusion of interception and volume of trade data in association with the risk management measures implemented for each pathway may assist stakeholders considering these documents.

Biosecurity Australia's response: Information based on interception data may be included in IRA's where the information is freely available from the countries concerned and is specifically applicable and appropriate to the IRA. This is not always the case. Interception data where there is no existing trade is restricted to illegally imported fruit/plants intercepted mostly from passengers and is not indicative of commercial legally imported fruit. Volumes of trade in the commodity by the country to existing markets can be included but are not always available or reliable.

Interstate quarantine arrangements

Stakeholder comment: Suggest a change to wording regarding regulations under ICA and inclusion of management conditions for European red mite, melon thrips and spiralling whitefly for entry into Western Australia (WA). Western Australia accepts ICA-01, ICA-02, ICA-04, ICA-07 and ICA-13 but does not accept ICA-14.

Biosecurity Australia's response: The wording relating to domestic arrangements has been simplified in the final IRA report. Biosecurity Australia acknowledges that Western Australia accepts ICA 1, 2, 4, 7 and 13 but not does not accept ICA 14. Also that, Western Australia (WA) is concerned about European red mite (*Panonychus ulmi*), melon thrips (*Thrips palmi* Karny) and spiralling whitefly (*Aleuroides dispersus*). WA management measures for these pests are pest free areas, property freedom or fumigation. Further information is available in Schedule 1 of the WA *Plant Diseases Regulations 1989*. These measures are currently under review. All other pests of concern are dealt with via inspection under the WA *Plant Diseases Act 1914*, Sections 13 and 23.

ARTHROPOD PESTS

Bactrocera papayae

Stakeholder comment: Why was *Bactrocera papayae* not included on the pest list for longan and lychee from Thailand, given that it is present in Thailand and other species of the *Bactrocera dorsalis* complex are considered? Longans are grown in tropical, southern regions of Thailand e.g. Chanthaburi, so *B. papayae* may be a risk in these areas. This pest is often regarded as more difficult to control than the other two flies included in your pest risk assessment but should be controlled by the cold treatment.

Biosecurity Australia's response: *Bactrocera papayae* has never been recorded on longan or lychee in Thailand, so Biosecurity Australia is unable to include this species on the pest list for Thailand. In addition, records show that the distribution of *B. papayae* in Thailand is restricted to the southern peninsular area around the Malaysian border, where there is no commercial production of longans or lychees. Cold disinfestation treatment at the specified temperature and duration for *B. dorsalis* on longans would ensure that there would be no live fruit fly larvae in exported fruit.

Reclassification of *Xylotrupes gideon*

Stakeholder comment: *Xylotrupes gideon* has recently been reclassified into five separate species, one of which is present in south-east Asia. Will Biosecurity Australia consider this species in the IRA?

Biosecurity Australia's response: The taxonomic information provided on *Xylotrupes gideon* is included in the final IRA. *Xylotrupes gideon* was considered as a quarantine pest due to its absence from WA. However, new taxonomic information (Rowland, 2003) identifies this taxon as consisting of five distinct species based on morphology and geographic isolation. The species found in south-east Asia and China is *X. mniszecki* while the species found in Australia is *X. ulysses.* As *X. mniszecki* is not known to be present in Australia it is therefore a quarantine pest Australia wide.

Mealybug species not present in China/Thailand

Stakeholder comment: Although mealybugs are known to be associated with longan and lychee in China and Thailand, no reference could be found in ScaleNet, 2001 or CABI Crop Protection Compendium regarding *Pseudococcus jackbeardsleyi* and its association with fruit of lychee in China or of *Planococcus lilacinus* and its association with either longan or lychee fruit in China and Thailand. No papers or data indicate that they are distributed in the major Chinese production areas of longan and lychee (Guangdong, Fujian and Hainan Provinces and Guangxi Zhuang Autonomous Region) only Chinese Taipei.

Biosecurity Australia's response: Biosecurity Australia agrees that the reference for *Pseudococcus jackbeardsleyi* and *Planococcus lilacinus* in Scalenet and CAB International is for Taiwan and not mainland China. There is also no specific evidence that although *Planoccoccus lilacinus* is present in Thailand (Scalenet, 2001) and listed as a host of lychee, that it is recorded on lychee in Thailand. These two mealybugs have been removed from the final IRA for both countries. Neither of these pests is present in Australia, the entry on ScaleNet refers to countries within the Australasian region, not Australia itself.

Stem pests of longan

Stakeholder comment: The 10-15 cm length and 3-4 mm diameter peduncle associated with longan fruit should be treated as a stem and any pest species associated with stem material may be potentially associated with the fruit pathway, this view is consistent with Stewart *et al*. (1999) considering the importation of longan fruit with stems. Comments and references to the pathway association should clearly state the non-association of the pest with fruit as well as stem material. Although some pest species would be more reasonably associated with larger diameter stems or branches or with new stem and leaf growth rather than the 3-4 mm diameter stems associated with longan fruit or the mature fruit peduncles, pests associated with the fruit/peduncle should be reassessed to better consider pests associated with peduncle (fruiting stem) material.

Biosecurity Australia's response: Stewart *et al* (1999) is the USDA (1999) reference used in the draft IRA report. Pests associated with the longan fruit alone were compared with those associated with the longan fruit including 'branch/stem/twig, but not new growth' in Appendices 2 and 3 of the technical issues paper. Further research on these pests resulted in the removal of many of these pests from the longan fruit panicle pathway as defined by the size of the panicle stem. Some of the stem pests included in the USDA pest risk analysis proved not to be on the fruit or panicle pathway at all and these have been rechecked. The heading in Appendix 1 of the final IRA report has been better defined in the final IRA to indicate that it includes the three pathways (lychee detached fruit; longan detached fruit; longan panicles).

Biocontrol agents on the fresh fruit pathway

Stakeholder comment: The apparent assumption that because a species is a biocontrol agent it is not considered to be present on the fruit pathway (Appendix 1 of draft), is not correct. Biocontrol agents have the potential to be present on the fruit pathway if their target host can be present on the fruit pathway. Examples of this can be found in interception records (AQIS, 2001) associated with stone fruit from New Zealand, where many biocontrol agents such as mites have been intercepted on the fruit pathway. The pathway association of the biocontrol agents should be reviewed, based on the interception of biocontrol agents on imported fruit.

Biosecurity Australia's response: Biosecurity Australia would review the pathway association of biocontrol agents intercepted on commodities that currently have access into Australia, such as stone fruit. There are no records of any interceptions of biocontrol agents on fresh longan or lychee fruit into Australia as none have entered under current conditions. To follow the suggested path of assessing all possible and potential biocontrol agents on the longan and lychee pathway would be construed as being trade restrictive and counter productive.

DISEASE PESTS

Pathway association of longan pathogens

Stakeholder comment: Clarification of the pathway association of a number of pathogens associated with longan production in China is sought, specifically *Leptosphaeria guayuan, Leptosphaeria longan, Marssonia euphoriae, Pestalotiopsis pauciseta*, and *Phomopsis guayuan* (Zhang and Qi, 1996). Of interest is the USDA pest risk assessment, where these pathogens are considered to be associated with the importation of longan fruit with stems from China based on China's pestlist and Zhang and Qi (1996).

Biosecurity Australia's response: Biosecurity Australia determined through translation of the pertinent paper that these pathogens were only associated with the leaves of longan and not with the fruit pathway.

Cylindrocladiella disease (*Cylindrocladiella peruviana*)

Stakeholder comment: Although Crous and Wingfield (1993) treated *C. peruviana* as a synonym of *C. camelliae*, Crous (2002) accepted *C. peruviana* as a separate species based on molecular work of Victor *et al*. (1998) and Schoch *et al*. (2000). However, Crous (2003) did not list lychee or longan as hosts of *C. peruviana*, listing lychee as a host of *Gliocladiopsis tenuis* only. The list uses Peerally (1974) as a source of information on economic importance but this data relates to *C. camelliae* and it is likely that *C. peruviana* may behave significantly differently. Consequently, much of the discussion of the biology of *C. camelliae* in the draft IRA may be regarded as irrelevant.

Biosecurity Australia's response: Biosecurity Australia acknowledges that the literature concerning the taxonomy of this species has changed in the past decade based on molecular work but that *C. peruviana* had at one stage been considered in synonymy with *C. camelliae*. This information was included in the draft IRA report for transparency as *C. camelliae* is present in Australia. China listed *Cylindrocladiella peruviana* as a pathogen of longan fruit (CIQ, 2000); however there is little or no information in the literature on this pathogen on longan indicating its lack of economic significance. The pest data sheet and pest risk assessment have been revised according to Crous (2002).

Phomopsis longanae

Stakeholder comment: As there are many unidentified species of *Phomopsis* recorded on longan and lychee in Queensland it could be argued that these may in fact be the *Phomopsis* species recorded in China and Thailand.

Biosecurity Australia's response: *Phomopsis* sp. recorded on longan and lychee in Australia may or may not be the same species as the specific species *P. longanae* identified from China

Phytophthora palmivora MF4

Stakeholder comment: The taxonomy of *Phytophthora* is currently undergoing significant change due to molecular techniques. It is likely that the "strain" of *P. palmivora* on litchi in Thailand is genetically distinct from strains of *P. palmivora* on other hosts in Australia. Introduction of this strain could have significant ramifications for Australian horticulture.

Biosecurity Australia's response: *Phytophthora palmivora* is present in eastern Australia but is absent in WA and therefore included as a quarantine pest. To consider *P. palmivora* as a quarantine pest for Australia as a whole on the basis of distinct strains requires that Australia can provide evidence that the strains are distinct and that they differ in their pathogenicity. Moreover, infected fruit would be easily detected during the post-harvest handling because of the obvious symptoms on the fruit.

Pseudoperonospora spp.

Stakeholder comment: Why is the fungal disease, *Pseudoperonospora* sp. not listed as a quarantine pest, as it is not listed in the Australian Plant Pest Database (APPD) on any species of Sapindaceae. As there are many Australian plants in the family Sapindaceae, this appears to be a potentially significant risk to the environment and warrants further investigation by BA.

Biosecurity Australia's response: According to the Australian Plant Pest Database, two species of *Pseudoperonospora* are present in Australia – *P. cubensis* and *P. urticae*. Biosecurity Australia has reassessed *Pseudoperonospora* sp. and carried it forward to Appendix 2. It has been eliminated as a quarantine pest on the basis that there is a lack of information on this pathogen on longan in China because of its lack of economic significance and because no studies were warranted on its biology or control on longan, hence no published work. The only reference to this pathogen was obtained from the pest risk analysis on longan from China conducted by the USDA.

Skierka nephelii.

Stakeholder comment: The leaf rust *Skierka nephelii* was not considered to be included in the pathway for lychees because it does not infect fruit. This fungus should be considered further as most rusts produce such abundant propagules that all fruit from infected trees would have to be assumed to be contaminated with spores of the rust. The risk of importing contaminated fruit and the likelihood of the spores infecting healthy lychee trees needs to be considered.

Biosecurity Australia's response: *Skierka nephelii*, although likely to be on the leaves of lychee trees was not considered to be on the pathway of lychees. The rust does not affect the fruit directly; therefore, any rust spores would merely be hitchhikers and would be dislodged during the process of harvesting, sorting, washing and handling.

PRODUCTION AND PACKAGING PROCEDURES IN CHINA AND THAILAND

Production and packinghouse procedures

Stakeholder comment: Biosecurity Australia needs to specify and describe the production and pack house procedures that are carried out in China and Thailand. The IRA does not provide information on these processes. How do you know if packing sheds have adequate systems in place?

At the stakeholder workshop held in Cairns 30 September 2003, stakeholders requested more details of the standard commercial practises in the production of longan and lychee and packinghouse procedures in China and Thailand.

Biosecurity Australia's response: Biosecurity Australia has been provided with general information on the production systems and harvesting and packinghouse procedures in China and Thailand some of which has been included in the technical issues paper and the draft IRA report. Further information provided by China and Thailand on request is included below.

Additional information on longan and lychee fruit production, harvesting and handling in China and Thailand

China

Longan
Commercial export varieties of longan are 'Shujia', 'Chuliang' and 'Wuyan'. Potassium/sodium chlorate is not commonly used for off-season flowering inducement in proposed longan export orchards. The longan panicle stem length is 30-60 mm. Where longans are exported as individual mature fruits the stems are cut carefully by workers to reduce damage to the skin of the longan.

Lychee
Commercial export varieties of lychee are 'Sanyuehong', 'Baitangyin', 'Heiye', 'Guiwei', 'Nuomici', 'Huizhi', 'Baila' and 'Feizixiao'.

All longan and lychee fruit are sourced from orchards where the use of pesticides is supervised and residue levels checked periodically during maturation and prior to export. During the ripening season heavily laden branches are supported by wooden props to prevent contact with the ground. The longan panicles and lychee bunches are cut from the tree or broken by hand. Clean and healthy fruit is picked into bamboo baskets placed on plastic sheets to prevent contact with the ground.

Leaves and small branches are removed and separated from the panicles and any remaining defective fruit are removed during the sorting procedure in the packinghouse. Fruit is sorted for quality and size according to the requirements of importers. Fruit is then washed by hand or mechanical means (fungicidal solution) and air-dried or by fan in the cold room. Fruit is stored at 2°C, moved by refrigerated transport and washed by cold water prior to cold treatment/VHT. Sulphur dioxide treatment is not used for longan or lychee prior to cold treatment. Pre-export cold treatment for quarantine pests is usually the preferred option for export fruit. Plastic containers or foam boxes are used to prevent reinfestation of treated fruit during storage and transport. (CIQ, 2000; AQSIQ, 2003c).

Thailand

Longan

Longans are harvested at full maturity indicated by a change in colour and optimal sweetness. The entire fruit bunch is cut from the tree accessed by bamboo ladders. The freshly harvested bunches are packed in bamboo or plastic baskets, transported to a collection site in the shade before moving to the grading shed.

After grading the bunch is trimmed to 15 cm and non-standard fruits removed. If individual fruits are intended, the fruit stalk must be less than 2mm. After grading, sorting and trimming the bunches, or individual fruits, are laid in 10-kg plastic baskets lined top and bottom with sponge and pre-cooled by dipping in 2-5°C water for 10-15 minutes They are allowed to dry before packing.

For exports of longans to some existing export markets the DOA has the regulation of export and requires that the exporter be registered and have a certificate of pesticide residues (including sulphur dioxide) which meets the requirements of the importing country.

Lychee

Lychee fruits are harvested when 50% of the fruits are red or the protuberances are wide, usually about four months after flowering. The main stem is cut about 10 cm behind the fruit clusters, packed in bamboo containers and taken to the packinghouse. Fruit are graded and sorted and stems/stalks cut according to the requirements of the importing country. The export fruit is packed into plastic cartons or 10 kg containers .

Off-season production

Thailand produces longans during the “off-season” in parts of the Saraburi, Petchaburi, Songkhla, Yal, Nakhon Si Thammarat and Chantaburi Provinces using special cultivars, especially ‘Phet Sakhon’ and ‘I Do’. There are also new plantings in the central and northeast of Thailand producing early crops of fruit (Anonymous, 2003). There were exports of longan from these regions to Taiwan, China, Indonesia and Hong Kong in January-February 2002 and 2003 (DOA, 2003c). Some early-fruiting lychee cultivars are produced in Samut Songkhram Province and Bangkok during January and February (Chomchalow and MacBaine, 2003; DOA, 2003c).

Adequate packinghouse systems

Stakeholder comment: How do you know if packing sheds have adequate systems in place?

Biosecurity Australia's response: Export of fruit would only be permitted from orchards, packinghouses and facilities that can meet the requirements of the proposed import conditions. Both China and Thailand have experience in the export of longan and lychee and/or other fruit to countries requiring quarantine measures and providing phytosanitary certification. Packing sheds will require registration and auditing by the NPPO.

Detached longans

Stakeholder comment: Industry questions the proposed importation of detached longan fruit and is concerned that the removal of the panicle would result in damage to the fruit, which would increase the risk of pests and diseases.

Biosecurity Australia's response: Biosecurity Australia has not specified the length of stalk for detached longan fruit, only the maximum size of fruiting stem for fruit on stems (10-15 cm in length and 3-4 mm in diameter. Any damage caused by removal from the panicle may result in shortened shelf life or downgraded quality but would not affect the quarantine status.

Use of flowering-inducing chemicals for out-of-season production in Thailand

Stakeholder comment: The draft IRA report fails to recognise that longans can and are grown all year round in Thailand through manipulation of flowering with the use of potassium chlorate. Given that the technology is readily available and simple then it is safe to assume that the longan harvest period will also be extended in China.

This is a fairly recent phenomenon and its impact is not recognised in the pest data collected by Plant Biosecurity that only applies to naturally producing orchards. Other pests not presently regarded as pests of longan grown in normal times of the year, under induced conditions and different climatic pressures may become risks. Until risk levels have been properly documented, current pest risk evaluations should be regarded as suspect. Given the unknowns, importing longans from either of these countries outside the natural growing times is a risk that is not possible to evaluate at this time.

Biosecurity Australia's response: Potassium chlorate, potassium nitrate, sodium hyperchlorite or stem cinqturing/girdling and other methods are used and trialed in Thailand and other countries to induce reliable flowering within the normal season, to extend flowering or to allow flowering outside of the normal season for the region or in new regions. Longans are sub-tropical species and have cold requirements which are not always met in tropical environments. Induced flowering by chemical or mechanical means enables longans to produce fruit under more tropical conditions.

The pest data used in the IRA for Thailand is up to date and reflects the pests of longan recorded in producing longan orchards regardless of the production time. Potassium chlorate and other chemicals have been in use for this purpose for the past six to seven years and under trailing by the DOA in Thailand. BA acknowledges that as with “normal” production some pests may be more/less prevalent or more/less serious depending upon seasonal conditions, the varieties grown and the orchard management practices, and has taken this issue of ‘extended’ or ‘induced’ seasonal production into account. The pest lists in the IRA relate to pests associated with longans in Thailand and China and include any pests recorded on longans in Thailand regardless of the time of flowering and fruit setting and maturity.

The import conditions outlined in the draft IRA are currently adequate to address any pests that may be of concern on longans produced outside of the main season or in newer areas. At anytime that information becomes available to indicate that the risk profile for longans has changed, appropriate action will be taken to review the policy. This would include information from the literature, the NPPO audits and records, or any interception of pests during pre-export or on-arrival inspection. Biosecurity Australia will review the policy after the first 12 months.

Literature on potassium chlorate

Stakeholder comment: There is concern that information about pests and diseases risk levels for all year round production is not yet available in the literature. Because little information is available is not, in this case, a demonstration of no risk. Plant Biosecurity is recommended to consider the literature on the use of Potassium Chlorate as it may contain more information than what has been presently revealed.

Biosecurity Australia’s response: The use of potassium chlorate and other flower-inducing agents were discussed widely at the 2nd International Symposium on Longan, Lychee, Rambutan and other Sapindaceae Plants in Chiang Mai, Thailand in August 2003 attended independently by an officer from Plant Biosecurity, an officer from QDPI and various Australian growers of Sapindaceae fruits. There were no reports of additional or new pest problems related to the use of these flowering-inducing practices.

Pests of young fruit

Stakeholder comment: Orchards in southern Thailand may have up to four different blocks of trees at different stages of production due to the inducement of flowering with potassium chlorate so trees with immature or young fruit could be along side trees with mature fruit. Pests removed from further consideration because they were only associated with young fruit should all be reinstated unless certain extra import conditions are added. *Aceria dimocarpi* is one such example plus several Lepidoptera species such as *Archips asiatica, A. tabescens, Euproctis scintillans, Homona coffearia,* and *Hypatima longanae.*

Biosecurity Australia's response: Biosecurity Australia has considered seasonal factors such as induced production where it is relevant to the pest and disease risk of longans and lychees produced in Thailand and China. Pests that are recorded on young fruits only are unlikely to attack mature fruits. The pests *Aceria dimocarpi*, *Archips asiatica, A. tabescens, Euproctis scintillans* and *Hypatima longanae* are recorded on longan and/or lychee in China not Thailand. *Homona coffearia* is recorded on leaves of longan and lychee in Thailand but never on fruit (DOA, pers. comm. 2003), and in China affects only young fruit causing premature drop.

Harvest periods

Stakeholder comment: Information on harvest periods for longans in Thailand and China in the draft IRA report are wrong. Thailand can and does produce longans all year round and for the past three years Thai longans have been exported to Asian markets during the Australian season.

Biosecurity Australia's response: The harvest periods provided by the Thai and Chinese authorities for consideration in the import risk analysis reflect the likely harvest periods for the bulk of their intended export product to Australia.

Contamination from the ground

Stakeholder comment: Longans and lychees may come into contact with the ground during the picking/production process and therefore may be contaminated with other pests.

Biosecurity Australia's response: Such pests would be considered as hitchhikers and unlikely to be recorded pests of the fruit pathway. Any pest, soil or plant matter would be eliminated through the combined process of sorting, trimming, cleaning, treatment and inspection. Export fruit is required to be free of quarantine pests and contamination by soil or other plant matter.

PEST RISK ASSESSMENTS

Extreme risk category

Stakeholder comment: Could Biosecurity Australia give an example of a pest or disease that would be given the risk estimate of **Extreme**?

Biosecurity Australia's response: The risk estimation matrix is used for import risk analyses for both plant and animal products. The **Extreme** risk category is more relevant to IRAs on animal products as these take into consideration, diseases that may result in mortality or cause widespread harm to human life or health as with mad cow disease (BSE) or to trade and social implications as with foot and mouth disease (FMD).

Unrestricted risk scenario

Stakeholder comment: The draft IRA's Risk Assessment section makes assessments of the unrestricted risk estimate for a number of pests and diseases. Under the section on probability of importation for many pests such as leaf rollers, Cylindrocladiella, litchi brown blight, and fruit blotch, it highlights the impact of inspection on the import risk. However inspection is also used as a method of risk management brought into play after an unrestricted risk assessment is made. The way Plant Biosecurity has made the assessment is therefore incorrect being not a reasonable estimate of the unrestricted risk estimate for these pests.

Biosecurity Australia's response: In determining the unrestricted risk estimate for a pest, BA considers all known standard commercial practices in the field and packinghouses e.g. in-field pest and disease management, cultural practices, harvesting, transportation and sorting, cleaning and grading procedures. Many of these harvesting, sorting and grading practises relate to quality control i.e. culling of diseased, infested, damaged or undersized fruit. This does not constitute an inspection for specific pests as a management measure and are not 'phytosanitary inspections' as described under the 'Risk Management' section.

Knowledge of production, harvesting and packaging methods

Stakeholder comment: The pest risk assessment section could be strengthened by including all aspects related to unrestricted risk, including the management activities routinely practised in China and Thailand that are considered normal commercial practice. Additional information on the commodity being imported, including the production and harvesting methods in China and Thailand, how the fruit is inspected and graded prior to packing, routinely washed and treated, packed and stored prior to shipment, shipped and stored during transport, handled, stored and distributed on arrival in Australia, and how the various quarantine objects (including packaging) are treated in Australia before disposal is required.

Biosecurity Australia's response: The pathways for the market access of fresh longan and lychee fruit to Australia have been determined and defined by Biosecurity Australia in the scope of the IRA. Fresh longan fruit is mature detached fruit or mature fruit on the panicle (fruiting stems 10-15 cm in length and 3-4 mm in diameter) of *Dimocarpus longan* Lour. and fresh lychee fruit is mature detached fruit of *Litchi chinensis* Sonn., excluding other plant parts. The produce will have been cultivated, harvested, packed and transported to Australia under commercial conditions.

Many of the details suggested such as fruit packaging and storage prior to shipment and shipping and storage under transport are commercial decisions and would be based on compliance with the import conditions outlined in the draft IRA following the risk assessment and proposed risk management options and are therefore not part of the unrestricted risk considerations.

Probability of importation and phytosanitary certification

Stakeholder comment: The probability of importation appears not to have taken into consideration that the mandatory issuance of a phytosanitary certification for all fresh fruit exported to Australia would involve inspection at some level by the exporting NPPO and that this would impact on the probability of importation. While it is acknowledged that this inspection may not necessarily follow AQIS standards, it would certainly reduce the probability of importation to at least a rating of **Very Low** in order for the phytosanitary certificate to be of any value.

Biosecurity Australia's response: Unrestricted risk scenario for risk assessment assumes commercial fruit production, handling and packaging which will include sorting and quality control. The unrestricted risk scenario does not include specific inspection for freedom from specific pests or phytosanitary certification which is part of the proposed supporting operational maintenance systems and verification of phytosanitary status.

Inconsistency of consequence assessment

Stakeholder comment: The section that identifies consequences of a pest's entry, establishment or spread, is difficult to interpret because of the inadequacies of the pathway descriptions. The section often invokes technical issues irrelevant to the epidemiological factors important to the pathway step under consideration and judgements on consequence that are not consistent with other IRA's conducted recently by Biosecurity Australia and, in particular, in relation to mealybugs.

Biosecurity Australia's response: IRA's recently conducted by Biosecurity in relation to mealybugs have assessed the consequences for mealybugs consistently as **Low** and the probability of entry, establishment and spread as **Moderate** resulting in an unrestricted risk of **Low**. The risk management measure for mealybugs is visual inspection except in the case of mangosteens where visual inspection alone is not considered adequate to detect mealybugs hiding under the calyx.

Unrestricted risk and ALOP

Stakeholder comment: The section of the draft IRA that specifies whether the resulting risks require mitigation may need revision if all existing management practices were included within the unrestricted risk estimate.

Biosecurity Australia's response: Biosecurity Australia does not consider that existing management practices significantly alter the current assessment of probability of entry, establishment and spread or the consequences and the resulting unrestricted risk estimate of the quarantine pests. Specific comments provided by stakeholders on the risk assessments have been considered.

Consequences

Stakeholder comment: Is the assessment of consequences based on shipments/consignments?

Biosecurity Australia's response: The assessment of consequences is based on the scenario of the potential pest having entered, established and spread in Australia.

ARTHROPOD RISK ASSESSMENTS

Scarab beetles

Stakeholder comment: BA's assessment discounts the likelihood of importation (as **Negligible**) and therefore does not proceed further with the pest risk analysis. Some of these eight scarab beetle pests have a very wide host range including temperate fruit trees and vines, they can feed on fruit, and some are closely related to the notorious Japanese beetle (*Popillia japonica*) which is a significant introduced pest throughout North America. Most of these pests are much smaller than the 5-7 cm indicated and therefore not as obvious when consignments are inspected. The close relationship to Japanese beetle is indicated by the fact that *P. quadriguttata* has apparently been mis-identified as *P. japonica* in Korea. It is likely that only one gravid female would be required to introduce this pest in a consignment. The consequences of introduction are very significant eg. numerous host plants, significant damage to turf, and possible displacement of native flora and are at least **Moderate.** Specific risk management measures should be considered.

Biosecurity Australia's response: The importation pathways considered by Biosecurity Australia for these scarab beetles are lychee and longan fruit from China. Scarab beetles mostly feed on leaves and flowers and only occasionally on fruit. They are highly mobile and although the species vary, adult scarab beetles are generally medium to large in size and thus easily seen on the fruit. Biosecurity Australia has reassessed the probability of importation and distribution. The pest risk assessment has also been followed through to completion for further clarity in the final IRA report. Biosecurity Australia acknowledges the wide host range of some of the listed beetles, such as *Popillia quadriguttata,* under consequences. However, the unrestricted risk is below the ALOP and therefore no risk mitigation measure is required.

Scarab beetles - Probability of distribution

Stakeholder comment: Although scarab beetles are unlikely to be found on waste material, there are other points on the fruit pathway where they may enter the PRA area, such as at wholesale points, retail points and in transit. Due to the high mobility and wide host range of quarantine scarab beetles as a group, these alternative entry points to the PRA would be a more likely source of infestation than from waste material. A likelihood of **Moderate** would be a more appropriate assessment of the probability of distribution for scarab beetles. The efficient assessment of scarab beetle as described in the draft is acknowledged.

Biosecurity Australia's response: Biosecurity Australia has reassessed the probability of distribution in recognition of the mobility of these beetles. As acknowledged, this does not alter the probability of entry establishment or spread.

Fruit flies as conditional non-host

Stakeholder comment: The entry risk from fruit flies is **Low.** The data currently in publication in Australia and Thailand show that lychees are a conditional non-host to fruit flies of the genus *Bactrocera*. Lychees are not a host when they are not over ripe and have an unbroken skin. The only risk is when the lychees are starting rot and the compounds that suppress emergence of pupae are decaying and are ineffective against the larvae. (P. Leach, pers. comm. 2003). Fruit flies are not an economic pest of lychees. Our experience as farmers is that no control measures are used in orchards in Thailand, China or Australia, as they are unnecessary. Fruit fly protocol for the trade in lychees, where published host testing data shows conditional non-host status, should be based on an unbroken skin and maturity index protocol similar to the accepted Australian trade protocol of ICA 13.

Biosecurity Australia's response: BA is unaware of any scientific data to date supporting conditional non-host status of longan and lychee for *Bactrocera dorsalis* in China or Thailand or of lychee for *B. cucurbitae* in Thailand. Although China considers *B. dorsalis* only as a host of longan and lychee on damaged or rotting fruit, no data has been provided to substantiate this claim. Particular fruit fly species may not be economic pests of lychees in production areas; however, they are undisputed economic pests of a range of other horticultural products, have severe implications for the export of horticultural produce around the world and thus the direct and indirect consequences to Australia are **High**. Together with a **High** probability of entry, establishment and spread the unrestricted risk is **High.** The USA and Japan require risk management treatment (cold disinfestation, VHT, hot water treatment or irradiation) for *B. dorsalis* and *B. cucurbitae*. The accepted Australian trade protocol of ICA 13 (unbroken skin) for interstate trade in longan and lychees is based on *Bactrocera tryoni* (Queensland fruit fly) and previously for *B. papayae* prior to its eradication.

Consequences of fruit flies

Stakeholder comment: The indirect consequences at the regional level (**E** rating) for eradication and control of fruit flies should be consistent with all IRAs.

The environmental consequences of the fruit flies should be reassessed as they may present threats to Australia's natural ecosystem.

Biosecurity Australia's response: Biosecurity Australia maintains the **E** rating for eradication and control under the indirect consequences for fruit flies, and it is consistent with current IRAs for similar species of fruit fly.

Environmental consequences of fruit flies (*B. dorsalis* and *B. cucurbitae*) were considered in the assessment of overall economic consequences in accordance with ISPM guidelines *No 11. Pest risk analysis for quarantine pests including analysis of environmental risks.* The economic aspects of the potential environmental effects referred to are adequately included under the assessment of economic consequences.

Mealybugs and soft scales - Probability of importation & distribution

Stakeholder comment: *Importation:* The probability of importation for mealybugs and soft scales would be **Very Low** (see Probability of importation and phytosanitary certification under Pest Assessments stakeholder comments). It is acknowledged that this would change the overall unrestricted risk estimate from **Low** to **Negligible** and that the application of additional risk management measures is unnecessary.

Distribution: Mealybug crawlers are only active for less than a day and only the immature or crawler stage of soft scales has any capability to move off the fruit as the adult female is immobile, further limiting the movement onto a host. The typical inter-host dispersal mechanisms (wind borne, mechanical or other insects) would be greatly diminished from discarded longan and lychee fruit or any other part of the pathway and should be **Low**. This would change the unrestricted risk assessment to **Very Low** and the application of additional risk management is unnecessary.

Biosecurity Australia's response: The **High** probability of importation of mealybugs and soft scales on longan or lychee fruit or panicles is maintained in the final IRA. Soft scales are often detected on inspection of Australian longan fruits for export (Stakeholder comment, pers. comm. 2003). *Planococcus litchi* has been intercepted on lychee fruit into the United Kingdom and USA (Cox, 1989). The unrestricted risk scenario does not include specific inspection for freedom from mealybugs or phytosanitary certification which are part of the proposed supporting operational maintenance systems and verification of phytosanitary status.

Biosecurity Australia also maintains that the probability of distribution is **Moderate** due to the survival ability of this pest group and its association with the waste material. The risk management measure of inspection for mealybugs and soft scales is considered necessary for detection of any of the quarantine mealybug and soft scale pests to ensure that these pests do not escape detection and removal during any washing, quality inspection or packaging steps.

Biosecurity Australia has rated the overall unrestricted risk of mealybugs as **Low** in all recent IRAs and therefore some form of risk mitigation measure is required. In the case of longan and lychee, pre-export inspection and on-arrival inspection is considered an adequate measure to mitigate the risk.

Mealybugs and scales - Consequences

Stakeholder comment: The results of the risk assessment indicate that the consequences and unrestricted risk estimates of mealybugs and soft scales are **Low**, but the assessments are not adequate to support risk management measures for these pests. Unlike the litchi fruit borers, whose larvae bore inside, the mealybugs and soft scales will be eliminated during the processes of washing and fresh keeping before packaging. We advise the removal of the inspection for the management of mealybugs and soft scales from the proposed Risk Management Measures.

Biosecurity Australia's response: The overall unrestricted risk of mealybugs and soft scales is **Low** and therefore above Australia's appropriate level of protection (ALOP), thus requiring risk management. Only unrestricted risks of **Very low** or **Negligible** do not require risk management measures (Table 1 Risk estimation matrix, page 21 draft IRA report). Inspection as a risk management measure for quarantine pests of mealybugs and scales is also proposed for other fruit imports into Australia such as citrus and grapes. Inspection for mealybugs and soft scales is necessary to ensure that none of these pests remain following standard commercial sorting, washing and packing procedures.

Stink bug – Probability of distribution

Stakeholder comment: The probability of distribution of **Moderate** for stink bugs has been assessed as similar to soft scales. An assessment of **High** would be more appropriate when taking into consideration the highly mobile nature of both the nymphs and adult stink bugs and their large host range. A reassessment of the probability of distribution will not change the unrestricted risk estimate; however, it would provide a more defensible risk assessment for this species.

Biosecurity Australia's response Biosecurity Australia has reassessed the probability of distribution in the final IRA in acknowledgement of the mobility of the nymphs and adults.

Lycaenid fruit borer *Deudorix epijarbas*

Stakeholder comment: Although fruit boring insects would predispose the fruit to rot, the reference cited Waite and Hwang (2002) does not indicate that this pest causes rotting of fruit.

Biosecurity Australia's response: Biosecurity Australia acknowledges that some of the information referenced as Waite and Hwang (2002) was actually from another Waite reference. Corrections have been made in the final IRA where appropriate. BA acknowledges that the reference indicates that the fruit is destroyed and did not intend to imply that infestation caused rotting but that it would be a likely outcome.

Stakeholder comment: Macadamia trees are also a host of *Deudorix epijarbas*. The consequences could extend to export trade and therefore the risk is **Moderate** rather than **Very low**.

Biosecurity Australia's response: *Deudorix epijarbas* is listed in the draft IRA as a quarantine pest for Western Australia. *D. epijarbas* is already present in Queensland. The probability of establishment and the indirect consequences of domestic trade have been reassessed in the final IRA report; however this has not altered the unrestricted risk estimate of **Very low** which is below Australia's ALOP.

Litchi fruit borer (*Conopomorpha sinensis*)

Stakeholder comment: The experience of Australian lychee growers is that in Thailand up to 80% of the fruit can be lost or rendered unsaleable due to this pest. In China, spray programs are needed to control this pest to insure the fruit is not damaged. *C. sinensis* is regarded as the most serious production pest of lychees in Asia by Waite and Hwang (2002). The probability of establishment should be rated as **High**. It has a high rate of reproduction. Lychee and longan trees occur from inner Sydney up the coast for 3000 kms to north of Cooktown providing enough host species to ensure the spread of this serious pest should they emerge from infected fruit. The escape of this pest would have immense production, trade and economic implications for the lychee industry therefore based on the Risk Estimation Matrix this pest should be rated as an **Extreme** risk.

Biosecurity Australia's response: The litchi fruit borer causes direct harm to a narrow range of host plants, longan and lychee. BA acknowledges that the direct consequences to plant health of these hosts may be significant at the local level and the indirect consequences to domestic and international trade in longan and lychee may be significant at the regional level. The implications for pest control were considered along with the other criteria. On this basis the consequences (direct and indirect) of the litchi fruit borer to Australia as a whole were assessed as **Moderate**. The risk assessment has determined the overall unrestricted risk posed by *C. sinensis* to be **Low** and thus above Australia's ALOP.

Therefore risk management measures of cold treatment or orchard control and targeted inspection are required to bring the risk below the ALOP.

Stakeholder comment: The probability of importation of the litchi fruit borer species should be **Very Low**. Infestations of litchi fruit borer would predispose fruit to rots in much the same way that lycaenid fruit borer does and infested fruit would be unlikely to be packed for export or would be detected by inspections involved in mandatory phytosanitary certification (see Probability of importation and phytosanitary certification under Pest Risk Assessments stakeholder comments). It is acknowledged that this would change the overall unrestricted risk estimate to **Very Low** and that the application of additional risk management measures is unnecessary.

The assessment **D** for the impact on international trade has been over estimated as this rating suggests that there would be significant impacts on international trade at the State level. A more defensible assessment would be **C** and that impacts to International trade may be significant at the district level such as areas within Queensland and New South Wales. It is acknowledged that this would change the unrestricted risk estimate to **Very Low** and the application of additional risk management measures unnecessary.

Biosecurity Australia's response: The risk assessment for litchi fruit borer does not assume that all infested fruit will have rotted and fallen from the tree. The entry tunnel of the larvae and frass although usually visible on the fruit, may be overlooked unless specifically looked for. The larvae are not as colourfully distinct as *Deudorix epijarbas* and reflect the colour of their diet. They will be hidden inside the fruit most of the time. A number of eggs are laid on the fruit and although visible may not be detected. The litchi fruit borer is a major pest of lychees and, to a lesser extent longans, in both China and Thailand and common in the lychee and longan producing areas. Indirect consequences to international trade were assessed as **D**, significant at the regional/State level, as this pest is of quarantine concern to potential export markets for Sapindaceae fruits such as USA and New Zealand. The USDA requires specific risk management measures for this pest in imports of longan and lychee from China and Taiwan.

Tortricid leaf rollers (*Adoxophyes* sp.)

Stakeholder comment: The probability of importation should be upgraded to **Low**, as eggs can be laid on fruit in masses and the fruit can contain larvae. Also the consequences should be upgraded to **Moderate** as there are many important potential hosts in Australia, and the export trade restrictions could be significant as *A. cyrtosema* is only recorded to occur in China.

Biosecurity Australia's response: Biosecurity Australia maintains the assessment of probability of importation as **Very low** as the pests are rarely found in orchards in China and the pests and damage is highly visible and unlikely to be included in fruit for export.

Biosecurity Australia has reassessed the indirect consequences on domestic trade in line with that of international trade; however, the wide host range has already been considered in the assessment and the consequences remain unaltered.

DISEASE RISK ASSESSMENTS

Cylindrocladiella disease

Stakeholder comment: The overall probability of entry, establishment and spread is presently assessed as **Low** as it is regarded as easily seen and normally associated with the soil; it should be **High**. In Thailand longans are packed into open plastic trays in the paddock on the ground under the tree and fruit is on the ground while excess wood is removed. This packing system will exacerbate chances of contamination. Picking up Cylindrocladiella disease through complete surface inspection of all fruit in a panicle would be difficult. In addition the pathogen has extensive sporulation on aerial mycelium and can be spread by wind or rain splash so probability of spread should be **High**.

The statements under indirect consequences – eradication, control are wrong. Longan growers, largely, do not use any pre or post harvest fungal treatments. Sulphur dioxide used to control skin colour, is only used by 4% of sheds. The overall result is that this disease moves into the **Low** category for unrestricted risk implying that risk management tools are needed for this disease.

Biosecurity Australia's response: *Cylindrocladiella* disease is present in China. The disease is not common on longan fruit in Chinese orchards and infected fruit with white mycelium, decayed or rotting would be easily visible during picking, sorting and grading. Reference to the presence of *Cylindrocladiella peruviana* on longans in Thailand on pg 224 of Part B of the draft IRA was an error and has been corrected. Similar *Cylindrocladiella* spp. are already present in Australia. The disease can be spread only locally by wind or rain splash and although it is adapted to a range of temperatures and hosts the probability of spread would still be **Moderate.**

The assessment of direct and indirect consequences considers not only longan and lychee but also other hosts and refers to pre- and post-harvest treatments in general. Biosecurity Australia has reassessed this indirect consequence in the final IRA report but this does not alter the consequences rating. The overall unrestricted risk remains as **Negligible**, thus not requiring risk management measures.

Lychee brown blight (*Peronophythora litchii)*

Stakeholder comment: The risk assessment by BA underestimates the significance of this pathogen and the disease it causes. The unrestricted risk estimate should be raised to **Low** (from **Negligible**), for the following reasons: The probability of spread should be increased to **Moderate** as plants, fruit and soil movement can spread this pathogen. It has been demonstrated to be transmitted on fruit exported from Taiwan to Japan by Kobayashi *et al.* (1986). This results in a probability of entry, establishment and spread of **Low**. The direct consequences should be raised to **D**, highly significant at a district level. This disease is one of the most important diseases of lychee in China and elsewhere (Menzel, 2002; Kao and Lou, 1980). In addition, the effect on the environment is discounted, yet control in China includes the use of soil fungicides such as copper (0.2-0.3%) and others which are know to persist in the environment. This is in addition to up to 6-7 sprays of trees during the growing season. The importance of this pathogen is reflected in the significant number of scientific papers on this disease in recent years. This is one of the major diseases of lychees in China and elsewhere, and if introduced to Australia it could seriously affect Australia's developing industry. As a result we recommend that risk mitigation measures should be implemented.

Biosecurity Australia's response: Biosecurity Australia acknowledges that lychee brown blight is a common and major pathogen of lychee in China and Thailand and has assessed its probability of entry accordingly. The probability of spread has been reassessed based on the ability of the pathogen to spread on infected fruit although the host range is limited to lychee. As suggested this would raise the probability of entry, establishment and spread to **Low**. Although obviously significant to the lychee industry the consequences are limited due to the single host status of the pathogen. The indirect consequences on the environment have been reassessed given the potential environmental effects of chemical control at the district level but this does not affect the overall direct and indirect consequences. Consequently the unrestricted risk would be **Very low** but still below the ALOP and not requiring risk management measures.

Stakeholder comment: Additional risk mitigation measures for fruit rots caused by *Peronophythora litchii* should include fungicides active against *Phytophthora* species, a related fungal group. These include copper, phosphorous acid, fosetyl aluminium, mancozeb, metalaxyl, oxadixyl, dimethomorph (field treatments from flowering to harvest). Fungicidal post harvest treatments are less acceptable to consumers, while biocontrol agents have, as yet, doubtful efficacy. There is an extensive list of publications on this pathogen mainly from Taiwan and mainland China. Any such treatment needs to be demonstrated to be both effective and to leave acceptable (and minimal) residues. As disease epidemics are closely related to extensive periods of cool wet weather, it is suggested that a protocol to reduce the risk from **Low** to **Very low** should include regular weather monitoring of export production areas, and details of control measures applied. Reporting of this within a few days of "real time" to AQIS would allow extra scrutiny for disease in consignments sent during or following severe weather events which favour high risk periods/seasons.

Biosecurity Australia's response: Biosecurity Australia considers the reassessed unrestricted risk from *Peronophythora litchii* (**Very low**) to be below the ALOP and therefore it does not require risk mitigation measures. Fruit affected by the disease will be unsuitable for export. Infected fruit would be easily be detected during the post-harvest handling because of its obvious symptoms on the fruit.

Fruit blotch (*Phomopsis longanae*)

Stakeholder comment: The probability of importation is put at **Low** as the chance of picking up the disease in inspection is seen as likely. With longans on the panicle chances of not picking up the disease are high. Any pest or disease controlled by inspection for longans must be regarded as a **High** risk of importation. The probability of establishment is graded as **Low** as it is claimed to only be a host of longan and lychee. However longans and lychee belong to the Sapindaceae family with species found throughout the rainforest along the east coast of Australia. Longans are hosts of fruit-boring insects more commonly found in Australian rainforest Sapindaceae species. Consequently the probability of establishment and probability of spread should be raised to **Low** and **Moderate,** respectively. The overall Unrestricted Risk assessment should therefore be **Very Low** not **Negligible**.

Biosecurity Australia's response: *Phomopsis* spp. are common post-harvest diseases of longan, lychee and other fruits in Australia. The report of *Phomopsis longanae* on longan was in China in 1992 and damage to fruit in China is low. There are Australian records of *Phomopsis* sp. on longan identified only to genus level. There is no evidence that *Phomopsis longanae* is hosted by other Sapindaceae species and it cannot be assumed that Sapindaceae rainforest species would be hosts. The probability of establishment has been reassessed in the final IRA report since there are *Phomopsis* sp already present on a range of fruits in Australia; however this does not alter the combined probability of entry, establishment and spread. The overall unrestricted risk remains as **Negligible**, thus not requiring risk management measures.

Phytophthora root rot (*Phytophthora palmivora*)

Stakeholder comment: Any import condition relying on inspection must be regarded with suspicion as to its effectiveness hence the probability of entry must be regarded as **High**. Also, the use of potassium chlorate, allowing production at other times of the year, and the reference to serious damage on fruit produced out of season under wet cool weather conditions is a concern. The probability of entry, establishment and spread should therefore be changed to **High** The Unrestricted Risk thus becomes **Moderate** making it essential that Risk Management measures be introduced.

Biosecurity Australia's response: *Phytophthora palmivora* is present in Australia (including Queensland and the Northern Territory). It is only included as a quarantine pest due to its absence in Western Australia. Out of season production of longans in Thailand is not an issue here. *P. palmivora* is a pathogen of longan and lychee and can be serious in cold wet conditions. The symptoms (brown lesions) are visible on the fruit but the small chance that an infected fruit may be overlooked during harvesting and sorting has been considered adequately with the assessment of probability of importation as **Moderate**. As explained in Tables 3 and 4 of the draft IRA, a **Moderate** probability of both importation and distribution combine to give a **Low** probability of entry and a subsequent **Low** probability of entry, establishment and spread.

Longan witches' broom

Stakeholder comment: The disease and the stink bug have been combined because of the possibility of the vector entering Australia and bringing the disease with it.

The draft IRA report states under probability of importation for stink bugs, that the nymphs can fly away. Nymphs cannot fly, as they do not have developed wings. Instead they move around and hide most likely in the panicle (Dr H. Fay pers. comm.). As inspection is a very ineffective method of finding infestations, the probability of importation should be raised to **High** resulting in a **Moderate** probability of entry.

Stink bugs have a relatively broad host range including citrus and eucalyptus so are likely to survive and find suitable hosts thus, the probability of establishment is more likely **High,** leading to a probability of entry, establishment and spread of **Moderate.**

Signs of witches broom can be seen on the ends of panicles where there has been vegetative growth after panicle development. There is a chance therefore that witches' broom could be incorporated in the panicle when packed.

The consequences have been significantly underestimated in the draft IRA. In Thailand where witches broom becomes a problem, growers virtually go out of production (J. Magro, personal communication with Thai growers in Thailand). Therefore there should be a D classification or a **High** consequence.

This flows through to an unrestricted risk level of **Moderate** which therefore needs risk management measures for both the vector and the disease.

Biosecurity Australia's response: Stink bugs are only occasional feeders on mature fruit mainly causing damage to flower clusters and developing fruit resulting in fruit abscission. Biosecurity Australia has corrected the error of including nymphs with the adults, as capable of flying in the final IRA. As stated, adults of the vector stinkbug, *Tessaratoma papillosa*, are likely to fly away when disturbed at harvesting and nymphs will also be disturbed and removed. The processes of sorting, trimming and washing will further ensure removal of any nymphs. The nymphs would be clearly visible on fruit due to their distinctive colours and markings even at the first nymphal instar stage (5 mm in length). Fifth-instar nymphs are 18-20 mm and adults up to 24-28 mm. Due to the mobility of these bugs, the probability of distribution has been reassessed. However, this does not alter the probability of entry establishment and spread. Biosecurity Australia agrees that there is a relatively broad host range for stink bugs and in the draft IRA (p 66) the probability of establishment for stink bugs was assessed accordingly as **Moderate**. As the probability of entry of stinkbugs is **Very Low** the probability of entry of a stinkbug which was carrying the organism causing witches' broom disease would be even lower or **Negligible**.

Trees affected by witches' broom are unlikely to be producing export quality longan fruit given the statement provided. Transmission of longan witches' broom disease is by vector or grafting, inarching or marcotting. Therefore, without a suitable vector there is no pathway for the disease to enter Australia. There is also considerable evidence in southern China that the witches' broom symptoms are caused by mite damage rather than by a pathogen.

The direct consequences of longan witches' broom to plant life were rated **C** as causing significant harm to longan production at the district level and indirect consequences on control, domestic and international trade at the significant at the district level. Consequences of **Low** are appropriate and consistent with other pest risk assessments, considering that longan is the only host. (Refer to pg 35 draft IRA report for explanation of consequences).

Stakeholder comment: It is a concern that untrained AQIS inspectors are unlikely to recognise witches' broom disease symptoms.

The export of longan witches' broom disease resistant fruit would not necessarily prevent a seed borne entity (limited evidence) being carried in fruit. Fruit of resistant cultivars are usually not immune to infection, but do not express the disease as severely as more susceptible cultivars.

Biosecurity Australia's response: Biosecurity Australia does not anticipate that longan witches' broom disease could be detected visually by AQIS inspectors as there are no symptoms on the fruit pathway.

There is insufficient evidence to support that the organism can be seedborne and seed transmittable. Longan seeds have been permitted entry to Australia for many years without any record of the disease in Australia indicating that it is very unlikely to be seed transmissible. Nursery stock (grafts/cuttings) require post-entry quarantine and observation for freedom from witches' broom disease.

RISK MANAGEMENT

Import season restriction

Stakeholder comments: If imports are allowed they should be restricted to “natural” production times of the year for each country and not from induced production systems as pest risks for production outside those times are not yet available in the literature. This implies that imports only be allowed in between 20th June and 31st August inclusive for Thailand and 15th May to the 31st July for China. If longan exports outside these times are not significant then these restrictions should not impact significantly on the exporting country but would reduce the risk to Australia.

Biosecurity Australia’s response: Restriction to any production times or production areas is only justified if the pest risk is scientifically different and greater and cannot be managed. To limit the export in the manner suggested without solid scientific justification is trade restrictive and unacceptable.

Scarab beetles

Stakeholder comment: Possible use of attractants (pheremone traps are available for *Popillia japonica*) and kill baits in containers to reduce the risk of scarab beetles (*Popillia* and others) being present in the fruit is suggested. Field monitoring for these pests together with other important pests should occur within the export production season.

Biosecurity Australia’s response: Biosecurity Australia considers the unrestricted risk of scarab beetles to be below the ALOP and therefore risk mitigation measures are not required (see Pest Risk Assessment comments).

Leafrollers

Stakeholder comment: Leaf rollers are listed on the quarantine pest list. Will the cold treatment proposed for fruit flies and *Conopomorpha sinensis* or VHT for fruit flies be effective for managing leaf rollers? Leaf rollers are found on Australian longans and are difficult to find on tight panicles. The draft IRA suggests that they are likely to be controlled by cold treatment. No indication is given of the effectiveness of vapour heat treatment as a control for leaf roller, the proposed alternative means of treatment. From information picked up at the Consultation meeting in Cairns it appears that this is not controlled by VHT so the only acceptable Import Condition should be cold treatment.

Biosecurity Australia’s response: Leaf rollers are listed as quarantine pests in this IRA, but the overall risk was assessed to be below the ALOP, therefore no risk management measures are justified.

Cold disinfestation treatment is effective against other species of Lepidoptera such as *C. sinensis* so may be effective against leaf rollers, although no specific information on the required times and temperatures for either cold or vapour heat treatment is available, to our knowledge. Nevertheless, the pest risk assessment for leafrollers suggests that cold chain temperatures for fruit (not cold disinfestation treatment temperatures) would not be conducive to the survival of *Adoxophes* species.

VHT for fruit flies

Stakeholder comment: Clarification is sought on the proposed VHT of 46°C for only 10 minutes to manage the risk of fruit flies on longan and lychee, when USA requires 47.2°C or above for 20 minutes for lychee fruit from Hawaii. Similarly, Victoria allows mango fruit to be vapour heat treated at 46.5 °C for 20 minutes or 47 °C for 15 minutes for Queensland fruit fly. We support cold treatment which is suitable as a disinfestation treatment for fruit flies and the litchi fruit borer.

Biosecurity Australia's response: Biosecurity Australia/AQIS has reassessed the proposed VHT treatment based on a review of VHT data and conditions for lychee and *B. dorsalis* The following recommended VHT treatment is consistent with that of other countries and those used domestically for fruit fly host fruits: 47.0 °C (fruit pulp temperature) for 15 minutes or·46.0 °C for 20 minutes.

VHT and *Conopomorpha sinensis*

Stakeholder comment: Is vapour heat treatment (VHT) effective for the management of *Conopomorpha sinensis*?

Biosecurity Australia's response: Biosecurity Australia is not aware of any efficacy data available to show that VHT at a specific temperature and duration is effective against *C. sinensis*. VHT is more commonly used as a phytosanitary measures against fruit flies.

Eggs of *Conopomorpha sinensis*

Stakeholder comment: Eggs of *Conopomorpha sinensis* are extremely small, almost invisible to the naked eye and larvae bore into fruit immediately after hatching. Visual inspection would, therefore, be inappropriate. We support the orchard control and inspection of fruits during the export season if the cold treatment for the borer is not an option.

Biosecurity Australia's response: The alternative measure to cold treatment for *Conopomorpha sinensis* is a program of orchard control and observation during the growing season plus targeted pre-export inspection of fruit. The entrance hole made by the larvae would be visible together with evidence of frass.

Technical information on treatments

Stakeholder comment: Where a proposed treatment is considered there should be reference to, and discussion of this treatment in the technical data sheets.
Biosecurity Australia's response: Technical pest data sheets include field and production pest management information from the literature but are not intended to detail quarantine treatments. The inclusion of specific technical information sheets for proposed quarantine treatments, not discussed or referenced elsewhere, will be considered for future IRA reports. The references for the treatments specified in the USDA Treatment Manuel (on-line) and other documents are included in the final IRA report.

Registration for trace back if live pests intercepted

Stakeholder comment: How is 'frequently' defined in the statement "if live pests are frequently intercepted". Do live pests detected in two consecutive consignments constitute a frequent intercept? Is it based on live pests intercepted more than once in a season from a single packhouse or orchard?

Biosecurity Australia's response: This is merely an example to explain the objective of the measure and the inappropriate word 'frequently' has been removed in the final IRA. Trace-back to individual orchards via the registration number enables the producers, exporters and the NPPO in the exporting country, in addition to AQIS, to investigate any problem associated with that orchard, such as live pests found at any stage of the harvesting and packinghouse procedures, inspection, storage and transportation.

DRAFT IMPORT CONDITIONS

Registration of orchards – Draft Import Condition 1

Stakeholder comment: Request that registration of orchards is extended to or apply only to longan orchards that are producing for harvest in the "natural" time of the year and where longan production is not "induced". Orchards inducing production at other times of the year should be excluded from export even if they have fruit produced in the normal time as well.

Biosecurity Australia's response: Orchards wishing to export longan fruit to Australia must be registered with the NPPO and be able to produce commercial fruit under standard cultivation, harvesting and packing activities to meet export fruit requirements of the importing country. If early season or out-of-season orchard production can meet the requirements set by the import conditions, then there is no justification in requiring conformity of production time. To limit export in this manner without scientific justification is trade restrictive and not acceptable in line with Australia's international obligations.

Cold treatment for litchi fruit borer – Draft Import Condition 3

Stakeholder comments: Based on Chinese test results, which showed that litchi fruit borer is more susceptible than fruit fly at the same low temperature, AQSIQ experts insist that the treatment schedule for fruit fly is enough to disinfest litchi fruit borers. Therefore we propose that the following options shall be taken for fruit fly and litchi fruit borer disinfestations for both longan and litchi fruit: 0°C or below for 10 days, or 0.56°C or below for 11 days, or 1.11°C or below for 12 days, or 1.67°C or below for 14 days, or 1.90°C or below for 15 days.

Biosecurity Australia's response: AQSIQ has not provided BA with any test results which relate to the cold disinfestation of lychee or longan fruit for *C. sinensis*. AQSIQ has provided the following papers: Liang *et al*. (1999). The study of cold storage quarantine treatment controlling Oriental fruit fly (Diptera: Tepritidae) in longan; and Liang *et al*. (1997). Controlled atmosphere and cold storage of litchi fruits as a quarantine treatment. Neither paper includes data on *C. sinensis*. The cold treatment conditions used by China for export fruit provided by CIQ (2000) indicated 1-2°C or below for 14-15 days. If data to support the effect on litchi fruit borers at the temperature regimes suggested by AQSIQ is available, it should be provided to BA.

Stakeholder comment: The cold treatment proposed for fruit flies is 1ºC. Will lychees still be edible after this treatment?

Biosecurity Australia's response: The cold treatments described in the IRA are based on those currently used for exports of longan and lychee fruit from China and Taiwan to the USA. The 1ºC treatment for lychees does not appear to damage the fruit and they are still fit for consumption after this treatment.

Treatment options for litchi fruit borer – Draft Import Conditions 3 & 5

Stakeholder comment: The two proposed protocols for litchi fruit borer are acceptable provided that there is an inspection process, upon entry to Australia, of cutting open the required 600 fruits per consignment to check for larvae of *C. sinensis*. This is needed, as our experience and the published data shows visual inspection of the outside is not sufficient to detect this pest. The draft IRA states that visual inspection of the fruit surface is unlikely to detect all *C. sinensis*.

Biosecurity Australia's response: Fruit cutting as a quarantine risk management measure is only used where the pest is an internal borer and the pest of concern would leave no indications of entry on the surface of the fruit. *C. sinensis* larvae bore into the fruit leaving an entry tunnel filled with frass which would be visible on inspection. The draft IRA states that standard visual inspection alone is not an appropriate risk management option and therefore the options of cold treatment or orchard control and inspection are recommended.

Inspection for mealybugs and scales – Draft Import Condition 6

Stakeholder comment: While the assessments included in the draft IRA are probably correct Plant Biosecurity should be aware that many submitted shipments of longans out of Australia for export to countries requiring a phytosanitary certificate have been refused on the grounds of soft scale contamination. Inspection on entry will find scales unless different standards are in place for entry inspection compared to exit inspection. Import Condition 11- on-arrival inspection will thus be very important and industry will be expecting a similar level of inspection by AQIS as for exports.

As longans are sold on the panicle it is extremely difficult to completely discover all soft scale or mealy bugs particularly on varieties with tight panicles. These pests will be guaranteed entry into Australia under the present proposal.

Biosecurity Australia's response: The Australian longan industry is required to meet the Australian phytosanitary certification standards for freedom from pests for export to other countries. The task of presenting longan panicles free of quarantine pests is the responsibility of the exporting country. If longans from China and Thailand are not free of mealybugs and soft scale they will be rejected for export. If quarantine pests such as soft scales are found on the fruit or panicle during on-arrival inspection by AQIS in Australia, the importer has the option of treatment, re-export or destruction. Longan imported on the panicle may take longer time to inspect than single detached fruit. AQIS inspectors are trained in sampling and inspection procedure and methodology and have a great deal of experience in handling many different horticultural commodities. They conduct inspections for both import and export in an efficient, effective and consistent manner. As you indicated, AQIS inspectors are successful at detecting scale contamination on export fruits.

Stakeholder comment: Inspection is a very poor method of control for fruit on a panicle. Consequently to be effective a three-stage process of inspection should be prescribed to improve effectiveness. As well it is extremely easy, when packing on the panicle as the markets require, to overlook small leaves so many of those insects associated with leaves should be reconsidered and risk assessments done on these as well.

Biosecurity Australia's response: Inspection is proposed as a risk mitigation measure for mealybugs and scales on other fruits such as citrus from Florida, limes from New Caledonia, grapes from Chile. Although inspection may be more time consuming with longans on the panicle, the nature of the fruit and panicle surface allows these pests to be seen unlike with mangosteens where cleaning is required to remove mealybugs hidden under the calyx. Leaves and plant trash other than the prescribed 10-15 cm long, 3-4 mm diameter panicle stems are not permitted. If these contaminants are found at any stage of inspection then they are rejected for export.

Pre-export inspection – Draft Import Conditions 6 & 7

Stakeholder comment: If inspecting longans is to be regarded as an adequate measure of control then a more prescribed method of inspection should be included. Longan panicles get entangled with each other especially if wood size is restricted to 3-4mm. Proper inspection would require a sample of trays to be completely unpacked and each panicle inspected before repacking. In the process, berry shatter would occur and fruit would be lost from the panicle so panicles not originally packed are likely to be added to the pack to make up the weight. A surface inspection of the top layer of fruit in the package would not be sufficient.

Pre export inspection should be at the same level as the pack out inspection required for ICA-13 and complete unpacking to enable proper inspection should be required.

Biosecurity Australia's response: Inspection for freedom from a specified pest must ensure that all fruit/panicles are actually free of the pest. How the producer/exporter chooses to ensure this freedom is determined by them and might include pre-and post-harvest management to minimise the pest load (in the case of mealybugs and soft scales), in addition to the risk management measure of inspection required by Biosecurity Australia and conducted and audited by the NPPO.

In the case of litchi fruit borer, if the VHT treatment option for fruit flies is adopted, the targeted inspection for freedom from the pest is in addition to a required orchard control program. The inspection carried out by the NPPO in issuing a Phytosanitary Certificate is in accordance with official procedures for all visually detectable quarantine pests and trash using sampling procedures developed by the NPPO in consultation with Biosecurity Australia/AQIS.

The inspection levels outlined in ICA 13 (10 Dec 2001) indicate two checks of fruit unbroken skin. One at the sorting stage, followed by in-line or end-point inspection, 100% inspection of 1 box in 50 boxes sampled (i.e. 2% sampling). Although more difficult than for single fruit, sampling of longan panicles from boxes is obviously achievable for domestic trade. However, the ICA-13 requirement is a measure, in place of a disinfestation treatment, to ensure that fruit is not likely to host high-risk fruit fly pests.

Stakeholder comment: It is not clear how this proposed risk management measure will 'ensure' that longan and lychee fruit exported to Australia do not contain quarantine pests or trash. Is it proposed to thoroughly inspect every fruit and panicle? What sampling rate, infestation level and confidence levels will be required? As consignments (potentially comprising of produce from multiple growers) are inspected what measures are in place to maintain homogeneity? Sampling rate, infestation level and confidence levels required by the NPPO should be included in the IRA.

Biosecurity Australia's response: It is not proposed to inspect every fruit to ensure that the consignment is free of the targeted pests, other quarantine pests, trash, soil, ect. as required. However, during pre-export and on-arrival inspection using a specified sampling plan (agreed to by BA/AQIS and the NPPO), any fruit found to harbour trash, soil or live quarantine pests will result in the whole consignment from that registered source being rejected. Rejected consignments would not be allowed to be exported and are traceable by their orchard registration number.

The sampling rate for pre-export inspection will be comparable to the AQIS sampling rate as specified in the draft IRA. This information is included in the final IRA. Pre-export inspection is one of the many quarantine measures to reduce risk in addition to the on-arrival inspection. Commercial orchard practices of monitoring and spraying when pests are detected, harvesting and processing practices which include grading and sorting, cleaning and checking of fruit for the export requirements in the orchard sheds and/or packinghouses will also help to reduce the risk of pests and contaminants on the fruit.

Packing and labelling – Draft Import condition 8

Stakeholder comment: The draft IRA report has an inadequate description of the method of packing presently employed in Thailand. Currently fruit is picked and packed under the tree into open weave plastic trays to allow subsequent sulphur dioxide treatment. Leaves are placed on the fruit in the trays to stop drying out. These open packs are vulnerable to entry by insects associated with fruit and leaves and soil-borne diseases. Leaf insects may not be associated directly with the fruit and have not been adequately covered by your pest risk assessment. This process will have to be considerably changed because there is presently no consistent inspection process.

The Thai industry treats all export fruit with sulphur dioxide to enhance shelf life. Fruit is transported to a central facility for this post harvest treatment that extends shelf life and this would certainly be needed to enable the cold treatment proposed in Import Condition 3 & 4.

Biosecurity Australia's response: Open-weave plastic containers, straw baskets or other various containers may be used during harvest. Longan fruit would undergo considerable processes of segregation from trash, panicle cutting, sorting and sizing, washing, and treatments such as sulphur dioxide, hydrocooling and drying in clean containers appropriate to the process before packing in the export boxes and mandatory treatments for fruit flies and litchi fruit borer. No leaves or soil are allowed in export fruit. Import Condition 8 already specifies the export packaging requirements for import into Australia.

Cardboard, foam or export plastic boxes will need to provide security from reinfestation by pests after treatments and inspections and during storage and transport.

Biosecurity Australia is aware of the common practice of sulphur dioxide fumigation of longans in Thailand and Australia and has visited such facilities. Fumigation with SO^2 is not a phytosanitary treatment but used commercially for preservation of the golden colour and for protection against some post-harvest storage pathogens. Longans exported to other countries must meet the MRLs for SO_2 set by the importing country.

Storage and movement – Draft Import Condition 10

Stakeholder comment: Sealed cartons, and shrink wrapping are all very well once packed but this import condition needs to be much more prescriptive for conditions during packing and inspection. If leaf is brought into the shed for stripping then insects associated with leaves and stalks will move freely from panicles with leaves to partially packed open containers. These insects may or may not be associated with longan in any significant way but could be a pest risk to other fruit grown in Australia. None of these appear to be recognised as risks.

For Import Condition 8 and 10 to be effective then much stricter control over packing conditions is necessary than presently implied under these two conditions. Sealed packing sheds should be required as with mangoes leaving Australia to go to Japan and all leaf material should be removed prior to entry into the packing shed.

Biosecurity Australia's response: Packing containers are required to be secure to prevent reinfestation of fruit following treatment and inspection and during transport and storage. The exact specifications will depend on the nature of the packaging, mesh used to cover holes, and the treatment undertaken.

Leaf stripping may occur in the orchard or in packinghouses. Longans coming direct from the orchard would enter packing houses at one end and proceed through the stripping, cutting, sorting, washing and treatment processes to final secure treatment/packing at the other end.

Potential hitchhikers can occur under the processing and packing of horticultural commodities and food in all countries both for domestic and export supply. Packing houses must be registered and audited by the NPPO to ensure that they can, and do, meet the requirements for ensuring that exports are not contaminated by any live pests or soil or plant material. Any additional uncategorized pest detected in consignments will trigger an assessment to determine its quarantine status and if phytosanitary action is required. It is trade restrictive to consider all such hitchhiking contaminants in international trade.

On-arrival inspection by AQIS – Draft Import Condition 11

Stakeholder comment: One detached fruit is an inappropriate unit of assessment in the case of longan, as it does not allow for assessment of panicle length and wood thickness. It is highly unlikely that a consignment will consist of "detached fruit" but if some is consigned it will be in a consignment mixed with fruit on the panicle. Longans, unlike lychee, do not have a natural break point just above the fruit. Detached fruit are commonly found to have broken skin at the point where the stem would have been attached to the fruit. This is where moulds commonly start on the fruit. Detached fruit without a short stem (at least 3-4mm) should be regarded with suspicion.

A single panicle is also inappropriate as an assessment unit because panicles vary in size and may contain from 3-20 fruit. There could be considerable variation in real sample size if this measure is used. A more consistent method would be to use a package as the unit of sample size. This would be the only sampling methodology capable of providing anywhere near the 95% confidence level required that there is not more than 0.5% infestation in a consignment.

Import Condition for inspection should be similar to the ICA-13 requirements as this puts on a higher standard than implied in this Import Condition. During the sampling process the container should be completely unpacked and all fruit and wood in the package completely inspected. On repacking the same fruit must be used.

Biosecurity Australia's response: Both detached longan and lychee fruit will have a short stem of less than 5mm. Exporters would be aware of the effects and consequences of broken skin on quality and health and shelf life. Panicles may well vary in size but would be in the range of the length limits of the panicle stem and diameter. This sampling unit is used adequately by AQIS for similar commodities such as grapes.

The ICA-13 sampling regime is to ensure that longan, lychee and other fruit have unbroken skin as a prerequisite for freedom from fruit fly larvae where they are accepted in Australia to be conditional non-hosts of Queensland fruit fly. This inspection is a measure in place of a disinfestation treatment for fruit flies. It consists of inspection of fruit during sorting and a 2% sampling of entire packed boxes.

Stakeholder comments: The ambiguous "Unit" (panicle or single fruit only) for inspection purposes should be removed and replaced by a package.

Biosecurity Australia's response:

The 'unit' is defined as the fruit (i.e. one orange, one mangosteen, one durian). In the case of smaller fruit intact on a stem, it is usual to define the unit as a cluster/panicle/bunch (i.e. grapes, longans). As the intention is to allow the import of longans and lychees as individual detached fruits, or in the case of longans, as longans on the panicle (which is industry common practice) the inspection unit needs to be defined in this way to accommodate both.

Sampling regime for on-arrival inspection

Stakeholder comment: The sampling size in the draft I RA report for on-arrival inspection of longan/lychee is too high particularly for longans on the panicle where the following sampling size is suggested:

For ‘consignments’ of fruit

≤10 units	100% of consignment (10 units)
10 units < For ‘consignments’ of fruit ≤100 units	greater than or equal to 10%
100 units <For ‘consignments’ of fruit ≤300 units	5-10%
300 units <For ‘consignments’ of fruit ≤500 units	4-5%
500 units <For ‘consignments’ of fruit ≤1000 units	3-4%
1000 units <For ‘consignments’ of fruit ≤2000 units	2-3%
2000 units <For ‘consignments’ of fruit ≤5000 units	1-2%
5000 units <For ‘consignments’ of fruit	0.2-1%

or inspecting 100% of all fruit from 1% of cartons

Biosecurity Australia’s response: The sampling size for on-arrival inspection specified in the draft IRA report is the standard sampling regime used by AQIS for most horticultural commodities and complies with international practice. This sampling regime is the same currently used, for example, for the preclearance of Ya and Asian pears from Hebei and Shandong Provinces where the unit is defined as a single pear.

For this IRA, the unit is defined as a single detached longan or lychee fruit or if longans are imported on the panicle, the unit is a single longan panicle. For consignments of less than 1000 units the sample size is either 450 units or 100% of consignment (whichever is smaller). For consignments of 1000 units or greater, 600 units are selected at random from the consignment for inspection. This sampling methodology provides 95% confidence that there is not more than 0.5% infestation in a consignment.

Tablegrape clusters are inspected in a similar manner, where the cluster is the inspection unit as proposed with longan panicles. This standard sampling methodology is used in AQIS-inspected export commodities to other countries unless otherwise specified. The units sampled by AQIS during on-arrival inspection will be those specified above. That is 600 single longan or lychee fruit (for detached fruits) or 600 panicles for longans on the panicle. These units will be selected at random from the boxes of fruit in the consignment.

Sampling and time taken for inspection

Stakeholder comments: It should be made clear in the report which units will be selected by AQIS during the inspection and how long the inspection will take. Samples taken by AQIS during inspection should not exceed those taken by AQSIQ before shipment in China.

Biosecurity Australia's response: The definition of the units in the sampling plan has been further clarified in the final IRA. The time required for inspection would depend on the nature of the unit (ie. detached fruit or longan on panicle) but would probably be about 1-2 hours.

Advising AQSIQ of quarantine failures

Stakeholder comments: AQIS/BA is requested to promptly inform AQSIQ of any longan/lychee from China that do not meet the Australian quarantine standards.

Biosecurity Australia's response: AQIS/BA would inform AQSIQ of any quarantine breaches and quarantine pests found on consignments of longan or lychees as requested.

Treatment for non-compliant consignments

Stakeholder comments: AQIS is requested to provide the quarantine treatment options for Chinese longan/lychee exporters whose consignments fail to meet the Australian quarantine standards to enable the consignments to pass the inspection after treatment in Australia.

Biosecurity Australia's response: The options for Chinese exporters/Australian importers if consignments are found to be non-compliant with requirements are for treatment, re-export or destruction of the consignment. The treatment option would depend on the nature of the quarantine pest but would be likely to be fumigation by methyl bromide for external feeders and cold disinfestation treatment for internal feeders. Any treatment would need to be approved by AQIS, carried out in AQIS-approved premises and would be conducted at the total expense of the importer.

Destruction of fruit

Stakeholder comments: If the option of destruction of fruit is selected, how are fruits destroyed or disposed of?

Biosecurity Australia's response: Fruit is destroyed in AQIS-approved premises, by an approved method usually by incineration or deep burial. The importer bears cost of the destruction.

Uncategorised pests

Stakeholder comment: The process for categorising pests should be included as part of the document as there are inevitably significant numbers of pests detected that are not identified by the analysis. If a pest, not identified in the analysis, is found on inspection and this pest is not present in the State of Western Australia, will the state be notified?

Biosecurity Australia's response: The term "uncategorized pest" refers to pests that could be present on the fruit pathway but that have not been reported and assessed previously. This could include hitchhikers or contaminants. Any new pests would be assessed via the same three-step process of pest categorisation as described in all the IRA documents to determine whether a pest is categorised as a quarantine pest in accordance with FAO's ISPM definition of a quarantine pest.

Any unidentified pests detected are sent for identification. If a new pest is detected and found to be of quarantine concern, the importer has the option of treatment (if available), destruction or re-export. Quarantine status is assessed in accordance with Australia's international obligations. All pests found are recorded in the AQIS 'Incidents' database.

Review of policy – Draft Import Condition 12

Stakeholder comment: When the related policy for the importation of longan / lychee from China is being reviewed, we request that China be informed promptly and that the final amendments be based on the results of bilateral consultation.

Biosecurity Australia's response: Review of policy in the draft IRA report states "Biosecurity Australia reserves the right to review this policy". Once the final IRA is released and the policy adopted by the Director of Quarantine, then an "arrangement document" will be drawn up between AQSIQ and BA/AQIS (likewise with Thailand's DOA/ARD) with specific details of the import conditions outlined in the final IRA report. Such arrangement documents may be reviewed after the first year of trade. BA will consult with AQSIQ on any issues raised by either party relating to the import conditions.

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