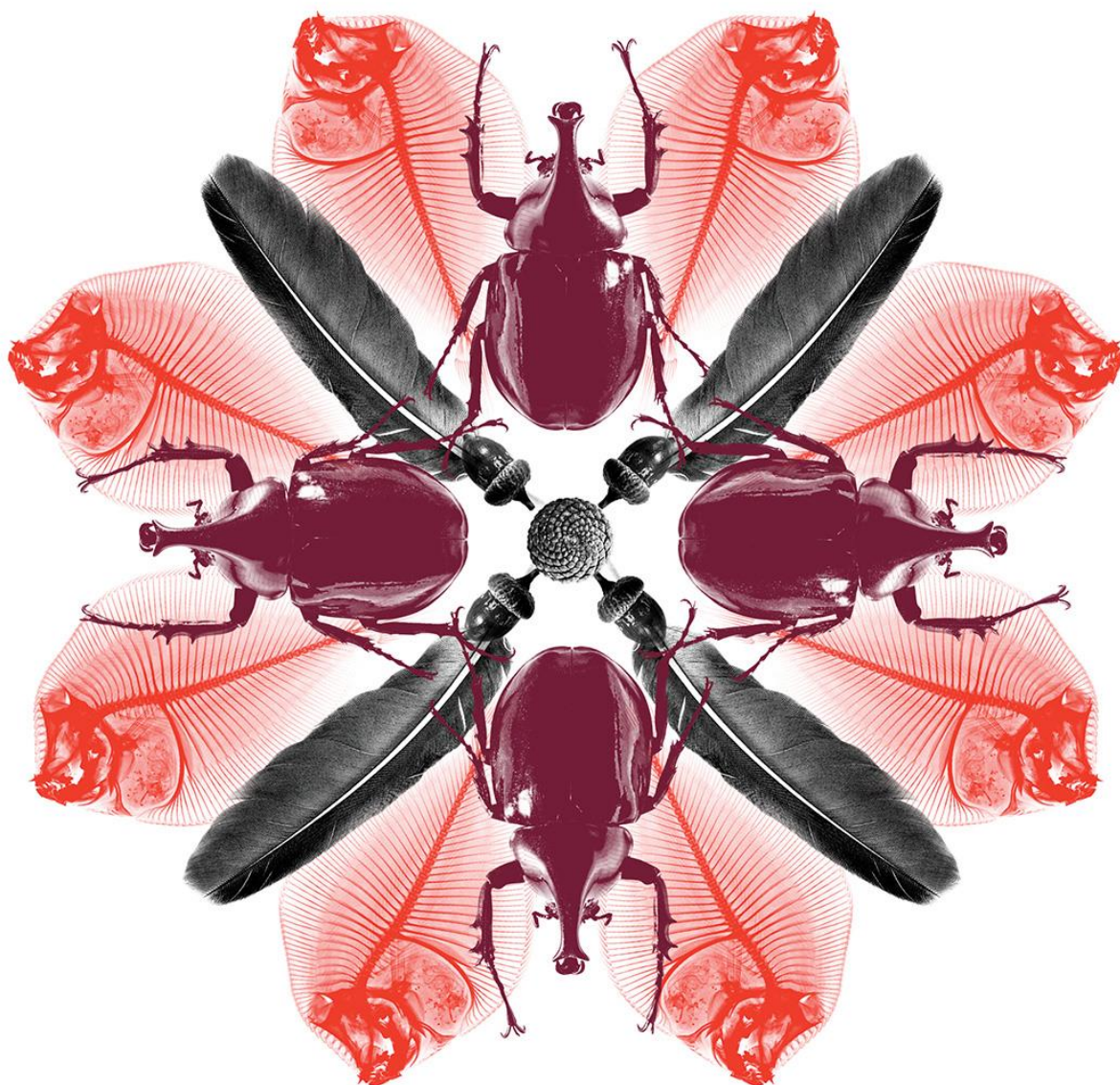




Australian Government
Department of Agriculture
and Water Resources

Final report for the review of biosecurity import requirements for fresh longan fruit from Vietnam

May 2019



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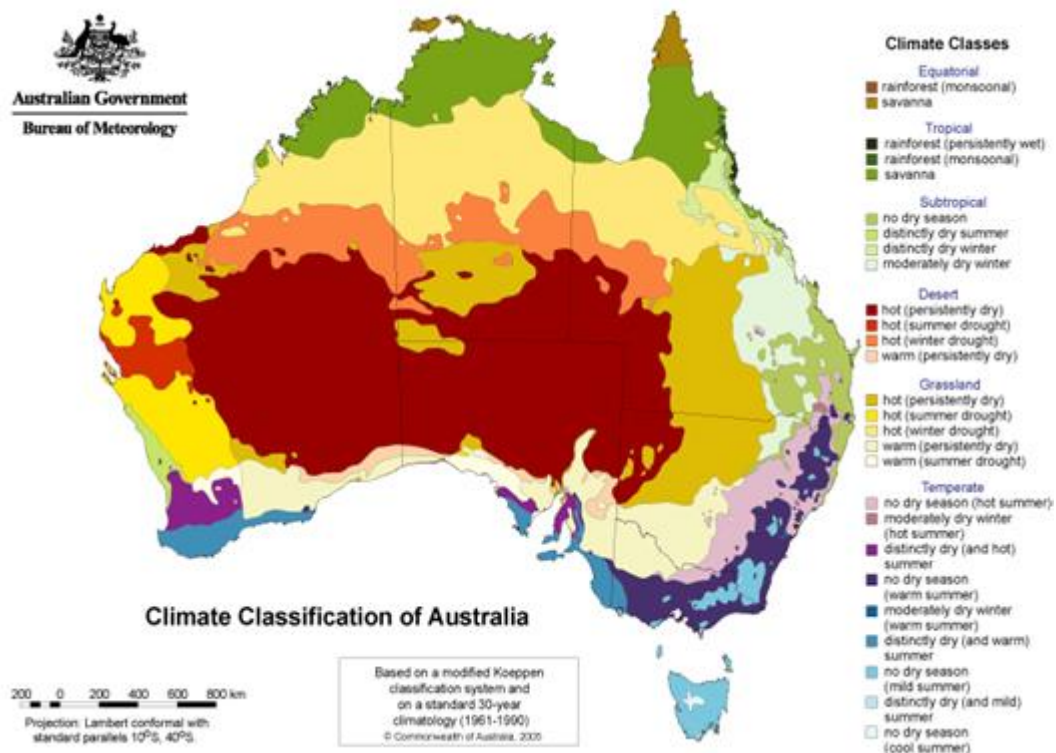
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Map 1 Map of Australia



Map 2 A guide to Australia's bio-climatic zones



Acronyms and abbreviations

Term or abbreviation	Definition
ACT	Australian Capital Territory
ALOP	Appropriate level of protection
BICON	Australia's Biosecurity Import Conditions System
BIRA	Biosecurity Import Risk Analysis
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EP	Existing policy
FAO	Food and Agriculture Organization of the United Nations
FSANZ	Food Standards Australia New Zealand
IPPC	International Plant Protection Convention
ISPM	International Standard for Phytosanitary Measures
NSW	New South Wales
NT	Northern Territory
PC	Phytosanitary Certificate
PPD	Vietnam's Plant Protection Department
PRA	Pest risk analysis
Qld	Queensland
SA	South Australia
SPS Agreement	WTO agreement on the Application of Sanitary and Phytosanitary Measures
Tas.	Tasmania
the department	The Department of Agriculture and Water Resources
Vic.	Victoria
WA	Western Australia
WTO	World Trade Organization

Summary

This risk analysis report considers the biosecurity risks for Australia associated with the importation of commercially produced fresh longan fruit for human consumption from Vietnam.

Currently the importation of fresh longan fruit for human consumption is permitted into Australia only from China and Thailand, provided it meets Australian biosecurity import conditions.

This final report recommends that the importation of fresh longan fruit to Australia from all commercial production areas of Vietnam be permitted, subject to it meeting a range of biosecurity requirements, as summarised in this report.

This final report contains details of all known pests with the potential to be associated with the importation of fresh longan fruit from Vietnam that may be of biosecurity concern to Australia. It also provides risk assessments for the identified quarantine pests, and recommends risk management measures to reduce the biosecurity risk to an acceptable level.

Eleven quarantine pests have been identified in this risk analysis as requiring risk management measures. Those pests are:

- Fruit flies: guava fruit fly (*Bactrocera correcta*) and Oriental fruit fly (*Bactrocera dorsalis*)
- Mealybugs: grey pineapple mealybug (*Dysmicoccus neobrevipes*), cocoa mealybug (*Exallomochlus hispidus*), litchi mealybug (*Planococcus litchi*), Pacific mealybug (*Planococcus minor*), coffee mealybug (*Planococcus lilacinus*), intercepted mealybug (*Paracoccus interceptus*), aerial root mealybug (*Pseudococcus baliteus*), and citriculus mealybug (*Pseudococcus cryptus*)
- Borers: litchi fruit borer (*Conopomorpha sinensis*).

Two thrips species, chilli thrips (*Scirtothrips dorsalis*) and onion thrips (*Thrips tabaci*), were assessed as regulated articles, as they are capable of harbouring and spreading emerging orthospoviruses that are quarantine pests for Australia, and therefore require risk management measures. These 13 species (11 quarantine pests and two regulated articles) have all been assessed previously by the department.

Recommended risk management measures take account of regional differences within Australia. Two pests, Pacific mealybug (*Planococcus minor*) and citriculus mealybug (*Pseudococcus cryptus*), have been identified as regional quarantine pests for Western Australia because interstate quarantine regulations and enforcement are in place for these species.

This final report recommends a range of risk management measures, combined with an operational system, to reduce the risks posed by the 13 identified species (11 quarantine pests and two regulated articles) so as to achieve the appropriate level of protection for Australia. These measures include:

- area freedom or fruit treatment (such as irradiation or cold disinfestation treatment) for fruit flies

- pre-export visual inspection and, if found, remedial action for mealybugs and/or thrips
- area freedom, fruit treatment (such as irradiation or cold disinfestation treatment) or a systems approach approved by the Department of Agriculture and Water Resources for litchi fruit borer.

Should Vietnam wish to use one or more of the recommended measures of area freedom, fruit treatment or a systems approach to manage the risk posed by fruit flies or litchi fruit borer, PPD will need to provide an appropriate technical submission to the department for its consideration.

Every submission must, as appropriate:

- fulfil requirements as set out in ISPM 4 (FAO 2017a) and ISPM 10 (FAO 2016b) for area freedom for all relevant pests, and additionally ISPM 26 (FAO 2019b) for area freedom for fruit flies,
- fulfil requirements as set out in ISPM 18 (FAO 2016c) for irradiation for relevant pests,
- fulfil requirements as set out in ISPM 14 (FAO 2017c) for a systems approach for litchi fruit borer, and/or
- demonstrate the processes and procedures for the registration, approval and audit of disinfestation treatment facilities.

Written submissions on the draft report were received from five stakeholders. The department has made a number of changes to the report following consideration of technical stakeholder comments and subsequent review of the literature. These changes include:

- The addition of two species of mealybug, *Planococcus angkorensis* and *Pseudococcus baliteus* (aerial root mealybug), to the pest categorisation table (Appendix A). Following a review of available scientific literature, these species are now recognised as present in Vietnam and associated with longan trees. *Planococcus baliteus* was subsequently assessed further in the mealybug pest risk assessment due to its potential association with longan fruit, and has been determined to require risk management measures.
- Amendments to the assessment of *Zeugodacus cucurbitae* (melon fly). Following a review of available scientific literature, this species is now not considered to be associated with the longan fruit pathway. The pest categorisation table (Appendix A) and the risk management measures (Chapter 5) have been amended to reflect this change.
- The addition of Appendix B 'Issues raised in stakeholder comments', which summarises key technical comments from stakeholders, for example on *Longan Witches Broom Disease* and *Zeugodacus cucurbitae*, and how technical issues were considered in the final report.
- Minor corrections, rewording, and editorial changes for consistency, clarity, and web-accessibility.

1 Introduction

1.1 Australia's biosecurity policy framework

Australia's biosecurity policies aim to protect Australia against the risks that may arise from exotic pests entering, establishing and spreading in Australia, thereby threatening Australia's unique flora and fauna, as well as those agricultural industries that are relatively free from serious pests.

The risk analysis process is an important part of Australia's biosecurity policies. It enables the Australian Government to formally consider the level of biosecurity risk that may be associated with proposals to import goods into Australia. If the biosecurity risks do not achieve the appropriate level of protection (ALOP) for Australia, risk management measures are recommended to reduce the risks to an acceptable level. If the risks cannot be reduced to an acceptable level, the goods will not be imported into Australia until suitable measures are identified.

Successive Australian Governments have maintained a stringent, but not a zero risk, approach to the management of biosecurity risks. This approach is expressed in terms of the ALOP for Australia, which is defined in the *Biosecurity Act 2015* as providing a high level of protection aimed at reducing risk to a very low level, but not to zero.

Australia's risk analyses are undertaken by the Department of Agriculture and Water Resources using technical and scientific experts in relevant fields, and involve consultation with stakeholders at various stages during the process.

Risk analyses may take the form of a biosecurity import risk analysis (BIRA) or a review of biosecurity import requirements (such as scientific review of existing policy and import conditions, pest-specific assessments, weed risk assessments, biological control agent assessments or scientific advice).

Further information about Australia's biosecurity framework is provided in the *Biosecurity Import Risk Analysis Guidelines 2016* located on the [Department of Agriculture and Water Resources website](#).

1.2 This risk analysis

1.2.1 Background

Vietnam's Plant Protection Department (PPD) formally requested market access to Australia for fresh longan fruit for human consumption in a submission received in March 2017. This submission included information on the pests associated with longan crops in Vietnam, including the plant part affected and the standard commercial production practices for fresh longan fruit in Vietnam.

Further technical information was provided by PPD in a letter dated 4 July 2018. This was in response to a request from the department for additional information on several pest species.

On 14 March 2018, the department publicly announced the commencement of this risk analysis, advising that it would be progressed as a review of biosecurity import requirements. This analysis is conducted in accordance with Section 174 of the *Biosecurity Act 2015*.

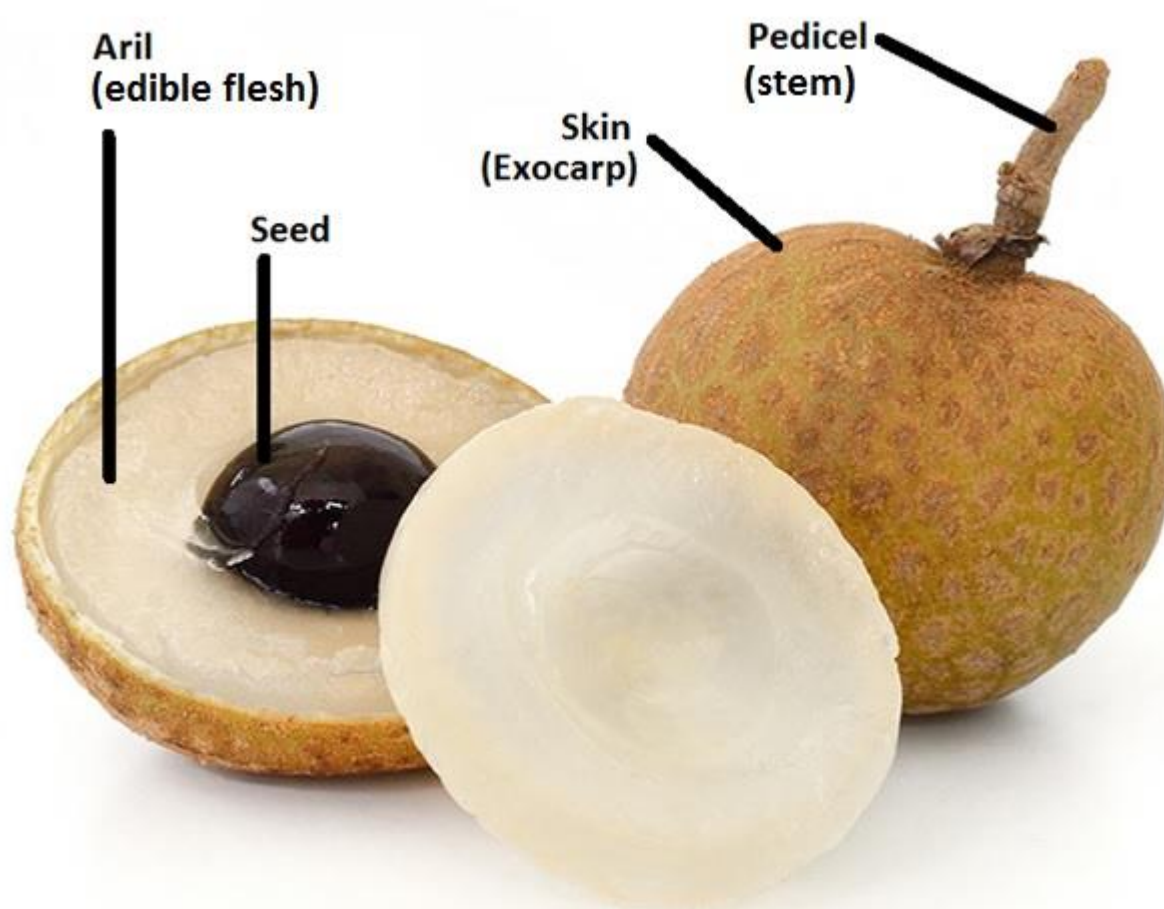
In February and August of 2018, Australian Government officials visited longan production areas in Vietnam. The objective of these visits was to observe commercial production, pest management and other export practices.

1.2.2 Scope

The scope of this risk analysis is to consider the biosecurity risk that may be associated with the pathway of fresh longan fruit (*Dimocarpus longan*) grown in Vietnam using typical commercial production and packing procedures for import into Australia for human consumption.

For the purposes of this risk analysis, longan fruit are defined as fruit with the skin, aril (edible flesh), seed and potentially a section of individual pedicel (stem) attached (Figure 1).

Figure 1 Diagram of longan fruit



Adapted from www.123rf.com/stock-photo. Modified based on information from PPD.

1.2.3 Existing policy

International policy

Import policy exists for fresh longan fruit from China and Thailand (DAFF 2004).

Import policies also exist for a number of fresh fruit commodities from Asia, including from Vietnam. Examples include lychee fruit from Taiwan and Vietnam (DAFF 2013), dragon fruit from Vietnam (Department of Agriculture and Water Resources 2017), and mangoes from the

Philippines (AQIS 1999), Taiwan (Biosecurity Australia 2006), Indonesia, Thailand and Vietnam (Department of Agriculture and Water Resources 2015). The potential pests of biosecurity concern identified for fresh longan fruit from Vietnam are the same as those identified for commodities for which import conditions exist.

The import requirements for these commodity pathways can be found at the department's Biosecurity Import Conditions (BICON) system on the department's website at <https://bicon.agriculture.gov.au/BiconWeb4.0>.

The department has considered all the pests previously identified in existing policies and, where relevant, the information in those assessments has been taken into account in this risk analysis. The department has also reviewed the latest literature to ensure that information in previous assessments is still valid. The biosecurity risk posed by thrips, and the orthotospoviruses they transmit, from all countries was previously assessed in the *Final group pest risk analysis for thrips and orthotospoviruses on fresh fruit, vegetable, cut-flower and foliage imports* (Australian Government Department of Agriculture and Water Resources 2017) (thrips group PRA), which is applicable to longan fruit from Vietnam. The department has determined that the information in those assessments can be adopted for the species under consideration in this risk analysis.

Domestic arrangements

The Australian Government is responsible for regulating the movement of goods such as plants and plant products into and out of Australia. However, the state and territory governments are responsible for plant health controls within their individual jurisdiction. Legislation relating to resource management or plant health may be used by state and territory government agencies to control interstate movement of plants and their products. Once plant and plant products have been cleared by Australian Government biosecurity officers, they may be subject to interstate movement regulations/arrangements. It is the importer's responsibility to identify and ensure compliance with all requirements.

1.2.4 Contaminating pests

In addition to the pests of longan fruit from Vietnam that are assessed in this risk analysis, there are other organisms that may arrive with the imported commodity. These organisms could include pests of other crops, or predators and parasitoids of other arthropods. The department considers these organisms to be contaminating pests that could pose sanitary (human or animal life or health) and phytosanitary (plant life or health) risks. These risks are identified and addressed using existing operational procedures that require a 600 unit on-arrival inspection of all consignments, or equivalent procedures. The department will investigate if any pest identified through these processes may be of quarantine concern to Australia, and thus may require remedial action.

1.2.5 Consultation

On 14 March 2018 the department notified stakeholders, in Biosecurity Advice 2018/03, of the commencement of a review of biosecurity import requirements for fresh longan fruit from Vietnam.

Prior to and after the commencement of this risk analysis, the department engaged with Australian longan growers regarding the process for this risk analysis.

The department has also consulted with Vietnam's PPD and Australian state and territory governments during the preparation of this report.

The draft report was released on 10 December 2018 (Biosecurity Advice 2018/31) for comment by stakeholders, for an extended consultation period of 75 days that concluded on 25 February 2019. The extension of the consultation period was to accommodate the Christmas and New Year holiday period in Australia.

The department received five written submissions on the draft report. All submissions received, and issues raised by domestic stakeholders during the consultation period, were carefully considered and, where relevant, changes were made to the final report. A summary of key technical stakeholder comments and how they were considered is provided in Appendix B.

1.2.6 Next Steps

The final report will be published on the department's website along with a notice advising stakeholders of its release. The department will also notify Vietnam's PPD, registered stakeholders and the WTO Secretariat about the release of the final report. Publication of the final report represents the end of the risk analysis process. The biosecurity requirements recommended in the final report will form the basis of the conditions published in the Biosecurity Import Conditions (BICON) system and subsequently for any import permits issued. The department will verify that Vietnam can meet the recommended biosecurity requirements before any trade in longans to Australia commences.

2 Method for pest risk analysis

This chapter sets out the method used for the pest risk analysis (PRA) in this report. The Department of Agriculture and Water Resources has conducted this PRA in accordance with the International Standards for Phytosanitary Measures (ISPMs), including ISPM 2: *Framework for pest risk analysis* (FAO 2016a) and ISPM 11: *Pest risk analysis for quarantine pests* (FAO 2017b) that have been developed under the SPS Agreement (WTO 1995).

A PRA is ‘the process of evaluating biological or other scientific and economic evidence to determine whether an organism is a pest, whether it should be regulated, and the strength of any phytosanitary measures to be taken against it’ (FAO 2019a). A pest is ‘any species, strain or biotype of plant, animal, or pathogenic agent injurious to plants or plant products’ (FAO 2019a). This definition is also applied in the *Biosecurity Act 2015*.

Biosecurity risk consists of two major components: the likelihood of a pest entering, establishing and spreading in Australia from imports; and the consequences should this happen. These two components are combined to give an overall estimate of the risk.

Unrestricted risk is estimated taking into account the existing commercial production practices of Vietnam and recognition that, on arrival in Australia, the department will verify that the consignment received is as described on the commercial documents and its integrity has been maintained.

Restricted risk is estimated with phytosanitary measure(s) applied. A phytosanitary measure is ‘any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests’ (FAO 2019a).

A glossary of the terms used in the risk analysis is provided at the end of this report.

The PRAs are conducted in the following three consecutive stages: initiation, pest risk assessment and pest risk management.

2.1 Stage 1 Initiation

Initiation identifies the pest(s) and pathway(s) that are of quarantine concern and should be considered for risk analysis in relation to the identified PRA area.

Appendix A of this risk analysis report lists the pests with the potential to be associated with the exported longan fruit produced using commercial production and packing procedures.

Appendix A does not present a comprehensive list of all the pests associated with the entire plant, but concentrates on the pests that could be on the assessed longan. Contaminating pests that have no specific relation to the longan or the export pathway have not been listed and would be addressed by Australia’s current approach to contaminating pests.

The identity of the pests is given in Appendix A. The species name is used in most instances but a lower taxonomic level is used where appropriate. Synonyms are provided where the current scientific name differs from that provided by the exporting Vietnam’s National Plant Protection Organisation (NPPO) or where the cited literature used a different scientific name.

For this risk analysis, the 'PRA area' is defined as Australia for pests that are absent, or of limited distribution and under official control. For areas with regional freedom from a pest, the 'PRA area' may be defined on the basis of a state or territory of Australia or may be defined as a region of Australia consisting of parts of a state or territory or several states or territories.

For pests that had been considered by the department in other risk assessments and for which import conditions already exist, this risk analysis considered the likelihood of entry of pests on the longan and whether existing policy is adequate to manage the risks associated with its import. Where appropriate, the previous risk assessment was taken into consideration in this risk analysis.

A Group Pest Risk Analysis (Group PRA) has been applied in this risk analysis, as explained in Section 2.2.7.

2.2 Stage 2 Pest risk assessment

A pest risk assessment (for quarantine pests) is the 'evaluation of the probability of the introduction and spread of a pest and of the magnitude of the associated potential economic consequences' (FAO 2019a).

The following three consecutive steps were used in pest risk assessment:

2.2.1 Pest categorisation

Pest categorisation identifies which of the pests with the potential to be on longan fruit are quarantine pests for Australia and require pest risk assessment. A 'quarantine pest' is 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 (FAO 2019a).

The pests identified in Stage 1 were categorised using the following primary elements to identify the quarantine pests for the longan being assessed:

- identity of the pest
- presence or absence in the PRA area
- regulatory status
- potential for establishment and spread in the PRA area
- potential for economic consequences (including environmental consequences) in the PRA area.

The results of pest categorisation are set out in Appendix A. The quarantine pests identified during categorisation were carried forward for pest risk assessment and are listed in Table 4.1.

2.2.2 Assessment of the probability of entry, establishment and spread

Details of how to assess the 'probability of entry', 'probability of establishment' and 'probability of spread' of a pest are given in ISPM 11 (FAO 2017b). The SPS Agreement (WTO 1995) uses the term 'likelihood' rather than 'probability' for these estimates. In qualitative PRAs, the department uses the term 'likelihood' for the descriptors it uses for its estimates of likelihood of entry, establishment and spread. The use of the term 'probability' is limited to the direct quotation of ISPM definitions.

A summary of this process is given here, followed by a description of the qualitative methodology used in this risk analysis.

Likelihood of entry

The likelihood of entry describes the likelihood that a quarantine pest will enter Australia as a result of trade in a given longan, be distributed in a viable state in the PRA area and subsequently be transferred to a host. It is based on pathway scenarios depicting necessary steps in the sourcing of the longan for export, its processing, transport and storage, its use in Australia and the generation and disposal of waste. In particular, the ability of the pest to survive is considered for each of these various stages.

The likelihood of entry estimates for the quarantine pests for a longan are based on the use of the existing commercial production, packaging and shipping practices of the exporting Vietnam. Details of the existing commercial production practices for the longan are set out in Chapter 3. These practices are taken into consideration by the department when estimating the likelihood of entry.

For the purpose of considering the likelihood of entry, the department divides this step into two components:

- **Likelihood of importation**—the likelihood that a pest will arrive in Australia when a given longan is imported.
- **Likelihood of distribution**— the likelihood that the pest will be distributed, as a result of the processing, sale or disposal of the longan, in the PRA area and subsequently transfer to a susceptible part of a host.

Factors to be considered in the likelihood of importation may include:

- distribution and incidence of the pest in the source area
- occurrence of the pest in a life-stage that would be associated with the longan
- mode of trade (for example, bulk, packed)
- volume and frequency of movement of the longan along each pathway
- seasonal timing of imports
- pest management, cultural and commercial procedures applied at the place of origin
- speed of transport and conditions of storage compared with the duration of the lifecycle of the pest
- vulnerability of the life-stages of the pest during transport or storage
- incidence of the pest likely to be associated with a consignment
- commercial procedures (for example, refrigeration) applied to consignments during transport and storage in the Vietnam of origin, and during transport to Australia.

Factors to be considered in the likelihood of distribution may include:

- commercial procedures (for example, refrigeration) applied to consignments during distribution in Australia
- dispersal mechanisms of the pest, including vectors, to allow movement from the pathway to a host

- whether the imported longan is to be sent to a few or many destination points in the PRA area
- proximity of entry, transit and destination points to hosts
- time of year at which import takes place
- intended use of the longan (for example, for planting, processing or consumption)
- risks from by-products and waste.

Likelihood of establishment

Establishment is defined as the ‘perpetuation for the foreseeable future, of a pest within an area after entry’ (FAO 2019a). In order to estimate the likelihood of establishment of a pest, reliable biological information (for example, lifecycle, host range, epidemiology, survival) is 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 likelihood of establishment.

Factors to be considered in the likelihood of establishment in the PRA area may include:

- availability of hosts, alternative hosts and vectors
- suitability of the environment
- reproductive strategy and potential for adaptation
- minimum population needed for establishment
- cultural practices and control measures.

Likelihood of spread

Spread is defined as ‘the expansion of the geographical distribution of a pest within an area’ (FAO 2019a). The likelihood of spread considers the factors relevant to the movement of the pest, after establishment on a host plant or plants, to other susceptible host plants of the same or different species in other areas. In order to estimate the likelihood of spread of the pest, reliable biological information is obtained from areas where the pest currently occurs. The situation in the PRA area is then carefully compared with that in the areas where the pest currently occurs and expert judgement used to assess the likelihood of spread.

Factors to be considered in the likelihood of spread may include:

- suitability of the natural and/or managed environment for natural spread of the pest
- presence of natural barriers
- potential for movement with commodities, conveyances or by vectors
- intended use of the longan
- potential vectors of the pest in the PRA area
- potential natural enemies of the pest in the PRA area.

Assigning likelihoods for entry, establishment and spread

Likelihoods are assigned to each step of entry, establishment and spread. Six descriptors are used: high; moderate; low; very low; extremely low; and negligible (Table 2.1). Definitions for these descriptors and their indicative probability ranges are given in Table 2.1. The indicative

probability ranges are only provided to illustrate the boundaries of the descriptors and are not used beyond this purpose in qualitative PRAs. These indicative probability ranges provide guidance to the risk analyst and promote consistency between different pest risk assessments.

Table 2.1 Nomenclature of likelihoods

Likelihood	Descriptive definition	Indicative range
High	The event would be very likely to occur	$0.7 < to \leq 1$
Moderate	The event would occur with an even likelihood	$0.3 < to \leq 0.7$
Low	The event would be unlikely to occur	$0.05 < to \leq 0.3$
Very low	The event would be very unlikely to occur	$0.001 < to \leq 0.05$
Extremely low	The event would be extremely unlikely to occur	$0.000001 < to \leq 0.001$
Negligible	The event would almost certainly not occur	$0 < to \leq 0.000001$

Combining likelihoods

The likelihood of entry is determined by combining the likelihood that the pest will be imported into the PRA area and the likelihood that the pest will be distributed within the PRA area, using a matrix of rules (Table 2.2). This matrix is then used to combine the likelihood of entry and the likelihood of establishment, and the likelihood of entry and establishment is then combined with the likelihood of spread to determine the overall likelihood of entry, establishment and spread.

For example, if the likelihood of importation is assigned a descriptor of 'low' and the likelihood of distribution is assigned a descriptor of 'moderate', then they are combined to give a likelihood of 'low' for entry. The likelihood for entry is then combined with the likelihood assigned for establishment of 'high' to give a likelihood for entry and establishment of 'low'. The likelihood for entry and establishment is then combined with the likelihood assigned for spread of 'very low' to give the overall likelihood for entry, establishment and spread of 'very low'. This can be summarised as:

importation x distribution = entry [E]	low x moderate = low
entry x establishment = [EE]	low x high = low
[EE] x spread = [EES]	low x very low = very low

Table 2.2 Matrix of rules for combining likelihoods

	High	Moderate	Low	Very low	Extremely low	Negligible
High	High	Moderate	Low	Very low	Extremely low	Negligible
Moderate		Low	Low	Very low	Extremely low	Negligible
Low			Very low	Very low	Extremely low	Negligible
Very low				Extremely low	Extremely low	Negligible
Extremely low					Negligible	Negligible
Negligible						Negligible

Time and volume of trade

One factor affecting the likelihood of entry is the volume and duration of trade. If all other conditions remain the same, the overall likelihood of entry will increase as time passes and the overall volume of trade increases.

The department normally considers the likelihood of entry on the basis of the estimated volume of one year's trade. This is a convenient value for the analysis that is relatively easy to estimate and allows for expert consideration of seasonal variations in pest presence, incidence and behaviour to be taken into account. The consideration of the likelihood of entry, establishment and spread and subsequent consequences takes into account events that might happen over a number of years even though only one year's volume of trade is being considered. This difference reflects biological and ecological facts, for example where a pest or disease may establish in the year of import but spread may take many years.

The use of a one year volume of trade has been taken into account when setting up the matrix that is used to estimate the risk and therefore any policy based on this analysis does not simply apply to one year of trade. Policy decisions that are based on the department's method that uses the estimated volume of one year's trade are consistent with Australia's policy on appropriate level of protection and meet the Australian Government's requirement for ongoing quarantine protection. If there are substantial changes in the volume and nature of the trade in specific commodities then the department will review the risk analysis and, if necessary, provide updated policy advice.

2.2.3 Assessment of potential consequences

The objective of the consequence assessment is to provide a structured and transparent analysis of the potential consequences if the pests or disease agents were to enter, establish and spread in Australia. The assessment considers direct and indirect pest effects and their economic and environmental consequences. The requirements for assessing potential consequences are given in Article 5.3 of the SPS Agreement (WTO 1995), ISPM 5 (FAO 2019a) and ISPM 11 (FAO 2017b).

Direct pest effects are considered in the context of the effects on:

- plant life or health
- other aspects of the environment.

Indirect pest effects are considered in the context of the effects on:

- eradication, control
- domestic trade
- international trade
- non-commercial and environmental.

For each of these six criteria, the consequences were estimated over four geographic levels, defined as:

Local—an aggregate of households or enterprises (a rural community, a town or a local government area).

District—a geographically or geopolitically associated collection of aggregates (generally a recognised section of a state or territory, such as ‘Far North Queensland’).

Regional—a geographically or geopolitically associated collection of districts in a geographic area (generally a state or territory, although there may be exceptions with larger states such as Western Australia).

National—Australia wide (Australian mainland states and territories and Tasmania).

For each criterion, the magnitude of the potential consequence at each of these levels was described using four categories, defined as:

Indiscernible—pest impact unlikely to be noticeable.

Minor significance—expected to lead to a minor increase in mortality/morbidity of hosts or a minor decrease in production but not expected to threaten the economic viability of production. Expected to decrease the value of non-commercial criteria but not threaten the criterion’s intrinsic value. Effects would generally be reversible.

Significant—expected to threaten the economic viability of production through a moderate increase in mortality/morbidity of hosts, or a moderate decrease in production. Expected to significantly diminish or threaten the intrinsic value of non-commercial criteria. Effects may not be reversible.

Major significance—expected to threaten the economic viability through a large increase in mortality/morbidity of hosts, or a large decrease in production. Expected to severely or irreversibly damage the intrinsic ‘value’ of non-commercial criteria.

The estimates of the magnitude of the potential consequences over the four geographic levels were translated into a qualitative impact score (A-G) using Table 2.3. For example, a consequence with a magnitude of ‘significant’ at the ‘district’ level will have a consequence impact score of D.

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

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

Note: In earlier qualitative PRAs, the scale for the impact scores went from A to F and did not explicitly allow for the rating 'indiscernible' at all four levels. This combination might be applicable for some criteria. In this report, the impact scale of A to F has been changed to become B-G and a new lowest category A ('indiscernible' at all four levels) was added. The rules for combining impacts in Table 2.4 were adjusted accordingly.

The overall consequence for each pest is achieved by combining the qualitative impact scores (A–G) for each direct and indirect consequence using a series of decision rules (Table 2.4). These rules are mutually exclusive, and are assessed in numerical order until one applies.

Table 2.4 Decision rules for determining the overall consequence rating for each pest

Rule	The impact scores for consequences of direct and indirect criteria	Overall consequence rating
1	Any criterion has an impact of 'G'; or more than one criterion has an impact of 'F'; or a single criterion has an impact of 'F' and each remaining criterion an 'E'.	Extreme
2	A single criterion has an impact of 'F'; or all criteria have an impact of 'E'.	High
3	One or more criteria have an impact of 'E'; or all criteria have an impact of 'D'.	Moderate
4	One or more criteria have an impact of 'D'; or all criteria have an impact of 'C'.	Low
5	One or more criteria have an impact of 'C'; or all criteria have an impact of 'B'.	Very Low
6	One or more but not all criteria have an impact of 'B', and all remaining criteria have an impact of 'A'.	Negligible

2.2.4 Estimation of the unrestricted risk

Once the assessment of the likelihood of entry, establishment and spread and for potential consequences are completed, the unrestricted risk can be determined for each pest or groups of pests. This is determined by using a risk estimation matrix (Table 2.5) to combine the estimates of the likelihood of entry, establishment and spread and the overall consequences of pest establishment and spread. Therefore, risk is the combination of likelihood and consequence.

When interpreting the risk estimation matrix, note the descriptors for each axis are similar (for example, low, moderate, high) but the vertical axis refers to likelihood and the horizontal axis refers to consequences. Accordingly, a 'low' likelihood combined with 'high' consequences, is not the same as a 'high' likelihood combined with 'low' consequences—the matrix is not symmetrical. For example, the former combination would give an unrestricted risk rating of 'moderate', whereas, the latter would be rated as a 'low' unrestricted risk.

Table 2.5 Risk estimation matrix

Likelihood of pest entry, establishment and spread	Consequences of pest entry, establishment and spread					
	Negligible	Very low	Low	Moderate	High	Extreme
High	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	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very low risk

2.2.5 The appropriate level of protection (ALOP) for Australia

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. The ALOP for Australia, 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. The band of cells in Table 2.5 marked ‘very low risk’ represents the ALOP for Australia.

2.2.6 Adoption of outcomes from previous assessments

Outcomes of previous risk assessments have been adopted in this assessment for pests for which the risk profile is assessed as comparable to previously assessed situations.

The prospective adoption of previous risk assessment ratings is considered on a case-by-case basis by comparing factors relevant to the current commodity/country pathway with those assessed previously. For assessment of the likelihood of importation, factors considered/compared include the commodity type, the prevalence of the pest and commercial production practices, whereas for assessment of the likelihood of distribution of a pest the factors include the commodity type, the time of year when importation occurs, and the availability and susceptibility of hosts at that time. After comparing these factors and reviewing the latest literature, previously determined ratings may be adopted if the department considers the likelihoods to be comparable to those assigned in the previous assessment(s).

The likelihood of establishment and of spread of a pest species in the PRA area (in this instance, Australia) will be comparable between risk assessments, regardless of the commodity/country pathway through which the pest is imported, as these likelihoods relate specifically to conditions and events that occur in the PRA area, and are independent of the importation pathway. Similarly, the estimate of potential consequences associated with a pest species is also

independent of the importation pathway. Therefore, the likelihoods of establishment and of spread of a pest, and the estimate of potential consequences, are directly comparable between assessments, and may be adopted with confidence.

2.2.7 Application of the Group PRA to this risk analysis

Risk estimates derived from a Group PRA are 'indicative' in character. This is because the likelihood of entry (the combined likelihoods of importation and distribution) can be influenced by a range of pathway-specific factors, as explained in Section 2.2.6. Therefore, the indicative likelihood of entry from a Group PRA needs to be verified on a case-by-case basis.

In contrast, and as noted in Section 2.2.6, the risk factors considered in the likelihoods of establishment and spread, and the potential consequences associated with a pest species are not pathway-specific, and are therefore comparable across all import pathways within the scope of the Group PRA. This is because at these latter stages of the risk analysis the pest is assumed to have already found a host within Australia at or beyond its point of entry. Therefore, a Group PRA assessment can be applied as the default outcome for any pest species on a plant import pathway once the previously assigned likelihood of entry has been verified.

In a scenario where the likelihood of entry for a pest species on a commodity is assessed as different to the indicative estimate, the Group PRA-derived likelihoods of establishment and spread and the estimate of consequences can still be used, but the overall risk rating and measures adopted may change.

The *Final group pest risk analysis for mealybugs and the viruses they transmit on fresh fruit, vegetable, cut flower and foliage imports* was finalised in January 2019 and is not applied in this risk analysis. However, its assessments and recommended risk management measures are consistent with the present analysis.

The Group PRA that was applied to this risk analysis is:

- The *Final group pest risk analysis for thrips and orthotospoviruses on fresh fruit, vegetable, cut-flower and foliage imports* (Australian Government Department of Agriculture and Water Resources 2017), which is referred to as the 'thrips group PRA'.

2.3 Stage 3 Pest risk management

Pest risk management describes the process of identifying and implementing phytosanitary measures to manage risks to achieve the ALOP for Australia, while ensuring that any negative effects on trade are minimised.

The conclusions from pest risk assessment are used to decide whether risk management is required and if so, the appropriate measures to be used. Where the unrestricted risk estimate does not achieve the ALOP for Australia, risk management measures are required to reduce this risk to a very low level. The guiding principle for risk management is to manage risk to achieve the ALOP for Australia. The effectiveness of any recommended phytosanitary measures (or combination of measures) is evaluated, using the same approach as used to evaluate the unrestricted risk, to ensure the restricted risk for the relevant pest or pests achieves the ALOP for Australia.

ISPM 11 (FAO 2017b) 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 likelihood of entry of the pest.

Examples given of measures commonly applied to traded commodities include:

- options for consignments—for example, inspection or testing for freedom from pests, 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 longan
- options preventing or reducing infestation in the crop—for example, 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—for example, pest-free area, pest-free place of production or pest-free production site
- options for other types of pathways—for example, consider natural spread, measures for human travellers and their baggage, cleaning or disinfestations of contaminated machinery
- options within the importing Vietnam—for example, surveillance and eradication programs
- prohibition of commodities—if no satisfactory measure can be found.

Risk management measures are identified for each quarantine pest where the level of biosecurity risk does not achieve the ALOP for Australia. These are presented in Chapter 5: Pest risk management, of this report.

3 Vietnam's commercial production practices for longan

This chapter provides information on the pre-harvest, harvest and post-harvest practices, considered to be standard practices in Vietnam, for the production of fresh longan fruit for export. The export capability of Vietnam is also outlined.

3.1 Considerations used in estimating unrestricted risk

Vietnam provided Australia with information on the standard practices for commercial production of longan cultivars in different regions of Vietnam (PPD 2017). This information has been complemented with data from other sources, such as published literature, and was taken into consideration when estimating the unrestricted risks of pests that may be associated with the import of this commodity.

Australian Government officials visited longan production areas in the provinces of Ben Tre and Hung Yen in February 2018 and the province of Son La in August 2018. The objective of these visits was to observe the harvesting, processing and packing, pest management procedures, and other export practices for longan fruit production. The observations and additional information provided during these visits confirmed the production and processing procedures described in this chapter as standard commercial production practices for longan fruit for export.

In estimating the likelihood of pest introduction it has been assumed that the pre-harvest, harvest and post-harvest production practices for longan as described in this chapter are implemented for all regions, and for all longan cultivars, within the scope of this analysis. Where a specific practice described in this chapter has not been used to estimate the unrestricted risk, it is clearly identified and explained in Chapter 4.

3.2 Longan production areas

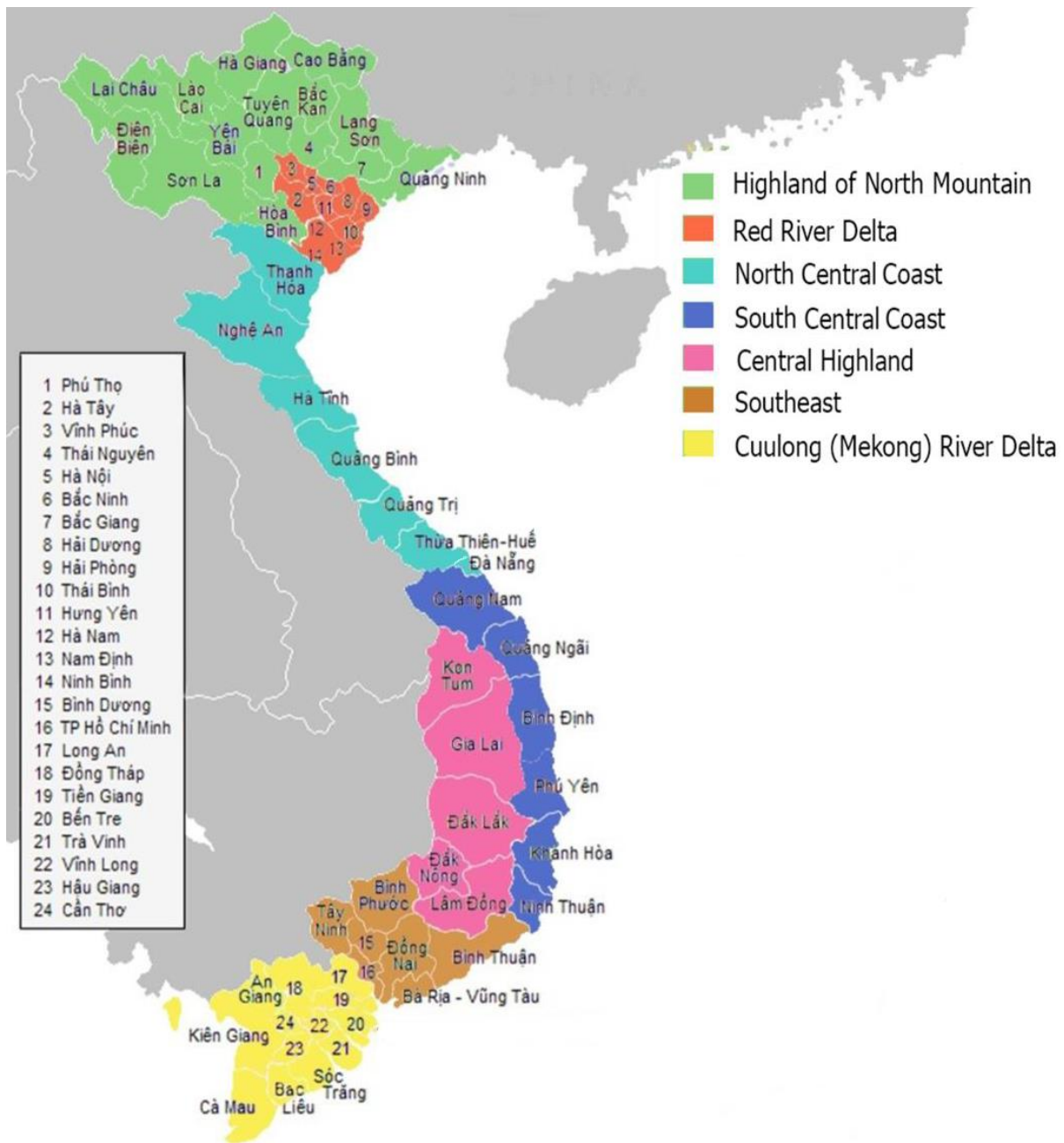
Longan fruit is grown throughout Vietnam, with the largest commercial production areas focused in the north of Vietnam in the Highland of North Mountain and Red River Delta regions, and in the south in the Cuulong (Mekong) River Delta region. These regions are shown in Map 3.

In 2014, there were approximately 75,100 hectares of longan planted in Vietnam, including 12,900 hectares in the Red River Delta region, 20,400 in the Highland of North Mountain region and 31,100 in the Cuulong (Mekong) River Delta Region (PPD 2017).

3.3 Climate in production areas

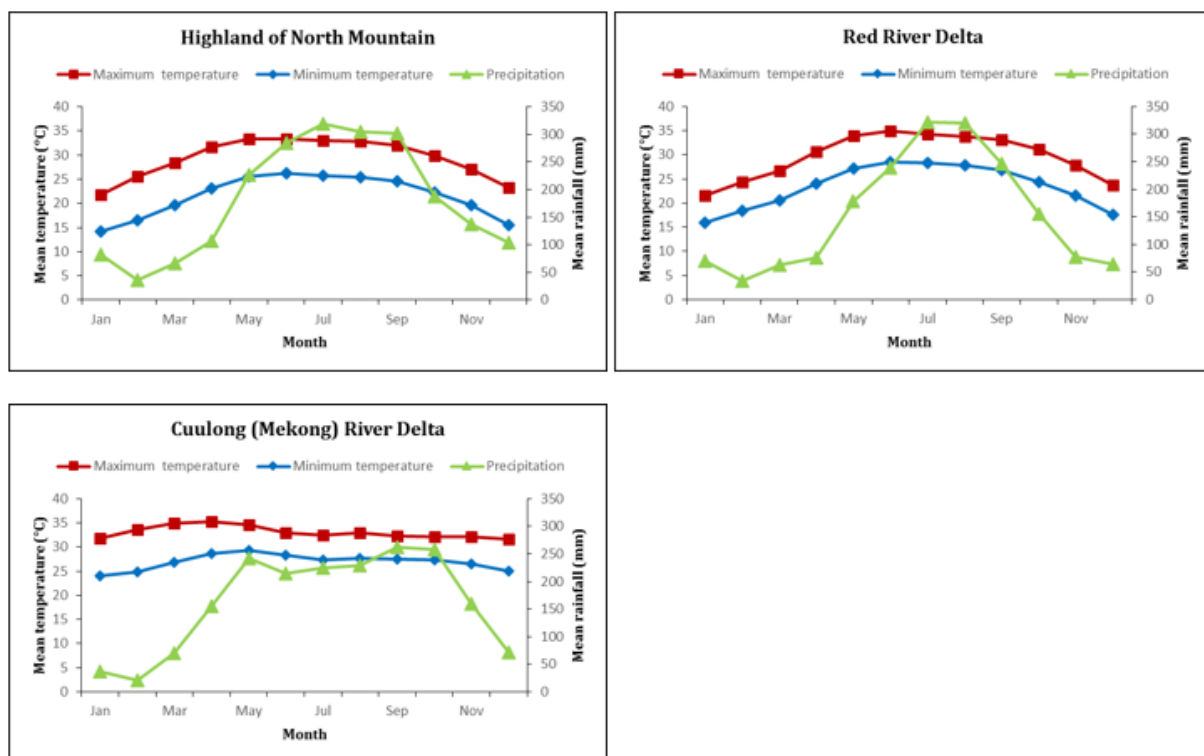
The climate in Vietnam is typically warm and humid, with monsoonal influences leading to high rates of rainfall in the wet season, which typically lasts from May to November depending on the region (Weatheronline 2018; World Weather Online 2018). The climate in the southern parts of Vietnam is divided into a wet season from June to November and a drier season from December to April (Hickery et al. 2015). Northern regions experience four distinct seasons. Temperatures in mountainous areas in the north can drop to below 10 °C in the winter (World Weather Online 2018). Average monthly temperatures and rainfall for the main longan production regions of Vietnam are shown in Figure 2. The longan season occurs naturally during the part of the year with the most rainfall, but the season can be extended or triggered at other times of the year through the use of irrigation (PPD 2017).

Map 3 Regions of Vietnam



Adapted from information provided by Vietnam (PPD 2017)

Figure 2 Maximum and minimum temperatures and mean monthly rainfall in the main longan production regions of Vietnam



Source: (World Weather Online 2018)

3.4 Pre-harvest

3.4.1 Cultivars

Traditionally, many longan farmers grew the *Tiêu da bò* (Cow skin) cultivar but nurseries now produce cultivars specifically selected to produce higher quality fruit and for resistance to disease. Cuttings of these new cultivars are purchased by farmers and grafted onto existing root stock to replace the traditionally grown cultivars. These new cultivars include *Nhãn long*, *Xuống cơm vàng* (Yellow rice sampan), *Miền thiết* and *Edor*.

3.4.2 Cultivation practices

Longan trees grow best in sandy soils. The trees are planted in rows and are pruned and maintained by hand. Longan orchards, that are located near each other, are grouped together for administrative purposes so that their pesticide use can be monitored and accredited by the local government. All orchards in the group deliver fruit to a common packing house. However, this grouping is for administrative purposes only, and each orchard is operated by the owner and their workers.

Longan seedlings are produced at government-approved nursery orchards. These seedlings are then transplanted or used as grafts onto existing root stock at commercial longan orchards. Nursery stock are inspected by officers of the Provincial Department of Agriculture and Rural Development before they are transported to orchards for commercial production.

In Vietnam, longan trees naturally flower in May and produce a single crop per year. Irrigation can be used to trigger flowering at other times of the year to produce fruit outside of the natural flowering season. However, each tree will still only produce a single crop annually.

Keeping the soil around trees drier causes them to produce less leaves and more fruit. Drainage ditches and rings of raised earth may be used to help control the amount of water that reaches and remains near each tree (Figure 3).

Figure 3 Longan orchard with drainage ditches and rings of raised earth to control the amount of water received by each tree



3.4.3 Pest management

Vietnamese farmers producing longan fruit for export are accredited under the Viet GAP (Vietnam Good Agricultural Practices) scheme by their local government. Accredited farmers receive annual training to ensure they can meet export requirements, and use approved pesticides according to spray calendars to meet the residue limits set by the export markets. Pesticides are selected from a list of approved options and pesticide use in the field is monitored by officers of the local government.

Trees are visually monitored by farmers and any signs of pests or diseases are either treated with approved pesticides or pruned from the trees to be disposed of by burning. Pesticide is applied using engine-pumped high pressure sprayers.

3.5 Harvesting and handling procedures

As longan fruit do not ripen further after being picked, harvest occurs when fruit are fully ripe on the tree (PPD 2017). The harvest period usually consists of two harvests occurring 7–10 days apart, if all the trees in the orchard ripen at the same time. It is possible to extend the harvest season by using irrigation to induce the flowering of some trees at different times.

Fruit is harvested by hand, with workers removing clusters of fruit using knives or scissors (PPD 2017). Fruit which is higher on the tree is harvested using secateurs on a long pole (Figure 4).

Figure 4 Harvesting longan fruit from high in the tree



The clusters of fruit are then placed into boxes that are provided to orchards by the local packing house. These boxes have a code unique to the orchard, either written directly on the box or on an inserted label, to allow for traceback and to record the amount of fruit supplied to the packing house from each orchard.

Fruit is selected by pickers during harvest, so that damaged fruit is not placed into the boxes. Once the boxes are filled with fruit they may be sealed with plastic wrap (Figure 5). The boxes are then loaded onto a vehicle to be transported for packing.

Figure 5 Harvested longan fruit placed in boxes and sealed with plastic

3.6 Post-harvest

Harvested fruit is loaded onto a vehicle and either taken directly to the local packing house or to a primary collection point. Fruit that goes to a primary collection point is sorted by hand into export or domestic quality fruit. Export quality fruit is selected based on size and quality (no damage or marks). The fruit is clipped from the panicle into individual fruit and the pedicel is trimmed according to the requirements of the importing country.

Fruit selected for export is then placed into vented containers and fumigated for 90 minutes with a vapour mix of sodium metabisulphite, hydrochloric acid and water. This fumigation is not a phytosanitary measure, but a mechanism to clean the fruit and cause the skin to develop colour. The fruit is then repackaged into boxes, still labelled with farm of origin, and transported to the packing house in a refrigerated truck.

3.6.1 Packing house

Packing houses undergo annual inspection and approval by PPD officers to be certified to export fruit.

Fruit is stored at 0 to 5 °C except when being sorted and packed. If the fruit has not already been sorted at a primary collection point, it is taken to a room at the packing house to be sorted into export and domestic quality fruit. The export fruit undergoes the same quality checks, clipping, and fumigation as fruit sorted at a primary collection point. The export-quality fruit is then moved to a second room to be packed into export packaging. Export packaging consists of

vented boxes lined with insect-proof mesh, which is sealed with a cable tie before the box lid is secured in place. Fruit are either packed into these boxes loose or in small mesh bags for individual sale (Figure 6). The smaller mesh bags contain 40–50 loose longan fruit. Both options allow airflow around packed fruit.

Figure 6 Example of export packaging option of individual longan fruit in small mesh bags for individual sale



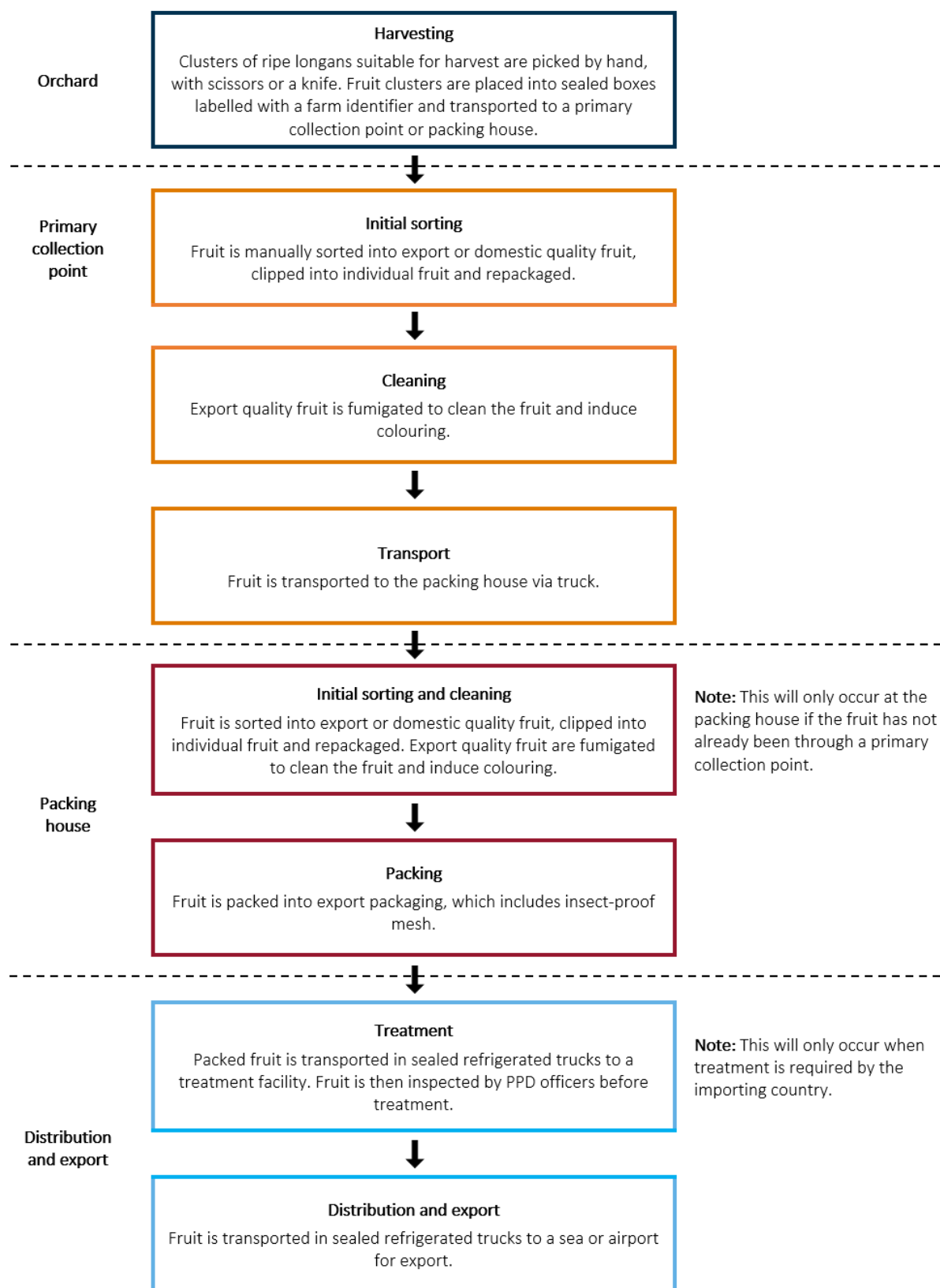
Export procedures

When the importing country requires that fruit undergo treatment, fruit packed for export are loaded into a sealed refrigerated truck and transported to a treatment facility. Consignments undergo visual inspection by PPD officers at the treatment facility before undergoing treatment.

3.6.2 Transport

Treated consignments are loaded into containers within the treatment facility and transported by truck directly to the port or airport from which they will be exported.

Figure 7 summarises the operational steps from harvesting to export of fresh longan fruit from Vietnam.

Figure 7 Summary of orchard and post-harvest steps for longan fruit grown in Vietnam for export

3.7 Export capability

3.7.1 Production statistics

In 2014, there were 75,000 hectares planted with longan trees in Vietnam (PPD 2017). At this time the average production of longan orchards was 5.4–7.2 tonnes per hectare for orchards in the south and 3.6–4.5 tonnes per hectare for orchards in the north (PPD 2017). Selective breeding work in approved nurseries has increased the average production to 9–10.8 tonnes per hectare in orchards using new longan cultivars.

3.7.2 Export statistics

Vietnam exports longan fruit to China, Singapore, Malaysia and the United States. In 2017 Vietnam exported over \$246,500 worth of longan fruit to China (International Trade Centre 2018).

3.7.3 Export season

In the north of Vietnam the export season runs from July to September (PPD 2017). In the south of Vietnam exports mainly coincide with the peak harvest period of June to July (PPD 2017). The smaller volumes of irrigation-induced fruit harvested outside the natural harvest season fetch premium prices at local markets and are unlikely to be exported.

4 Pest risk assessments

A total of 14 quarantine pests for Australia (Table 4.1) and two regulated thrips species (Table 4.2) ('regulated articles', see Section 4.5), associated with export-quality fresh longan fruit produced in Vietnam were identified in the pest categorisation process (Appendix A). This chapter assesses the likelihood of entry (importation and distribution), establishment and spread of these species, and the economic (including environmental) consequences these species may cause if they were to enter, establish and spread in Australia.

Two pests identified in this assessment have been recorded in some regions of Australia but, due to interstate quarantine regulations and their enforcement, are considered pests of regional concern. The acronym for the state for which the regional pest is considered, 'WA' (Western Australia), is used to identify these pests.

All of the 14 quarantine pests considered here have been assessed previously by the department. Therefore, the outcomes of the previous assessments for these pests have been adopted for this risk analysis, unless new information is available that suggests the risk would be different. The acronym 'EP' is used to identify species assessed previously and for which import policy already exists. The adoption of outcomes from previous assessments is outlined in Section 2.2.6.

The biosecurity risk posed by thrips and the orthotospoviruses they transmit, from all countries, on fresh fruit, vegetable, cut-flower and foliage imports was previously assessed in the *Final group pest risk analysis for thrips and orthotospoviruses on fresh fruit, vegetable, cut-flower and foliage imports* (Australian Government Department of Agriculture and Water Resources 2017). This assessment is applicable to the same pests on fresh longan fruit from Vietnam. The acronym 'GP' is used to identify species previously assessed in a Group PRA and for which the Group PRA is applied. The application of the thrips Group PRA to this risk analysis is outlined in Section 2.2.7. A summary of pest information from the thrips Group PRA is presented in this chapter for convenience.

Assessments of risks associated with these species are presented in this chapter unless otherwise indicated.

Table 4.1 Quarantine pests associated with longan from Vietnam

Pest	Common name
Fruit flies [Diptera: Tephritidae]	
<i>Bactrocera correcta</i> (EP)	Guava fruit fly
<i>Bactrocera dorsalis</i> (EP)	Oriental fruit fly
Mealybugs [Hemiptera: Pseudococcidae]	
<i>Dysmicoccus neobrevipes</i> (EP)	Grey pineapple mealybug
<i>Exallomochlus hispidus</i> (EP)	Cocoa mealybug
<i>Paracoccus interceptus</i> (EP)	Intercepted mealybug
<i>Planococcus lilacinus</i> (EP)	Coffee mealybug
<i>Planococcus litchi</i> (EP)	Litchi mealybug
<i>Planococcus minor</i> (EP, WA)	Pacific mealybug
<i>Pseudococcus baliteus</i> (EP)	Aerial root mealybug
<i>Pseudococcus cryptus</i> (EP, WA)	Citriculus mealybug
Soft scales [Hemiptera: Coccidae]	
<i>Drepanococcus chiton</i> (EP)	Longan soft scale
Fruit borers [Lepidoptera: Gracillariidae]	
<i>Conopomorpha sinensis</i> (EP)	Litchi fruit borer
Chromalveolata	
<i>Phytophthora litchii</i> (EP)	Brown blight
Diseases of unknown aetiology	
<i>Longan Witches' Broom Disease</i> (EP)	LWBD

EP: Species has been assessed previously and import policy already exists. **WA:** Pest of regional concern for Western Australia.

Table 4.2 Regulated thrips associated with longan from Vietnam

Thrips [Thysanoptera: Thripidae]	Common name
<i>Scirtothrips dorsalis</i> (GP)	Chilli thrips
<i>Thrips tabaci</i> (GP)	Onion thrips

GP: Species has been assessed previously in a group PRA, and this group PRA has been applied (Australian Government Department of Agriculture and Water Resources 2017).

4.1 Fruit flies

***Bactrocera correcta* (EP) and *Bactrocera dorsalis* (EP)**

Bactrocera correcta (guava fruit fly) and *B. dorsalis* (Oriental fruit fly) belong to the Tephritidae family. They have been grouped together because of their related biologies, on the basis of which they are predicted to pose similar risks and to require similar risk management measures. In this assessment, the term 'fruit flies' is used to refer to these species. The scientific name is used when the information relates to an individual species.

Bactrocera invadens Drew, Tsuruta & White, *B. papayae* Drew & Hancock and *B. philippinensis* Drew & Hancock have recently been synonymised with *B. dorsalis* (Schutze et al. 2015). References to these previously accepted species are now considered to be references to *B. dorsalis*, and this is reflected in the assessment of fruit flies for longan fruit from Vietnam.

Bactrocera correcta and *B. dorsalis* have been assessed previously in the existing import policies for mangoes from Pakistan (Biosecurity Australia 2011), longan and lychees from China and Thailand (DAFF 2004), lychee fruit from Taiwan and Vietnam (DAFF 2013) and dragon fruit from Vietnam (Department of Agriculture and Water Resources 2017). In those existing policies, the unrestricted risk estimate for fruit flies did not achieve the ALOP for Australia. Therefore, specific risk management measures are required for these pests on the pathway.

The department has assessed the likelihood of importation of these fruit fly species on the longan fruit from Vietnam pathway as being similar to the previous assessments of High for these species on other commodity/country pathways. Tephritid fruit flies lay their eggs directly into host fruit, where the larvae then hatch and grow. While this feeding eventually leads to obvious damage to the fruit, signs of infestation are not obvious when the eggs are initially laid. Longan is recorded as a host for these three species of fruit fly, and the presence of these fruit flies in Vietnam has not changed since they were assessed for lychee and dragon fruit from Vietnam. For these reasons, the likelihood of importation of these fruit fly species on longan fruit from Vietnam is considered similar to previously made assessments of High.

Previous assessments of these fruit fly species on other commodity/country pathways rated the likelihood of distribution as High. Longan fruit from Vietnam are expected to be distributed in Australia in a similar way to other fruit commodities assessed previously. Each of these fruit fly species has a wide host range, and host material is likely to be available at all times in parts of Australia. Additionally, adults of these species are capable of flight, and would thus be able to find a suitable host if infested longans were discarded in the environment. There are climatic conditions suitable for the development of these flies in most parts of Australia. Due to the year-round availability of host material, suitable climatic conditions and the ability of these fruit flies to disperse to find hosts, the department has determined the likelihood of distribution for these fruit fly species on the longan fruit from Vietnam pathway to be similar to previously made assessments. Therefore, the same rating of High for the likelihood of distribution of these fruit flies is adopted for the longan fruit from Vietnam pathway.

The likelihoods of establishment and spread of fruit flies in Australia are similar to those of previous assessments. Those likelihoods relate specifically to events that occur in Australia and are essentially independent of the import pathway. The consequences of entry, establishment and spread for fruit flies are also independent of the import pathway and are similar between pest risk assessments. Therefore, the existing ratings for the likelihoods of entry, establishment

and spread, and the rating for the overall consequences for these fruit fly species have been adopted for the longan fruit from Vietnam pathway.

In addition, the department has reviewed the latest literature—for example Hill et al. (2016), Huang and Chi (2014), Kim and Kim (2018), Kunprom, Sopaladawan and Pramual (2015) and PHA (2018)—and no new information has been identified that would significantly change the risk ratings for importation, distribution, establishment, spread and consequences as set out for fruit flies in the existing policies.

The likelihoods of importation, distribution, establishment and spread for these fruit flies on the longan fruit from Vietnam pathway were all rated as High, and the consequences of entry, establishment, and spread were also rated as High. When these likelihood and consequences ratings are combined using the rules presented in Table 2.2 and Table 2.5, the unrestricted risk is determined to be High. All likelihood ratings are set out in Table 4.5.

Unrestricted risk estimate

The unrestricted risk estimate for fruit flies from the longan fruit from Vietnam pathway is assessed as High, which is identical to the outcomes of previous assessments, and which does not achieve the ALOP for Australia. Therefore, specific risk management measures are required for these pests.

4.2 Mealybugs

***Dysmicoccus neobrevipes* (EP), *Exallomochlus hispidus* (EP), *Paracoccus interceptus* (EP), *Planococcus lilacinus* (EP), *Planococcus litchi* (EP), *Planococcus minor* (EP, WA), *Pseudococcus baliteus* (EP) and *Pseudococcus cryptus* (EP, WA)**

Dysmicoccus neobrevipes (grey pineapple mealybug), *Exallomochlus hispidus* (cocoa mealybug), *Paracoccus interceptus* (intercepted mealybug), *Planococcus lilacinus* (coffee mealybug), *Planococcus litchi* (litchi mealybug), *Planococcus minor* (Pacific mealybug), *Pseudococcus baliteus* (aerial root mealybug) and *Pseudococcus cryptus* (citriculus mealybug) belong to the Pseudococcidae or mealybug family. They have been grouped together because of their related biologies, on the basis of which they are predicted to pose similar risks and to require similar risk management measures. In this assessment, the term ‘mealybugs’ is used to refer to these seven species. Scientific names are used when the information refers to an individual species.

Planococcus minor and *Pseudococcus cryptus* are not present in Western Australia and are pests of regional quarantine concern for that state.

The mealybug species assessed here have been assessed previously in a number of existing import policies, for example, in the import policies for longan and lychees from China and Thailand (DAFF 2004), lychee fruit from Taiwan and Vietnam (DAFF 2013), mangosteen from Indonesia (DAFF 2012) and dragon fruit from Vietnam (Department of Agriculture and Water Resources 2017). In those existing policies, the unrestricted risk estimate for mealybugs was uniformly assessed as Low, which does not achieve the ALOP for Australia. Therefore specific risk management measures are required for these pests on those pathways.

The department has assessed the likelihood of importation of mealybugs on the longan fruit from Vietnam pathway as being similar to the previous assessments of High for these species on other commodity/country pathways. Mealybugs often feed on the leaves of their hosts but can also be associated with fruit. When a mealybug finds a suitable feeding site it anchors itself to the host plant with its mouthparts. A feeding mealybug is difficult to dislodge as it produces a waxy coating that helps protect it from predators, parasitoids and desiccation, and may make it difficult to remove through fruit packing processes. The small size of mealybugs (adults range from 1 to 4 millimetres) also means they may not be detected on fruit. For these reasons, the likelihood of importation of mealybugs on longan fruit from Vietnam is considered similar to previously made assessments of High.

Previous assessments of mealybugs on other commodity/country pathways rated the likelihood of distribution as Moderate. Longan fruit from Vietnam are expected to be distributed in Australia in a similar way to other fruit commodities assessed previously. Each of these mealybugs has a wide host range and host material is likely to be available for these pests at all times in Australia, especially as they can feed on leaves and stems when fruit is not available. The most active life stage is the ‘crawler’ (first instar) stage, which is considered to be the most likely stage at which a mealybug will reach a host plant through its own activity. Mealybug nymphs and adult females are not capable of flight, but can potentially be carried by wind. Potential mealybug hosts include herbaceous plants that could be found in areas where longan fruit may be discarded. However, as disposed longan fruit would deteriorate quickly, the mealybug crawlers would only have a limited timeframe to find a new host. For these reasons, the department has determined the likelihood of distribution for mealybugs on the longan fruit

from Vietnam pathway to be similar to previously made assessments. Therefore, the same rating of Moderate for the likelihood of distribution of mealybugs is adopted for the longan fruit from Vietnam pathway.

The likelihoods of establishment and spread of mealybugs in Australia are similar to those of previous assessments. These likelihoods relate specifically to events that occur in Australia and are essentially independent of the import pathway. The consequences of entry, establishment and spread of mealybugs are also independent of the import pathway and are similar between pest risk assessments. Therefore, the existing ratings for the likelihood of entry, establishment and spread and the rating for the overall consequences for mealybugs have been adopted for longan fruit from Vietnam.

In addition, the department has reviewed the latest literature—for example Brahman, Awasthi and Kerketta (2018), Evans and Dooley (2013), García Morales et al. (2019), Hu et al. (2017), Indarwatmi et al. (2017), Kuswadi et al. (2016) and Wang et al. (2018)—and no new information is available that would significantly change the risk ratings for importation, distribution, establishment, spread and consequences as set out for mealybugs in the existing policies.

The likelihoods of importation, establishment and spread for these mealybugs on the longan fruit from Vietnam pathway were rated as High, while the likelihood of distribution was rated as Moderate and the consequences of entry, establishment, and spread were rated as Low. When these likelihood and consequences ratings are combined using the rules presented in Table 2.2 and Table 2.5, the unrestricted risk is determined to be Low. All likelihood ratings are set out in Table 4.5.

Unrestricted risk estimate

The unrestricted risk estimate for mealybugs from the longan fruit from Vietnam pathway is assessed as Low, which is identical to the outcomes of previous assessments, and which does not achieve the ALOP for Australia. Therefore, specific risk management measures are required for these pests.

4.3 Longan soft scale

***Drepanococcus chiton* (EP)**

Drepanococcus chiton (longan soft scale, wax scale) is a soft scale in the family Coccidae. It is distributed throughout southern Asia, Indonesia, Papua New Guinea and China (Gavrilov 2013). Its primary host is longan but it is also known to feed on citrus, mulberry, legumes, and several species of ornamental plants (García Morales et al. 2019).

Drepanococcus chiton was previously assessed in the import policy for mangosteen from Indonesia (DAFF 2012). In that existing policy, the unrestricted risk estimate for *D. chiton* was assessed as Very Low, which achieves the ALOP for Australia. Therefore specific risk management measures are not required for the pest on this pathway.

The department has assessed the likelihood of importation for *D. chiton* on the longan fruit from Vietnam pathway as being similar to the previous assessment of High for this species on the mangosteen from Indonesia pathway. *Drepanococcus chiton* can be associated with longan fruit and a feeding female produces a waxy shell that will protect her from environmental extremes. These individuals are less than 3 millimetres in length and may not be detected on fruit. For the reasons outlined, the likelihood of importation of *D. chiton* on longan fruit from Vietnam is considered similar to the previous assessment of High.

Previous assessment of *D. chiton* on the mangosteen from Indonesia pathway rated the likelihood of distribution as Low. While *D. chiton* has a wide host range and host material is likely to be available at all times in Australia, the mobility of this species is limited. The first nymphal instar is only capable of crawling short distances and, after this initial crawler stage, females attach themselves to the host plant and do not move for the rest of their lives. The crawling nymphs and later-stage males are also vulnerable to environmental extremes and have a low survival rate. Due to the low mobility of this species and the vulnerability of the mobile stages, the department has determined the likelihood of distribution for *D. chiton* on the longan fruit from Vietnam pathway to be similar to previous assessments. Therefore, the previously determined rating of Low for the likelihood of distribution of *D. chiton* is adopted for the longan fruit from Vietnam pathway.

The likelihoods of establishment and spread of *D. chiton* in Australia for longan fruit from Vietnam are similar to those of previous assessments. Those likelihoods relate specifically to events that occur in Australia and are principally independent of the import pathway. The consequences of entry, establishment and spread for *D. chiton* are also independent of the import pathway and are similar between pest risk assessments. Therefore, the existing ratings for the likelihoods of entry, establishment and spread, and the rating for the overall consequences for *D. chiton* have been adopted for the longan fruit from Vietnam pathway.

In addition, the department has reviewed the latest literature—for example Evans and Dooley (2013), García Morales et al. (2019), Mani and Krishnamoorthy (2010) and Suh and Bombay (2015)—and no new information has been identified that would significantly change the risk ratings for importation, distribution, establishment, spread or consequences as set out for *D. chiton* in the existing policy.

While the likelihoods of importation, establishment and spread for *D. chiton* on the longan fruit from Vietnam pathway were rated as High, the likelihood of distribution and the consequences

of entry, establishment, and spread were rated as Low. When these likelihood and consequences ratings are combined using the rules presented in Table 2.2 and Table 2.5, the unrestricted risk is determined to be Very Low. All these likelihood ratings are set out in Table 4.5.

Unrestricted risk estimate

The unrestricted risk estimate for *D. chiton* from the longan fruit from Vietnam pathway is assessed as Very Low, which is identical to the outcomes of previous assessments, and which achieves the ALOP for Australia. Therefore, specific risk management measures are not required for this pest.

4.4 Litchi fruit borer

Conopomorpha sinensis (EP)

Conopomorpha sinensis (Litchi fruit borer) is a moth in the family Gracillariidae. It is found throughout Asia and is a known pest of lychee and longan (Meng et al. 2018; Waite & Hwang 2002).

Conopomorpha sinensis has been assessed previously in the import policies for longan and lychees from China and Thailand (DAFF 2004), and lychee fruit from Taiwan and Vietnam (DAFF 2013). In those policies the unrestricted risk estimate was assessed as Low, which did not achieve the ALOP for Australia. Therefore, specific risk management measures are required for this pest on those pathways.

The department has assessed the likelihood of importation of *C. sinensis* on the longan fruit from Vietnam pathway as being similar to the previous assessments of High for this species on other commodity/country pathways. *Conopomorpha sinensis* lays eggs on longan trees, including directly onto the fruit. When the eggs hatch, the larvae burrow into the fruit to feed on the flesh and seed. While the entry hole may contain visible frass (fruit debris ejected by the larvae), or infestation may begin to cause the fruit to rot, recent entry holes may not be detected on fruit that is harvested and packed. For these reasons, the likelihood of importation of *C. sinensis* on longan fruit from Vietnam is considered similar to previously made assessments of High.

Previous assessments of *C. sinensis* on other commodity/country pathways rated the likelihood of distribution as Moderate. Longan fruit from Vietnam are expected to be distributed in Australia in a similar way to other fruit commodities assessed previously. *Conopomorpha sinensis* only feeds on longan and lychees, but these hosts are available in parts of Australia. Adult *C. sinensis* are capable of flight, and would thus be able to find a suitable host if infested longans were discarded in the environment. There are climatic conditions suitable for the development of *C. sinensis* in those parts of Australia where longan and lychee fruit are grown. Due to the existence of suitable climatic conditions in Australia and the ability of *C. sinensis* to disperse to find hosts, moderated by its limited host range, the department has determined the likelihood of distribution for this species on the longan fruit from Vietnam pathway to be similar to previous assessments. Therefore, the same rating of Moderate for the likelihood of distribution of *C. sinensis* is adopted for the longan fruit from Vietnam pathway.

The likelihoods of establishment and spread of *C. sinensis* in Australia are similar to previous assessments. Those likelihoods relate specifically to events that occur in Australia and are essentially independent of the import pathway. The consequences of entry, establishment and spread for *C. sinensis* are also independent of the import pathway and are similar between pest risk assessments. Therefore, the existing ratings for the likelihoods of entry, establishment and spread and the rating for the overall consequences for *C. sinensis* have been adopted for the longan fruit from Vietnam pathway.

In addition, the department has reviewed the latest literature—for example Srivastava et al. (2016), Li et al. (2014), Meng et al. (2018) and Ranjan (2013)—and no new information has been identified that would significantly change the risk ratings for importation, distribution, establishment, spread or consequences as set out for *C. sinensis* in the existing policies.

While the likelihood of establishment for *C. sinensis* on the longan fruit from Vietnam pathway was rated as Low, the likelihood of importation was rated as High and the likelihoods of distribution and spread and the consequences of entry, establishment, and spread were rated as Moderate. When these likelihood and consequences ratings are combined using the rules presented in Table 2.2 and Table 2.5, the unrestricted risk is determined to be Low. All likelihood ratings are set out in Table 4.5.

Unrestricted risk estimate

The unrestricted risk estimate for *C. sinensis* from the longan fruit from Vietnam pathway is assessed as Low, which is identical to the outcomes of previous assessments, and which does not achieve the ALOP for Australia. Therefore, specific risk management measures are required for this pest.

4.5 Regulated thrips as vectors of emerging quarantine orthospoviruses

Scirtothrips dorsalis, *Thrips tabaci*

No thrips species that are quarantine pests for Australia were identified on the fresh longan fruit from Vietnam pathway. However, *Scirtothrips dorsalis* and *Thrips tabaci* are identified as regulated articles because they are capable of harbouring and spreading (vectoring) emerging orthospoviruses that are quarantine pests for Australia, as detailed in the thrips Group PRA (Australian Government Department of Agriculture and Water Resources 2017).

A regulated article is defined by the IPPC as 'Any plant, plant product, storage place, packaging, conveyance, container, soil and any other organism, object or material capable of harbouring or spreading pests, deemed to require phytosanitary measures, particularly where international transportation is involved' (FAO 2019a). For readability and simplicity, *S. dorsalis* and *T. tabaci* are referred to as 'regulated thrips' in this document, where appropriate.

The indicative likelihood of entry for all thrips is assessed in the thrips Group PRA as Moderate. This indicative likelihood is also relevant to regulated thrips that transmit quarantine orthospoviruses. After assessment of relevant pathway-specific factors (see Section 2.2.7) for fresh longan fruit from Vietnam, likelihoods of entry of Moderate were verified as appropriate for these regulated thrips (Table 4.3).

Table 4.3 Regulated thrips species for longan fruit from Vietnam

Pest	In thrips group PRA	Quarantine pests	Regulated thrips	On longan pathway	Moderate indicative likelihood of entry for thrips verified
<i>Scirtothrips dorsalis</i>	Yes	No	Yes	Yes	Yes
<i>Thrips tabaci</i>	Yes	No	Yes	Yes	Yes

A summary of the risk assessment for quarantine orthospoviruses transmitted by thrips is presented in Table 4.4 for convenience.

Table 4.4 Risk estimates for emerging quarantine orthospoviruses vectored by regulated thrips

Risk component	Rating for emerging quarantine orthospovirus (a)
Likelihood of entry (importation x distribution)	Low (Moderate x Moderate)
Likelihood of establishment	Moderate
Likelihood of spread	High
Overall likelihood of entry, establishment and spread	Low
Consequences	Moderate
Unrestricted risk	Low

(a): The identified regulated thrips vector emerging quarantine orthospoviruses. This table presents the risk estimates for these viruses from the thrips group PRA.

The indicative unrestricted risk estimate for emerging quarantine orthospoviruses transmitted by regulated thrips is Low, which does not achieve the ALOP for Australia, as assessed in the thrips group PRA (Table 4.4).

This indicative unrestricted risk estimate is considered to be applicable for the emerging orthospoviruses known to be vectored by the thrips species present on the pathway for fresh longan fruit from Vietnam. Therefore, specific risk management measures are required for regulated thrips to mitigate the risks posed by emerging quarantine orthospoviruses in order to achieve the ALOP for Australia.

The conclusion of this risk assessment, which is based on the thrips Group PRA, applies to all phytophagous quarantine thrips and regulated thrips on the fresh longan fruit from Vietnam pathway, irrespective of their specific identification in this document.

4.6 Brown blight

Phytophthora litchii (EP)

Phytophthora litchii (litchi brown blight, downy blight) is a water mould in the family Pythiaceae. It has a restricted distribution in Asia, being found in China, Thailand, Vietnam and India (Wang et al. 2010), and is known to infect lychee and longan fruits (Ye et al. 2016). Recent analysis has confirmed that *P. litchii* is in the genus *Phytophthora*, rather than its previous genus *Peronophythora* (Sun et al. 2017).

Phytophthora litchii has been assessed previously in the import policies for longan and lychees from China and Thailand (DAFF 2004) and lychee fruit from Taiwan and Vietnam (DAFF 2013). In these existing policies the unrestricted risk estimate was assessed as Negligible, which achieves the ALOP for Australia. Therefore, specific risk management measures are not required for this pest on these pathways.

The department has assessed the likelihood of importation of *P. litchii* on the longan fruit from Vietnam pathway as being similar to the previous assessments of Moderate for this species on other commodity/country pathways. Fruit infected with *P. litchii* develop symptoms which include visible necrosis and irregular brown lesions. Infected fruit eventually turn brown and become covered in a white downy growth of hyphae, sporangiophores and sporangia. Most infected developing fruit will fall from the tree before harvest and, due to visible symptoms of the disease at the flower budding and fruitlet stage, control measures can be applied before fruit maturity. However, it is possible that infected fruit without evident symptoms, or with only minor symptoms may not be detected. For these reasons, the likelihood of importation of *P. litchii* on longan fruit from Vietnam would be similar to previous assessments of Moderate.

Previous assessments of *P. litchii* on other commodity/country pathways rated the likelihood of distribution as High. *Phytophthora litchii* has a wide host range, and host material is likely to be available at all in times in Australia. Additionally, *P. litchii* is likely to survive storage and transport, and can be spread via water droplets and rain splash. *Phytophthora litchii* is able to persist in tropical or subtropical environments and germinate and spread as sporangia from discarded fruit skins. Due to the year-round availability of host material, suitable climatic conditions and the potential for *P. litchii* to be dispersed by rain splash, the department has determined the likelihood of distribution for *P. litchii* on the longan fruit from Vietnam pathway to be similar to previous assessments. Therefore, the same rating of High for the likelihood of distribution of *P. litchii* is adopted for the longan fruit from Vietnam pathway.

The likelihoods of establishment and spread of *P. litchii* in Australia are similar to those of previous assessments. These likelihoods relate specifically to events that occur in Australia and are principally independent of the import pathway. The consequences of entry, establishment and spread of *P. litchii* in Australia are also independent of the import pathway and are similar across pest risk assessments. Therefore the existing ratings for the likelihoods of entry, establishment and spread, and the rating for the overall consequences for *P. litchii* have been adopted for the longan fruit from Vietnam pathway.

In addition, the department has reviewed the latest literature—for example Bourret et al. (2018), Sun et al. (2017) and Ye et al. (2016)—and no new information has been identified that would significantly change the risk ratings for importation, distribution, establishment, spread or consequences, as set out for *P. litchii* in existing policies.

While the likelihood of distribution for *P. litchii* on the longan fruit from Vietnam pathway was rated as High, the likelihood of importation was rated as Moderate, and the likelihoods of establishment and spread and the consequences of entry, establishment, and spread were rated as Low. When these likelihood and consequences ratings are combined using the rules presented in Table 2.2 and Table 2.5, the unrestricted risk is determined to be Negligible. All these likelihood ratings are set out in Table 4.5.

Unrestricted risk estimate

The unrestricted risk estimate for *Phytophthora litchii* from the longan fruit from Vietnam pathway is assessed as Negligible, which is identical to the outcomes of previous assessments, and which achieves the ALOP for Australia. Therefore, specific risk management measures are not required for this pest on this pathway.

4.7 Longan Witches' Broom Disease (EP)

Longan Witches' Broom Disease (EP)

Longan Witches' Broom Disease (LWBD) is a disease syndrome of longan, known to cause losses of up to 100 per cent of longan fruit on farms in Vietnam (Hoat et al. 2017). The cause of the disease syndrome is not known. However, its effects, potential causative factors and method of spread and transmissibility have been widely observed and studied over several decades. Although it is symptomatically similar to *Litchi Witches' Broom Disease*, which affects lychees (Chen et al. 1996), there is insufficient evidence to suggest that the two disease syndromes have the same causal agent, or that LWBD is capable of affecting other hosts. Similar symptoms have also been observed on longan trees in China, Thailand and Hong Kong, which were attributed to LWBD (Hoat et al. 2017). Because there is no definitive evidence for a specific causal agent for LWBD, this analysis will focus on the species which are associated most closely with the disease syndrome in the literature.

Longan Witches' Broom Disease has been assessed previously on longan in the import policy for longan and lychees from China and Thailand (DAFF 2004). In this policy the unrestricted risk estimate was assessed as Negligible, which achieves the ALOP for Australia. Therefore, specific risk management measures were not required for this pest on these pathways.

The department has assessed the likelihood of importation of LWBD on the longan fruit from Vietnam pathway as being similar to the previous assessment of Very Low for this disease on longan and lychees from China and Thailand. There are several arthropod species considered to be vectors of LWBD present in Vietnam, including the stink bug *Tessaratoma papillosa* and the mite *Eriophyes dimocarpis*. However, these arthropod vectors are not associated with the longan fruit export pathway (DAFF 2013; Peña, Sharp & Wysoki 2002; USDA-APHIS 2007). There are reports of LWBD infection possibly being associated with seed in other longan producing countries (Chen, Chen & Xu 2001), but this association is not supported for cases of LWBD in Vietnam Hoat et al. (2017). For these reasons, the likelihood of importation of LWBD on the longan fruit from Vietnam pathway is considered similar to the previous assessment of Very Low.

Previous assessments of LWBD on longan in the longan and lychees from China and Thailand report rated the likelihood of distribution as Moderate. *Longan Witches' Broom Disease* infects longan trees, and host material is available in parts of Australia. There is limited experimental evidence to suggest that LWBD is transmissible by seed in some longan producing countries (Chen, Chen & Xu 2001). However, there is no evidence that cases of LWBD recorded in Vietnam have been transmitted by seed. Instead, LWBD cases recorded in Vietnam have been associated with arthropod vector species Hoat et al. (2017). Additionally, there are several arthropod species present in Australia with potential to be vectors for LWBD (DAFF 2004; Plant Health Australia 2019). These include the fruit spotting bug *Amblypelta nitida* and the mite *Aceria litchii*, which are both pests of longan (FAO 2002). Due to the presence of potential vectors for this disease, moderated by its limited host range, the department has assessed the likelihood of distribution of LWBD on the longan fruit from Vietnam pathway to be similar to the previous assessment of this disease syndrome on longan and lychees from China and Thailand. Therefore, the same rating of Moderate for the likelihood of distribution of LWBD is adopted for the longan fruit from Vietnam pathway.

The likelihoods of establishment and spread of LWBD in Australia are similar to those in previous assessment of this disease syndrome in the longan and lychees from China and Thailand report. These likelihoods relate specifically to events that occur in Australia and are essentially independent of the import pathway. The consequences of entry, establishment and spread of LWBD in Australia are also independent of the import pathway and are similar between pest risk assessments. Therefore, the existing ratings for the likelihood of entry, establishment and spread, and the rating for the overall consequences for LWBD have been adopted for the longan fruit from Vietnam pathway.

In addition, the department has also reviewed the latest literature—for example Hoat et al. (2017), Qiu (2014) and Seo et al. (2017)—and no new information has been identified that would significantly change the risk ratings for importation, distribution, establishment, spread and consequences, as set out for LWBD in the existing policy for longan and lychees from China and Thailand.

While the likelihoods of distribution and spread for LWBD on the longan fruit from Vietnam pathway were rated as Moderate, the likelihood of establishment and the consequences of entry, establishment, and spread were rated as Low, and the likelihood of importation was rated as Very Low. When these likelihood and consequences ratings are combined using the rules presented in Table 2.2 and Table 2.5, the unrestricted risk is determined to be Negligible. All these likelihood ratings are set out in Table 4.5.

1.8.1 Unrestricted risk estimate

The unrestricted risk estimate for *Longan Witches' Broom Disease* from the longan fruit from Vietnam pathway is assessed as Negligible, which is identical to the outcome assessed in the existing import policy for longan and lychees from China and Thailand (DAFF 2004). This achieves the ALOP for Australia. Therefore, specific risk management measures are not required for this disease syndrome on this pathway.

The department will consider any new information which may affect this assessment as it becomes available in the future.

4.8 Pest risk assessment conclusions

Table 4.5 Summary of unrestricted risk estimates for quarantine pests associated with fresh longan fruit from Vietnam

Pest name	Likelihood of			Establishment	Spread	EES	Consequences	URE
	Entry		Overall					
	Importation	Distribution						
Fruit flies [Diptera: Tephritidae]								
<i>Bactrocera correcta</i> (EP)	High	High	High	High	High	High	High	High
<i>Bactrocera dorsalis</i> (EP)	High	High	High	High	High	High	High	High
Mealybugs [Hemiptera: Pseudococcidae]								
<i>Dysmicoccus neobrevipes</i> (EP)	High	Moderate	Moderate	High	High	Moderate	Low	Low
<i>Exallomochlus hispidus</i> (EP)	High	Moderate	Moderate	High	High	Moderate	Low	Low
<i>Paracoccus interceptus</i> (EP)	High	Moderate	Moderate	High	High	Moderate	Low	Low
<i>Planococcus lilacinus</i> (EP)	High	Moderate	Moderate	High	High	Moderate	Low	Low
<i>Planococcus litchi</i> (EP)	High	Moderate	Moderate	High	High	Moderate	Low	Low
<i>Planococcus minor</i> (EP, WA)	High	Moderate	Moderate	High	High	Moderate	Low	Low
<i>Pseudococcus baliteus</i> (EP)	High	Moderate	Moderate	High	High	Moderate	Low	Low
<i>Pseudococcus cryptus</i> (EP)	High	Moderate	Moderate	High	High	Moderate	Low	Low
Soft scales [Hemiptera: Coccidae]								
<i>Drepanococcus chiton</i> (EP)	High	Low	Low	High	High	Low	Low	Very Low
Fruit borers [Lepidoptera: Gracillariidae]								
<i>Conopomorpha sinensis</i> (EP)	High	Moderate	Moderate	Low	Moderate	Low	Moderate	Low
Chromalveolata								
<i>Phytophthora litchii</i> (EP)	Moderate	High	Moderate	Low	Low	Very Low	Low	Negligible
Diseases of unknown aetiology								
<i>Longan Witches' Broom Disease</i> (EP)	Very Low	Moderate	Very Low	Low	Moderate	Very Low	Low	Negligible

Pest name	Likelihood of					Consequences	URE	
	Entry			Establishment	Spread			EES
	Importation	Distribution	Overall					
Orthotospoviruses [Bunyvirales: Tospoviridae] vectored by regulated thrips (<i>Scirtothrips dorsalis</i> and <i>Thrips tabaci</i>) a								
Listed in the thrips group PRA	Moderate	Moderate	Low	Moderate	High	Low	Moderate	Low

EP: Species has been assessed previously and import policy already exists. **WA:** Pest of quarantine concern for Western Australia. **EES:** Overall likelihood of entry, establishment and spread.

URE: Unrestricted risk estimate. This is expressed in an ascending scale from negligible to extreme as explained in Section 2.2.4.

a: The identified regulated thrips vector emerging quarantine orthotospoviruses, and this table presents the risk estimates for these viruses from the thrips group PRA (Australian Government Department of Agriculture and Water Resources 2017).

4.9 Summary of assessment of quarantine pests of concern

This section provides a summary of the process of assessment of potential and confirmed quarantine pests of concern (shown in Figure 8).

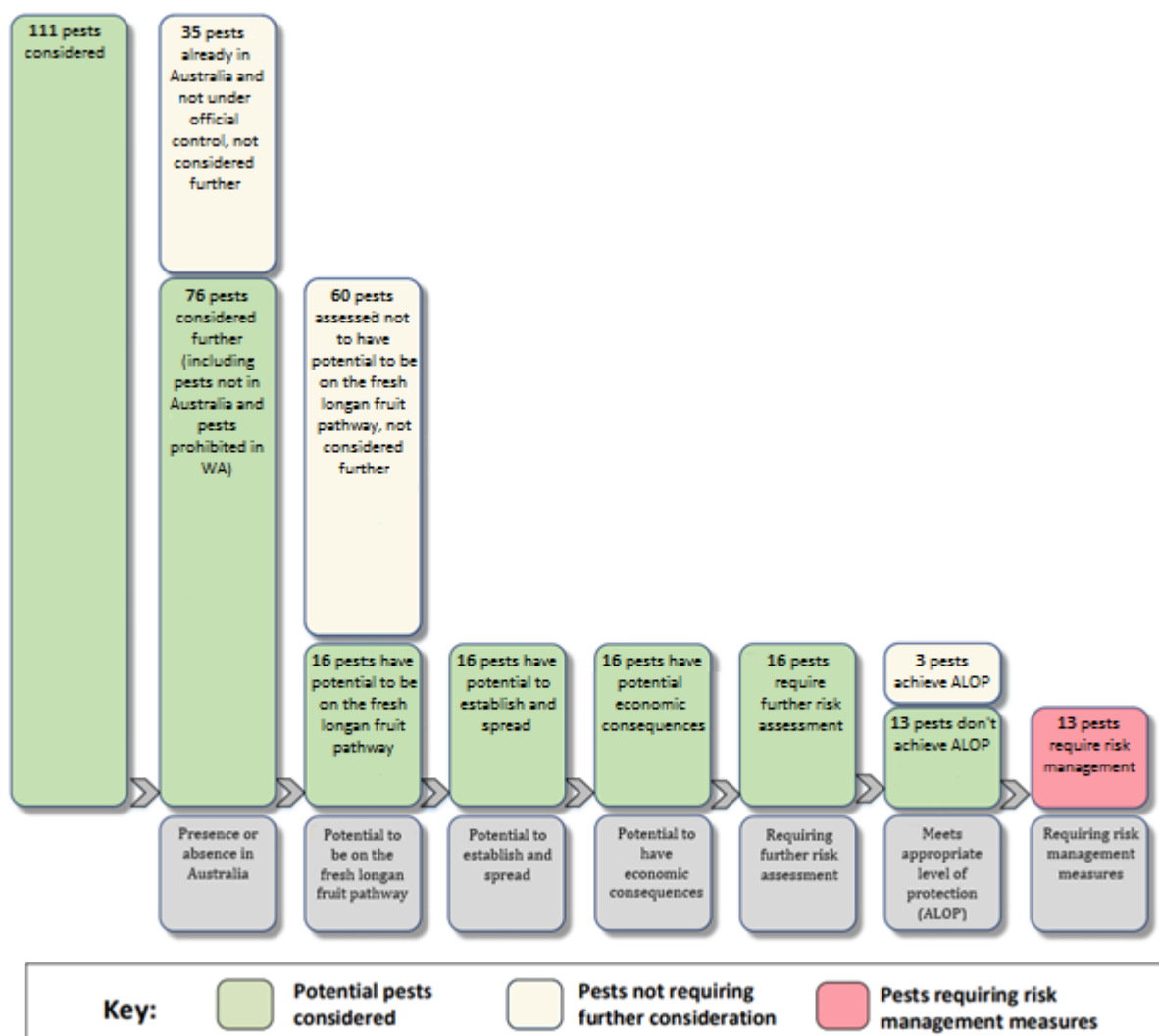
The pest categorisation process (Appendix A) identified 111 pests. Of these 111 pests:

- 35 pests are already present in Australia and not under official control, and therefore were not considered further;
- 60 pests were assessed as not having potential to be on the fresh longan pathway, and therefore did not undergo further assessment;

The outcome of this process left 14 pests and two regulated thrips that require further consideration, that is, a pest risk assessment. Pest risk assessments for these 16 species were subsequently completed.

- The estimated risk for three of the pests was assessed as achieving the ALOP for Australia, and thus no specific risk management measures are required for this pathway. These pests are:
 - *Drepanococcus chiton*
 - *Phytophthora litchii*
 - Longan Witches' Broom Disease
- The estimated risk for 11 quarantine pests were assessed as not achieving the ALOP for Australia and thus specific risk management measures are required. These pests are:
 - *Bactrocera correcta*
 - *Bactrocera dorsalis*
 - *Dysmicoccus neobrevipes*
 - *Exallomochlus hispidus*
 - *Paracoccus interceptus*
 - *Planococcus lilacinus*
 - *Planococcus litchi*
 - *Planococcus minor*
 - *Pseudococcus baliteus*
 - *Pseudococcus cryptus*
 - *Conopomorpha sinensis*
- Two thrips species, *Scirtothrips dorsalis* and *Thrips tabaci*, were identified in the thrips group PRA as regulated thrips due to their ability to vector emerging quarantine orthospoviruses. Their potential to introduce emerging quarantine orthospoviruses into Australia via the longan pathway was confirmed (Table 4.3 and Table 4.4) and thus these pests require specific risk management measures.

Figure 8 Summary of assessment of pests listed in the pest categorisation table



Two of these pests were assessed as being regulated articles and therefore require risk management measures

5 Pest risk management

This chapter provides information on the management of quarantine pests and regulated thrips identified as having an unrestricted risk that does not achieve the appropriate level of protection (ALOP) for Australia. The recommended risk management measures for these pests are described in this chapter. This chapter also describes the operational system that is required for the maintenance and verification of the phytosanitary status of fresh longan fruit from Vietnam for export to Australia.

5.1 Pest risk management measures and phytosanitary procedures

Pest risk management evaluates and selects options for measures to reduce the risk of entry, establishment or spread of quarantine pests and regulated thrips for Australia, where they have been assessed to have an unrestricted risk level that does not achieve the ALOP for Australia. In calculating the unrestricted risk estimate, existing commercial production practices in Vietnam have been considered, as have post-harvest procedures and the packing of fruit.

In addition to Vietnam's existing commercial production systems and packing house operations for fresh longan fruit, specific pest risk management measures are recommended in order to achieve the ALOP for Australia.

In this chapter, the Department of Agriculture and Water Resources has recommended risk management measures that may be applied to consignments of longan fruit sourced from Vietnam. Finalisation of the import conditions may be undertaken with input from the Australian states and territories as appropriate.

5.1.1 Analysis of pest interception data to date

Australia has imported a relatively small amount of fresh longan fruit for human consumption from two permitted countries since 2006. Interceptions of live pests on consignments of longan fruit entering Australia have been rare. These intercepted pests had been identified as of biosecurity concern in the previous risk analysis and appropriate corrective actions and/or remedial actions were undertaken in all cases, including suspension of non-compliant treatment facilities as appropriate. The intercepted species have included some pests relevant to this analysis, including *Bactrocera dorsalis*, several mealybug species such as *Planococcus lilacinus* and *P. minor*, and *Conopomorpha* moth species.

5.1.2 Pest risk management for quarantine pests

The pest risk assessments identified the quarantine pests listed in Table 5.1 as having unrestricted risks that do not achieve the ALOP for Australia. Therefore, risk management measures are required to manage the risks posed by these pests; the recommended measures are listed in Table 5.1.

Table 5.1 Risk management measures recommended for quarantine pests of fresh longan fruit from Vietnam

Pest	Common name	Measures
<i>Bactrocera correcta</i> (EP)	Guava fruit fly	Area freedom a
<i>Bactrocera dorsalis</i> (EP)	Oriental fruit fly	OR Irradiation OR Cold disinfestation treatment
<i>Dysmicoccus neobrevipes</i> (EP)	Grey pineapple mealybug	Pre-export visual inspection and, if found, remedial action b
<i>Exallomochlus hispidus</i> (EP)	Cocoa mealybug	
<i>Paracoccus interceptus</i> (EP)	Intercepted mealybug	
<i>Planococcus lilacinus</i> (EP)	Coffee mealybug	
<i>Planococcus litchi</i> (EP)	Litchi mealybug	
<i>Planococcus minor</i> (EP, WA)	Pacific mealybug	
<i>Pseudococcus baliteus</i> (EP)	Aerial root mealybug	
<i>Pseudococcus cryptus</i> (EP, WA)	Citriculus mealybug	
<i>Conopomorpha sinensis</i> (EP)	Litchi fruit borer	Area freedom a OR Systems approach OR Cold disinfestation treatment OR Irradiation

a Area freedom may include pest free areas, pest free places of production, or pest free production sites. **b** Remedial action (depending on the location of the inspection) may include treatment of the consignment to ensure that the pest is no longer viable or withdrawal of the consignment from export to Australia. **EP** Species has been assessed previously and import policy already exists. **WA** Pest of quarantine concern for Western Australia.

5.1.3 Pest risk management for regulated thrips

The thrips group PRA has identified thrips and emerging orthotospoviruses of biosecurity importance to Australia (Australian Government Department of Agriculture and Water Resources 2017). *Scirtothrips dorsalis* and *Thrips tabaci* are associated with longan fruit from Vietnam. Measures are required to reduce the risk posed by the emerging quarantine orthotospoviruses they vector to achieve the ALOP for Australia (Table 5.2).

Table 5.2 Risk management measures for regulated thrips associated with longan fruit from Vietnam

Regulated thrips	Common name	Measure
<i>Scirtothrips dorsalis</i> (GP)	Chilli thrips	Pre-export visual inspection and, if found, remedial action a
<i>Thrips tabaci</i> (GP)	Onion thrips	

a Remedial action (depending on the location of the inspection) may include treatment of the consignment to ensure that the pest is no longer viable or withdrawal of the consignment from export to Australia. **GP** Species has been assessed previously in a group PRA and the group PRA recommendations have been applied.

5.1.4 Risk management measures for quarantine pests and regulated thrips

Risk management measures recommended here are based on the existing policies for the import of lychee fruit from Taiwan and Vietnam (DAFF 2013) and longan and lychees from China and

Thailand (DAFF 2004) as well as the thrips Group PRA (Australian Government Department of Agriculture and Water Resources 2017). Recommended risk management measures include irradiation or cold disinfestation treatment for fruit flies and litchi fruit borer, with the additional option of a systems approach for litchi fruit borer, and visual inspection and, if found during inspection, remedial action for mealybugs and/or thrips.

This final report recommends that when the following risk management measures are applied, the restricted risk for all identified quarantine pests and regulated thrips, and hence the orthospoviruses the thrips may vector, will achieve the appropriate level of protection (ALOP) for Australia. These measures are:

for fruit flies–

- area freedom, irradiation or cold disinfestation treatment

for mealybugs and thrips–

- pre-export visual inspection and, if found, remedial action

for litchi fruit borer–

- area freedom, a systems approach, cold disinfestation treatment or irradiation.

Management for fruit flies

To manage the risk of fruit flies the Australian Government Department of Agriculture and Water Resources recommends the options of area freedom, irradiation or cold disinfestation treatment as measures for these pests. The objective of the recommended measures is to reduce the risk associated with these pests to achieve the ALOP for Australia.

Recommended measure 1: Area freedom

The requirements for establishing pest free areas, pest free places of production or pest free production sites are set out in ISPM 4: *Requirements for the establishment of pest free areas* (FAO 2017a), ISPM 10: *Requirements for the establishment of pest free places of production and pest free production sites* (FAO 2016b) and, more specifically, ISPM 26: *Establishment of pest free areas for fruit flies (Tephritidae)* (FAO 2019b).

Bactrocera correcta and *B. dorsalis* are widespread in Vietnam (Drew & Romig 2013). Therefore, area freedom may not be a viable option for these species in Vietnam. Should Vietnam wish to use area freedom as a measure to manage the risk posed by *B. correcta* and *B. dorsalis*, PPD will need to provide a submission to the Australian Government Department of Agriculture and Water Resources for its consideration. The submission demonstrating area freedom must fulfil requirements as set out in ISPM 4 (FAO 2017a), ISPM 10 (FAO 2016b) and ISPM 26 (FAO 2019b) and is subject to approval by the Australian Government Department of Agriculture and Water Resources.

Recommended measure 2: Irradiation

The requirements for using irradiation as a phytosanitary measure are set out in ISPM 18: *Guidelines for the use of irradiation as a phytosanitary measure* (FAO 2016c). Irradiation is recognised as an effective method for pest risk management when performed in approved facilities and at specific dose rates recognised as effective for target pest groups. Irradiation dose

rates up to a maximum of 1000 gray are permitted for quarantine purposes for food, including longan fruit, by Food Standards Australia New Zealand (FSANZ 2017).

The Department of Agriculture and Water Resources recommends a treatment schedule of 150 gray minimum absorbed dose, consistent with ISPM 28 Annex 7: *Irradiation treatment for fruit flies of the family Tephritidae (generic)* (FAO 2017d) for *Bactrocera correcta* and *B. dorsalis*.

The use of irradiation as a phytosanitary measure is subject to the Australian Government Department of Agriculture and Water Resources' approval of the irradiation facilities identified by PPD. Should Vietnam wish to use irradiation as a phytosanitary measure, PPD would need to provide a submission to the Australian Government Department of Agriculture and Water Resources. The submission must fulfil requirements as set out in ISPM 18 (FAO 2016c).

Recommended measure 3: Cold disinfestation treatment

Cold disinfestation treatment is considered a suitable measure for *Bactrocera dorsalis* and *B. correcta*. This treatment can be conducted pre-export in Vietnam or in transit to Australia.

The Department of Agriculture and Water Resources recommends a cold disinfestation treatment schedule consistent with the *USDA Treatment Manual* (T107-h) (USDA 2018), recommended for *Bactrocera dorsalis*. Cold disinfestation treatments which are effective for *B. dorsalis* are considered to be effective for *B. correcta* as *B. correcta* is more sensitive to cold than *B. dorsalis* (Liu & Ye 2009; Myers et al. 2016).

The Australian Government Department of Agriculture and Water Resources recommends the following specifications for temperature and exposure times, consistent with T107-h, where cold disinfestation is utilised:

- fruit held at 0.99 °C or below for 17 days, or
- fruit held at 1.38 °C or below for 20 days.

Should Vietnam wish to use pre-export cold disinfestation treatment as a phytosanitary measure, PPD would need to provide a submission to the Australian Government Department of Agriculture and Water Resources that demonstrates it has processes and procedures for the registration, approval and audit of treatment facilities. The Australian Government Department of Agriculture and Water Resources may request on-site verification of the treatment facilities.

Both the pre-export cold disinfestation and in-transit cold disinfestation treatments must fulfil the requirements as set out in the [Australian phytosanitary treatment application standard for cold disinfestation treatment](http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/export/plants-plant-products/plant-exports-manual/resources/australian-phytosanitary-treatment-cold.docx), available at: <http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/export/plants-plant-products/plant-exports-manual/resources/australian-phytosanitary-treatment-cold.docx>.

Management for mealybugs and thrips

The Australian Government Department of Agriculture and Water Resources recommends pre-export visual inspection and, if found, remedial action, as a measure for mealybugs. The objective of the recommended measure is to reduce the risk associated with these pests to achieve the ALOP for Australia.

The measure is also considered appropriate for the regulated thrips *Scirtothrips dorsalis* and *Thrips tabaci* (Table 5.2) and is consistent with the options provided in the thrips Group PRA (Australian Government Department of Agriculture and Water Resources 2017). This measure also applies to all phytophagous quarantine thrips, or regulated thrips, on the longan fruit import pathway, irrespective of their specific identification in this document, consistent with the thrips Group PRA.

Recommended measure 1: Pre-export visual inspection and, if found, remedial action

All consignments of longans for export to Australia must be inspected by PPD and found free of the mealybugs *Dysmicoccus neobrevipes*, *Exallomochlus hispidus*, *Planococcus litchi*, *Planococcus minor*, *Planococcus lilacinus*, *Paracoccus interceptus*, *Pseudococcus baliteus* and *Pseudococcus cryptus* and the thrips *Scirtothrips dorsalis* and *Thrips tabaci*. Pre-export visual inspection must be undertaken by PPD in accordance with ISPM 23: *Guidelines for inspection* (FAO 2016d) and consistent with the principles of ISPM 31: *Methodologies for sampling of consignments* (FAO 2016e). Export consignments found to contain any of these pests must be subjected to remedial action. Remedial action may include withdrawing the consignment from export to Australia, or, if available, application of an approved treatment to ensure that the pest is no longer viable.

Management for litchi fruit borer

The Australian Government Department of Agriculture and Water Resources recommends the options of area freedom, systems approach, cold disinfestation treatment, or irradiation as measures for *Conopomorpha sinensis*. The objective of these recommended measures is to reduce the risk associated with this pest to achieve the ALOP for Australia.

Recommended measure 1: Area freedom

The requirements for establishing pest free areas, pest free places of production or pest free production sites are set out in ISPM 4: *Requirements for the establishment of pest free areas* (FAO 2017a) and ISPM 10: *Requirements for the establishment of pest free places of production and pest free production sites* (FAO 2016b).

Longan fruit for export to Australia will need to be sourced from export orchards free of *Conopomorpha sinensis*. This measure would require systems to be in place for the establishment, maintenance and verification of orchard freedom from *C. sinensis* under the supervision of PPD. The inspection method appropriate for this pest, including details of the timing and size of the sampling to be undertaken for each orchard, would be developed by PPD and submitted to the Department of Agriculture and Water Resources for consideration and approval.

If *C. sinensis* is detected in any export orchard, fruit from that export orchard will not be eligible for the export program to Australia.

PPD is required to report any actions undertaken to the Australian Government Department of Agriculture and Water Resources, including eradication activities. Reinstatement of the area freedom status will be subject to the joint investigation between PPD and the Department of Agriculture and Water Resources on the eradication outcomes.

Recommended measure 2: Irradiation

The requirements for using irradiation as a phytosanitary measure are set out in ISPM 18: *Guidelines for the use of irradiation as a phytosanitary measure* (FAO 2016c). Irradiation is recognised as an effective method for pest risk management when performed in approved facilities and at specific dose rates recognised as effective for target pest groups. Irradiation dose rates up to a maximum of 1000 gray are permitted for quarantine purposes for food, including longan fruit, by Food Standards Australia New Zealand (FSANZ 2017).

The Australian Government Department of Agriculture and Water Resources recommends a treatment schedule of 400 gray minimum absorbed dose, consistent with the USDA Treatment Manual (USDA 2018) for *Conopomorpha sinensis* eggs and larvae.

The use of irradiation as a phytosanitary measure is subject to the Australian Government Department of Agriculture and Water Resources' approval of the irradiation facilities identified by PPD. Should Vietnam wish to use irradiation as a phytosanitary measure, PPD would need to provide a submission to the Australian Government Department of Agriculture and Water Resources. The submission must fulfil requirements as set out in ISPM 18 (FAO 2016c).

Recommended measure 3: Cold disinfestation treatment

Cold disinfestation treatment is considered a suitable measure for *Conopomorpha sinensis*. This treatment can be conducted pre-export in Vietnam or in transit to Australia.

A cold disinfestation treatment schedule consistent with the *USDA Treatment Manual* (T107-h) (USDA 2018) is effective for treating longan fruit for *Conopomorpha sinensis*.

The Australian Government Department of Agriculture and Water Resources recommends the following specifications for temperature and exposure times, consistent with T107-h, where cold disinfestation is utilised:

- fruit held at 0.99 °C or below for 17 days, or
- fruit held at 1.38 °C or below for 20 days.

Should Vietnam wish to use pre-export cold disinfestation treatment as a phytosanitary measure, PPD would need to provide a submission to the Australian Government Department of Agriculture and Water Resources that demonstrates it has processes and procedures for the registration, approval and audit of treatment facilities. The Australian Government Department of Agriculture and Water Resources may request on-site verification of the treatment facilities.

Both the pre-export cold disinfestation and in-transit cold disinfestation treatments must fulfil the requirements as set out in the [Australian phytosanitary treatment application standard for cold disinfestation treatment](http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/export/plants-plant-products/plant-exports-manual/resources/australian-phytosanitary-treatment-cold.docx), available at:

<http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/export/plants-plant-products/plant-exports-manual/resources/australian-phytosanitary-treatment-cold.docx>.

Recommended measure 4: Systems approach

A systems approach that uses the integration of different risk management measures, at least two of which act independently, and which cumulatively achieve the required level of phytosanitary protection, could be used to reduce the risk of *Conopomorpha sinensis* being

imported to Australia with consignments of longan fruit. The requirements of a systems approach are set out in ISPM 14: *The use of integrated measures in a systems approach for pest risk management* (FAO 2017c).

The Department of Agriculture and Water Resources considers a systems approach could be based on establishing an area of low pest prevalence, a combination of in-field preventative measures and monitoring, and pest control, with post-harvest measures. The approach could be used to progressively reduce the risk of infested longan fruit being imported to Australia.

Should Vietnam wish to use a systems approach as a measure to manage the risk posed by *C. sinensis*, PPD would need to provide a submission for consideration and approval by the Department of Agriculture and Water Resources. The submission will need to outline components of the system and how these components would address the risks posed by this pest and also fulfil the requirements set out in ISPM 14 (FAO 2017c).

5.1.5 Consideration of alternative measures

Consistent with the principle of equivalence detailed in ISPM 11: *Pest risk analysis for quarantine pests* (FAO 2017b), the Australian Government Department of Agriculture and Water Resources will consider any alternative measure proposed by PPD, providing that it demonstrably manages the target pest to achieve the ALOP for Australia. Evaluation of such measures will require a technical submission from PPD that details the proposed measures, including suitable information to support the claimed efficacy, for consideration by the Australian Government Department of Agriculture and Water Resources.

5.2 Operational system for the maintenance and verification of phytosanitary status

A system of operational procedures is necessary to maintain and verify the phytosanitary status of longan fruit from Vietnam. This is to ensure that the recommended risk management measures have been met and are maintained.

5.2.1 A system of traceability to source orchards

The objectives of the recommended procedure are to ensure that:

- longan fruit are sourced only from orchards producing commercial quality fruit
- orchards from which longan fruit are sourced can be identified so investigation and corrective action can be targeted rather than applied to all contributing export orchards in the event that live pests are intercepted.

It is recommended that PPD establishes a system to enable traceability to origins from which the longan fruit for export to Australia are sourced. PPD would be responsible for ensuring that export longan growers are aware of pests of biosecurity concern to Australia and agreed risk management measures.

5.2.2 Registration of packing houses and treatment providers and auditing of procedures

The objectives of this recommended procedure are to ensure that:

- longan fruit are sourced only from packing houses and treatment providers processing commercial quality longan fruit approved by PPD.
- treatment providers are capable of applying a treatment that suitably manages the target pests.

Export packing houses are registered with PPD before the commencement of harvest each season. PPD must maintain a list of registered packing houses. PPD is required to ensure that the registered packing houses are suitably equipped and have a system in place to carry out the specified phytosanitary activities. Records of PPD audits would be made available to the Department of Agriculture and Water Resources upon request.

In circumstances where longan fruit undergo treatment prior to export, this process must be undertaken by treatment providers that have been registered with and audited by PPD for that purpose. Records of PPD registration requirements and audits are to be made available to the Department of Agriculture and Water Resources upon request.

The approval of treatment providers by PPD must include verification that suitable systems are in place to ensure compliance with the treatment requirements. This may include:

- documented procedures to ensure longan fruit are appropriately treated and safeguarded post treatment
- staff training to ensure compliance with procedures
- record keeping procedures
- suitability of facilities and equipment
- compliance with PPD's system of oversight of treatment application.

5.2.3 Packaging, labelling and containers

The objectives of this recommended procedure are to ensure that:

- longan fruit intended for export to Australia, and associated packaging, are not contaminated by quarantine pests or regulated articles (as defined in ISPM 5: *Glossary of phytosanitary terms* (FAO 2019a))
- unprocessed packaging material, for example unprocessed plant material—which is not permitted entry, or may vector pests identified as not being on the pathway or pests not known to be associated with longan fruit—is not imported with the longan fruit
- all wood material, containers and transport methods (non-commodity) used in packaging of longan fruit complies with the [Non-commodity information requirements policy](#) (Department of Agriculture and Water Resources 2016b)
- secure packaging is used for export of longan fruit to Australia to prevent re-infestation during storage and transport and to prevent escape of pests during clearance procedures on arrival in Australia. Packaging must meet Australia's secure packing options published on the department's BICON database at <https://bicon.agriculture.gov.au/BiconWeb4.0/ViewElement/Element/Index?elementPk=914691&caseElementPk=992680>
- the packaged longan fruit are labelled with sufficient identification for the purposes of traceability. This may include:
 - for treated product: the treatment facility name/number and treatment identification reference/number
 - for longan fruit where the measures include orchard freedom/area freedom/pest free place of production: the orchard reference/number

- for longan fruit where phytosanitary measures are applied at the packing house: packing house reference/number.

Export packing houses and treatment providers (where applicable) must ensure clean, new packaging and labelling are appropriate to maintain phytosanitary status of the export consignments.

5.2.4 Specific conditions for storage and movement

The objective of this recommended procedure is to ensure that the quarantine integrity of the commodity during storage and movement is maintained.

Longan fruit for export to Australia that have been treated and/or inspected must be kept secure and segregated at all times from any fruit for domestic or other markets, and untreated/non pre-inspected product, to prevent mixing or cross-contamination.

5.2.5 Freedom from trash

The objective of this recommended procedure is to ensure that longan fruit for export are free from trash (for example, loose stem and leaf material, seeds, soil, animal matter/parts or other extraneous material) and foreign matter.

Freedom from trash will be confirmed by the inspection procedures. Export lots or consignments found to contain trash or foreign matter should be withdrawn from export unless approved remedial action such as reconditioning is available and applied to the export consignment and then re-inspected.

5.2.6 Pre-export phytosanitary inspection and certification by PPD

The objectives of this recommended procedure are to ensure that Australia's import conditions have been met.

All consignments have been inspected in accordance with official procedures for all visually-detectable quarantine pests and other regulated articles (including soil, animal and plant debris) using random samples of 600 units per phytosanitary certificate, or equivalent (as defined in ISPM 31: *Methodologies for sampling consignments* (FAO 2016e)). One unit is considered to be a single longan fruit.

A phytosanitary certificate (PC) is issued for each consignment upon completion of pre-export inspection to verify that the required risk management measures have been undertaken offshore and the consignment meets Australia's import requirements.

Each PC includes:

- a description of the consignment (including traceability information);
- details of disinfestation treatments (for example, methyl bromide fumigation) which includes date, concentration, temperature, duration, and/or attached fumigation certificate (as appropriate);
- any other statements that may be required, such as identification of the consignment as being sourced from a recognised pest free area.

5.2.7 Phytosanitary inspection by the Department of Agriculture and Water Resources

The objectives of this recommended procedure are to ensure that:

- consignments comply with Australian import requirements
- consignments are as described on the phytosanitary certificate
- quarantine integrity has been maintained.

On arrival in Australia, the Department of Agriculture and Water Resources will:

- assess documentation to verify that the consignment is as described on the phytosanitary certificate, that required phytosanitary actions have been undertaken, and that product security has been maintained
- verify that the biosecurity status of consignments of longan fruit from Vietnam meet Australia's import conditions. When inspecting consignments, the department will use random samples of 600 units per phytosanitary certificate and inspection methods suitable for the commodity.

5.2.8 Remedial action(s) for non-compliance

The objectives of remedial action(s) for non-compliance are to ensure that:

- any quarantine pest or regulated article, including trash, is addressed by remedial action, as appropriate
- non-compliance with import requirements is addressed, as appropriate.

Any consignment that fails to meet Australia's import conditions is subject to a suitable remedial treatment where an effective treatment is available and biosecurity risks associated with applying the treatment can be effectively managed, or the imported consignment will be re-exported or destroyed.

Other actions, including partial or complete suspension of the import pathway, may be taken depending on the identity and/or importance of the pest intercepted, for example fruit flies of economic importance.

In the event that longan consignments are repeatedly non-compliant, the Department of Agriculture and Water Resources reserves the right to suspend imports (either all imports, or imports from specific pathways) and conduct an audit of the risk management systems. Imports will recommence only when the Department of Agriculture and Water Resources is satisfied that appropriate corrective action has been undertaken.

5.3 Uncategorized pests

If an organism that has not been categorised, including a contaminant pest, is detected on longan fruit on arrival in Australia, it will require assessment by the Department of Agriculture and Water Resources to determine its quarantine status and whether phytosanitary action is required.

Assessment is also required if the detected species was categorised as not likely to be on the import pathway. If the detected species was categorised as on the pathway but assessed as having an unrestricted risk that achieves the ALOP for Australia, then it may require reassessment. The detection of any pests of biosecurity concern not already identified in the analysis may result in remedial action and/or temporary suspension of trade while a review is conducted to ensure that existing measures continue to provide the appropriate level of protection for Australia.

5.4 Review of processes

5.4.1 Verification of protocol

Prior to or during the first season of trade, the Department of Agriculture and Water Resources will verify the implementation of agreed import conditions and phytosanitary measures including registration, operational procedures and treatment providers, where applicable. This may involve representatives from the Department of Agriculture and Water Resources visiting areas in Vietnam that produce longan fruit for export to Australia.

5.4.2 Review of policy

The Department of Agriculture and Water Resources will review the import policy after a suitable volume of trade has been achieved. In addition, the department reserves the right to review the import policy as deemed necessary, including if there is reason to believe that the pest or phytosanitary status in Vietnam has changed.

PPD must inform the Department of Agriculture and Water Resources immediately on detection in Vietnam of any new pests of longan fruit that might be of potential biosecurity concern to Australia.

5.5 Meeting Australia's food laws

Imported food for human consumption must comply with the requirements of the *Imported Food Control Act 1992*, as well as Australian state and territory food laws. Among other things, these laws require all food, including imported food, to meet the standards set out in the Australia New Zealand Food Standards Code (the Code).

The Department of Agriculture and Water Resources administers the *Imported Food Control Act 1992*. This legislation provides for the inspection and control of imported food using a risk-based border inspection program, the Imported Food Inspection Scheme. More information on this inspection scheme, including the testing of imported food, is available from the [department's website](#).

Food Standards Australia New Zealand (FSANZ) is responsible for developing and maintaining the Code, including Standard 1.4.2 - Agvet chemicals. This standard is available on the [Federal Register of Legislation](#) or through the [FSANZ website](#).

Standard 1.4.2 and Schedules 20 and 21 of the Code set out the maximum residue limits (MRLs) and extraneous residue limits (ERLs) for agricultural or veterinary chemicals that are permitted in food, including imported food.

Standard 1.1.1 of the Code specifies that a food must not have, as an ingredient or a component, a detectable amount of an Agvet chemical or a metabolite or a degradation product of the Agvet chemical, unless expressly permitted by the Code.

Standard 1.5.3 of the code stipulates the mandatory requirements where irradiation is applied as a phytosanitary measure, including the permitted fruit and vegetables, sources of irradiation, minimum and a maximum absorbed dose, and the record-keeping and labelling requirements for irradiated produce.

6 Conclusion

The findings of this final risk analysis for fresh longan fruit from Vietnam are based on a comprehensive scientific analysis of relevant literature.

The Department of Agriculture and Water Resources considers that the risk management measures recommended in this report will provide an appropriate level of protection against the pests identified as associated with the trade of fresh longan fruit from Vietnam.

Appendix A: Initiation and categorisation for pests of fresh longan fruit from Vietnam

This table identifies pests that have the potential to be present on fresh longan fruit grown in Vietnam using typical commercial production and packing procedures, and to be imported into Australia.

The *Final group pest risk analysis for thrips and orthotospoviruses on fresh fruit, vegetable, cut-flower and foliage imports* (Australian Government Department of Agriculture and Water Resources 2017) has been applied in this risk analysis.

The purpose of pest categorisation is to ascertain which of these pests require detailed assessment in order to determine whether phytosanitary measures are required. The steps in the pest categorisation process are considered sequentially. The assessment terminates at 'Yes' for the third column (present within Australia), except for pests that are present but under official control, and/or are pests of regional concern. In cases where this does not apply, assessment terminates at the first 'No' in any of the following columns.

In the final column of the table (column 7) the acronyms 'EP' and 'WA' are used. The acronym EP (existing policy) is used for pests that have previously been assessed by Australia and for which import policy exists. The acronym WA is used to identify organisms that have been recorded in some regions of Australia but, due to interstate quarantine regulations, are considered pests of regional concern to Western Australia.

Details of the method used in this risk analysis are given in Section 2: Method for pest risk analysis.

This is not a comprehensive list of all pests associated with longan production, and it does not include soil-borne pests and pathogens, or wood-borers and root pests, as these are not directly related to the export pathway of fresh longan fruit. Other pests that may occasionally be detected in trade, but which are not specifically associated with longan fruit, are not categorised here. Any such contaminant pests detected at the border are managed under existing standard operational procedures. It is important to note that any quarantine pests detected on arrival by quarantine inspection will be actioned as appropriate, even if they have not been assessed in this report.

The department is aware of the recent changes in fungal nomenclature concerning the separate naming of different states of fungi with a pleomorphic life cycle. However, as the nomenclature for these fungi is in a phase of transition and many priorities of names are still to be resolved, this report uses the generally accepted names and provides alternatively used names as synonyms, where required. As official lists of accepted and rejected fungal names become available, these accepted names will be adopted.

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
ARTHROPODS						
Coleoptera						
<i>Adoretus compressus</i> (Weber, 1801) [Scarabaeidae] Rose beetle	Yes (CABI 2019)	No records found	No. Adults feed on leaves and larvae feed on roots (McQuate & Jameson 2011).	Assessment not required	Assessment not required	No
<i>Adoretus sinicus</i> Burmeister, 1855 [Scarabaeidae] Chinese rose beetle	Yes (CABI 2019)	No records found	No. Adults feed on leaves and larvae feed on roots (McQuate & Jameson 2011).	Assessment not required	Assessment not required	No
<i>Adoretus tenuimaculatus</i> Waterhouse, 1875 [Scarabaeidae]	Yes (PPD 2017)	No records found	No. Adults feed on leaves and larvae feed on roots (McQuate & Jameson 2011).	Assessment not required	Assessment not required	No
<i>Anomala cupripes</i> Hope, 1839 [Scarabaeidae] Large green chafer beetle	Yes (CABI 2019)	No records found	No. Adults feed on leaves and larvae feed on roots (Wang & Liu 1991).	Assessment not required	Assessment not required	No
<i>Aulacophora femoralis</i> (Motschulsky, 1857) [Chrysomelidae] Cucurbit leaf beetle	Yes (CABI 2019)	No records found	No. This species is associated with leaves, not the fruit pathway (Tan, Wei & Lan 1998).	Assessment not required	Assessment not required	No
<i>Aulacophora semifusca</i> Jacoby, 1892 Synonym: <i>Aulacophora almora</i> Maulik [Chrysomelidae] Leaf beetle	Yes (Kimoto 1989)	No records found	No. Adults feed on flowers and foliage, and larvae feed on roots (Tan, Wei & Lan 1998).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Euwallacea fornicatus</i> (Eichhoff, 1868) [Curculionidae] Tea shot-hole borer	Yes (CABI 2019; Ge et al. 2017)	Yes. Qld (Geering 2013; Plant Health Australia 2019) Regulated as a Declared Organism (Prohibited (s. 12)) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	No. Larvae tunnel in twigs and small branches of host (CABI 2019).	Assessment not required	Assessment not required	No
<i>Henosepilachna vigintioctopunctata</i> (Fabricius, 1775) Synonym: <i>Epilachna vigintioctopunctata</i> (Fabricius, 1775) [Coccinellidae] Hadda beetle	Yes (CABI 2019)	Yes. NSW, NT, Qld, WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Hypomeces squamosus</i> (Fabricius, 1792) [Curculionidae] Green weevil	Yes (PPD 2017)	No records found	No. This species feeds on leaves and young shoots (Salakpetch 2000).	Assessment not required	Assessment not required	No
<i>Gametis jucunda</i> (Faldermann, 1835) Synonym: <i>Oxycetonia jucunda</i> (Faldermann, 1835) [Scarabaeidae] Smaller green flower chafer	Yes (ITIS 2018)	No records found	No. Adults feed on leaves and larvae feed on roots (Tan, Wei & Lan 1998).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Phaedon brassicae</i> Baly, 1874 [Chrysomelidae] Daikon leaf beetle	Yes (CABI 2019)	No records found	No. Adults and larvae feed on leaves (Tan, Wei & Lan 1998).	Assessment not required	Assessment not required	No
<i>Phyllotreta striolata</i> (Fabricius, 1803) [Chrysomelidae] Cabbage flea beetle	Yes (CABI 2019)	No records found	No. Adults feed on leaves and larvae feed on roots (Tan, Wei & Lan 1998).	Assessment not required	Assessment not required	No
<i>Platymycterus sieversi</i> (Reitter, 1900) [Curculionidae]	Yes (PPD 2017)	No records found	No. Feeds on leaves and stems (PPD 2017; Waterhouse 1993).	Assessment not required	Assessment not required	No
<i>Xylotrupes gideon</i> (Linnaeus, 1767) [Scarabaeidae] Elephant beetle	Yes (CABI 2019)	Yes. NSW, NT, Qld (Plant Health Australia 2019) Regulated as a Declared Organism (Prohibited (s. 12)) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	No. Adult <i>Xylotrupes gideon</i> feed on the surface of fruit but are over 3 cm long and easily visible (QDAF 2012a). Note: <i>X. gideon</i> was assessed as on the pathway in the IRA for longan and lychees from China and Thailand (DAFF 2004). However, review of available biological information concluded that it would be unlikely for the species to persist on the export fruit pathway for longan.	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Diptera						
<i>Bactrocera correcta</i> (Bezzi, 1916) [Tephritidae] Guava fruit fly	Yes (PPD 2010a)	No records found	Yes. <i>Bactrocera correcta</i> lays eggs into longan fruit (CABI 2019).	Yes. <i>Bactrocera correcta</i> has a wide host range including mango, peach, mandarin and longan (CABI 2019). It has a wide distribution in Asia ranging from China, Japan, India, Sri Lanka and Pakistan to Thailand (Drew & Romig 2013). The wide host range and geographic distribution of this pest suggest that there are suitable environments for this pest to establish and spread in Australia.	Yes. <i>Bactrocera correcta</i> is a pest of numerous tropical and subtropical fruit crops and is capable of causing serious economic damage to fruit production (Liu, Yan & Ye 2013).	Yes (EP)
<i>Bactrocera dorsalis</i> (Hendel, 1912) Synonyms: <i>Bactrocera invadens</i> Drew, Tsuruta & White, 2005, <i>B. papayae</i> Drew & Hancock, 1994 and <i>B. philippinensis</i> Drew & Hancock, 1994 have recently been synonymised with <i>B. dorsalis</i> (Schutze et al. 2015). [Tephritidae] Oriental fruit fly	Yes (Drew & Hancock 1994; PPD 2017)	No. Eradicated from Australia (Hancock et al. 2000).	Yes. <i>Bactrocera dorsalis</i> lays eggs into longan fruit in Vietnam (PPD 2017).	Yes. <i>Bactrocera dorsalis</i> attacks over 300 cultivated and wild fruits, and has a broad global distribution due to its ability to establish when introduced into new environments (Mau & Martin Kessing 2007).	Yes. Feeding by <i>B. dorsalis</i> larvae directly damages fruit and causes rotting due to bacteria and fungi (Mau & Martin Kessing 2007).	Yes (EP)

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<p><i>Zeugodacus cucurbitae</i> (Coquillett, 1899)</p> <p>Synonym: <i>Bactrocera cucurbitae</i> (Coquillett, 1899)</p> <p><i>Bactrocera cucurbitae</i> has been reclassified as <i>Zeugodacus cucurbitae</i> (Virgilio et al. 2015).</p> <p>[Tephritidae]</p> <p>Melon fly</p>	Yes (CABI 2019)	<p>No. Records of <i>Zeugodacus cucurbitae</i> in Australia refer to Christmas Island and transient detections in the Torres Strait Islands. These are both managed as separate quarantine areas to mainland Australia and Tasmania and include strict regulatory measures, including movement controls, to ensure that Australia remains free of <i>Z. cucurbitae</i>. Any detections in the Torres Strait Islands are promptly eradicated under the ongoing Exotic Fruit Fly in the Torres Strait Response program (Department of Agriculture and Water Resources 2016a). Christmas Island is an external territory of Australia, situated in the Indian Ocean more than 1500 km northwest of the mainland.</p>	<p>No. Early records of <i>Z. cucurbitae</i> being reared from field collected longans in Hawaii (McBride & Tanada 1949) have not been subsequently confirmed (Dhillon et al. 2005; McQuate, Liquido & Nakamichi 2017; White & Elson-Harris 1992). The original records in McBride and Tanada (1949) were based on unpublished notes and did not list any details of the state of the fruit being collected or methods of identification of the flies. Longans were therefore classified as being a doubtful host. There have been no subsequent host status tests that meet current international standards to demonstrate that longans are a viable host of <i>Z. cucurbitae</i>.</p>	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Zeugodacus tau</i> (Walker, 1849) Synonym: <i>Bactrocera tau</i> (Walker, 1849) <i>Bactrocera tau</i> has been reclassified as <i>Zeugodacus tau</i> (Virgilio et al. 2015). [Tephritidae]	Yes (CABI 2019)	No records found	No. Though some sources identify longan as a host of <i>Z. tau</i> , these sources mistakenly reference a paper by Borah and Dutta (1996), which does not associate this species with longan.	Assessment not required	Assessment not required	No
Hemiptera						
<i>Ceroplastes rubens</i> Maskell, 1893 [Coccidae] Pink wax scale	Yes (CABI 2019)	Yes. NSW, NT, Qld, Vic., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Ceroplastes rusci</i> Linnaeus, 1758 [Coccidae] Fig wax scale	Yes (García Morales et al. 2019)	Yes. NT (Plant Health Australia 2019). WA (DAFWA 2015)	Assessment not required	Assessment not required	Assessment not required	No
<i>Cervaphis rappardi</i> Hille Ris Lambers, 1956 [Aphididae]	Yes (PPD 2017) (as <i>Cevaphis rappadi</i>)	No records found	No. Associated with flowers (Nam & Hung 2006).	Assessment not required	Assessment not required	No
<i>Coccus pseudomagnoliarum</i> (Kuwana, 1914) [Coccidae] Grey citrus scale	Yes (PPD 2017)	Yes. NSW, SA, Vic., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Coccus viridis</i> (Green, 1889) [Coccidae] Soft green scale	Yes (CABI 2019)	Yes. NSW, NT, Qld, WA (Plant Health Australia 2019; Waterhouse & Sands 2001)	Assessment not required	Assessment not required	Assessment not required	No
<i>Cornegenapsylla sinica</i> Yang & Li, 1982 [Psyllidae] Longan psyllid	Yes (PestNet 2019)	No records found	No. Associated with leaves and shoots (Shaoxiong 1999).	Assessment not required	Assessment not required	No
<i>Cryptotympana atrata</i> (Fabricius, 1775) [Cicadidae] Black cicada	Yes (Sanborn 2014)	No records found	No. Adults feed on branches and nymphs feed on roots (CHNZX-Farming 2008).	Assessment not required	Assessment not required	No
<i>Drepanococcus chiton</i> (Green, 1909) [Coccidae] Wax scale	Yes (García Morales et al. 2019; PaDIL 2019)	No records found	Yes. <i>Drepanococcus chiton</i> is associated with the longan fruit export pathway (Evans & Dooley 2013).	Yes. <i>Drepanococcus chiton</i> is polyphagous, feeding on a range of plant species including cocoa, fig, lime, eggplant, guava and ornamental flower species (García Morales et al. 2019). The host range and current geographic distribution of this pest suggest that there are suitable environments for it to establish and spread in Australia.	Yes. This species is considered a serious economic pest that attacks several tropical fruit species of economic importance in Caribbean basin countries (Peña 2013).	Yes (EP)

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Dysmicoccus neobrevipes</i> Beardsley, 1959 [Pseudococcidae] Grey pineapple mealybug	Yes (PPD 2017)	No records found	Yes. This species feeds on the fruit, leaves, roots and stems of longan plants (PPD 2017).	Yes. <i>Dysmicoccus neobrevipes</i> feeds on a wide range of host plants including citrus and mango, and has been reported as an important economic pest of pineapple and banana throughout its pantropical distribution (CABI 2019). The host range and current geographic distribution of this pest suggest that there are suitable environments for it to establish and spread in Australia.	Yes. Mealybugs directly damage their plant hosts, reducing productivity. <i>Dysmicoccus neobrevipes</i> is an important pest of pineapple and is a vector of pineapple mealybug wilt associated virus (Khoo, Ooi & Ho 1991; Sarpong, Asare-Bediako & Acheampong 2017; Williams 2004).	Yes (EP)

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Exallomochlus hispidus</i> (Morrison, 1921) [Pseudococcidae] Cocoa mealybug	Yes (García Morales et al. 2019)	No records found	Yes. This species attacks the stems and fruits of host plants (García Morales et al. 2019).	Yes. <i>Exallomochlus hispidus</i> has a wide host range including figs, rambutan, longan, durian, mangosteen, cocoa, sugar apple, mangrove fan palm and various Rubiaceae plants. Internationally it is distributed in most of Asia and in Italy in environments ranging from temperate to tropical (García Morales et al. 2019).	Yes. <i>Exallomochlus hispidus</i> is a pest of plants from 25 families, including several commercially grown species (Williams 2004). Severe infestations may induce leaf drop but economic losses mostly result from indirect effects of moderate infestations. Deposits of powdery wax and black sooty mould that grows on honeydew droplets on fruits and leaves reduce fruit quality and photosynthesis. In presence of ants the cocoa mealybug tends to be a serious pest (Kuswadi et al. 2016).	Yes (EP)
<i>Ferrisia virgata</i> (Cockerell, 1893) [Pseudococcidae] Striped mealybug	Yes (García Morales et al. 2019)	Yes. NSW, NT, Qld, WA (Plant Health Australia 2019; Poole 2010)	Assessment not required	Assessment not required	Assessment not required	No
<i>Geisha distinctissima</i> (Walker, 1858) [Flatidae] Green broad winged flatid	Yes (Bourgoin 2019)	No records found	No. Associated with stems (USDA 1999).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Greenidea ficicola</i> Takahashi, 1921 [Aphididae]	Yes (PPD 2017)	Yes. NSW, Qld, WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Huechys sanguinea</i> (DeGreer, 1773) [Cicadidae] Black and scarlet cicada	Yes (Sanborn 2014)	No records found	No. Associated with stems (USDA 1999).	Assessment not required	Assessment not required	No
<i>Idioscopus clypealis</i> (Lethierry, 1889) [Cicadellidae] Mango leafhopper	Yes (CABI 2019)	Yes. Qld (Plant Health Australia 2019) Regulated as a Declared Organism (Prohibited (s. 12)) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	No. Feeds on flowers and new leaves (Fletcher & Dangerfield 2002).	Assessment not required	Assessment not required	No
<i>Kerria lacca</i> (Kerr, 1782) [Kerriidae] Lac insect	Yes (Mishra & Kumar 2017)	No records found	No. Feeds on sap from twigs (Mishra & Kumar 2017).	Assessment not required	Assessment not required	No
<i>Lawana imitata</i> (Melichar, 1902) [Flatidae]	Yes (CABI 2019)	No records found	No. Feeds on leaves and shoots (Liu et al. 1996).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Lepidosaphes ulmi</i> (Linnaeus, 1758) [Diaspididae] Oyster-shell scale	Yes (PPD 2017) (as <i>Lepidosaphes uloni</i>)	Yes. NSW, Qld, SA, Tas., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Leptocorisa acuta</i> (Thunberg, 1783) [Coreidae] Rice seed bug	Yes (Waterhouse 1993)	Yes. NSW, NT, Qld, Tas. (Plant Health Australia 2019) Permitted (s. 11) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	Assessment not required	Assessment not required	Assessment not required	No
<i>Maconellicoccus hirsutus</i> (Green, 1908) [Pseudococcidae] Pink hibiscus mealybug	Yes (García Morales et al. 2019; Williams 2004)	Yes. NSW, NT, Qld, WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Nipaecoccus viridis</i> (Newstead, 1894) [Pseudococcidae] Spherical mealybug	Yes (CABI 2019; García Morales et al. 2019)	Yes. NT, Qld, WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Paracoccus interceptus</i> Lit, 1997 [Pseudococcidae] Intercepted mealybug	Yes (García Morales et al. 2019)	No records found	Yes. <i>Paracoccus interceptus</i> is associated with the longan fruit export pathway (Evans & Dooley 2013).	Yes. This species is recorded from more than 24 host plant species across 18 families including mangosteens, mango, custard apple, fig, guava, citrus fruits, lychee and rambutan (Williams 2004). It is likely to establish and spread in Australia if introduced.	Yes. Like other mealybug species <i>P. interceptus</i> has the potential to become an important pest when introduced into new regions. Williams (2004) states that <i>P. interceptus</i> must be regarded as a possible invasive species as it is frequently intercepted by quarantine inspections in the United States. Mealybugs feed on sap, stressing their host plants and reducing the yield of commercial crops. The production of honeydew by mealybugs also promotes the growth of sooty moulds, which reduces the marketability of fruit (CABI 2019).	Yes (EP)
<i>Parasaissetia nigra</i> (Nietner, 1861) [Coccidae] Black coffee scale	Yes (García Morales et al. 2019)	Yes. NSW, NT, Qld, SA, Vic., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Planococcus angkorensis</i> (Takahashi, 1942) [Pseudococcidae]	Yes (García Morales et al. 2019)	No records found	No. <i>Planococcus angkorensis</i> feeds on the roots and within the stems of host plants (Williams 2004).	Assessment not required	Assessment not required	No
<i>Planococcus citri</i> (Risso, 1813) [Pseudococcidae] Citrus mealybug	Yes (García Morales et al. 2019)	Yes. NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Planococcus lilacinus</i> Ferris, 1950 [Pseudococcidae] Coffee mealybug	Yes (García Morales et al. 2019)	Yes. Torres Strait, under official control (QDAF 2018a)	Yes. <i>Planococcus lilacinus</i> is associated with the longan fruit export pathway (Evans & Dooley 2013).	Yes. <i>Planococcus lilacinus</i> has a wide host range and is distributed throughout many tropical areas (Entwistle 1972). Reproduction is usually parthenogenetic (Khoo, Ooi & Ho 1991).	Yes. <i>Planococcus lilacinus</i> is common in southern Asia and has been reported attacking many economically important crops (Williams 2004). It is considered a major threat to agriculture (Miller, Miller & Watson 2002).	Yes (EP)

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Planococcus litchi</i> Cox 1989 (Pseudococcidae) Litchi mealybug	Yes (García Morales et al. 2019)	No records found	Yes. <i>Planococcus litchi</i> is associated with longan and has been intercepted on fruit shipments of lychees (García Morales et al. 2019).	Yes. <i>Planococcus litchi</i> feeds on longans, lychees, loquat and pineapples. It has been reported from multiple temperate and tropical regions in Asia (García Morales et al. 2019). The host range and geographic distribution of this pest suggest that it is capable of establishing and spreading in Australia.	Yes. <i>Planococcus litchi</i> is a pest of several commercial crops (García Morales et al. 2019).	Yes (EP)
<i>Planococcus minor</i> (Maskell, 1897) [Pseudococcidae] Passionvine mealybug	Yes (García Morales et al. 2019)	Yes. ACT, NSW, NT, Qld, SA, Vic. (Plant Health Australia 2019) Regulated as a Declared Organism (Prohibited (s. 12)) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	Yes. <i>Planococcus minor</i> is associated with the longan fruit export pathway (USDA-APHIS 2007).	Yes. <i>Planococcus minor</i> has a wide host range including mango, banana, mandarin, potato and grapevine (CABI 2019). It is distributed in the Australian states and territories of ACT, NSW, NT, Qld, SA and Vic. Internationally it is distributed in most of Asia, Eastern Europe and parts of Africa in environments ranging from temperate to tropical (García Morales et al. 2019).	Yes. <i>Planococcus minor</i> is a significant pest of over 250 plant species, including several commercial crops (Roda et al. 2013; Venette & Davis 2004).	Yes (EP, WA)

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Pseudococcus baliteus</i> Lit, 1994 [Pseudococcidae] Aerial root mealybug	Yes (García Morales et al. 2019)	No records found	Yes. Longan is a host of <i>P. baliteus</i> (García Morales et al. 2019). Although this species is mostly associated with the aerial roots of its hosts (García Morales et al. 2019), it has been intercepted globally on shipments of fruit commodities (Department of Agriculture and Water Resources 2019; Evans & Dooley 2013), including longan (Williams 2004).	Yes. <i>Pseudococcus baliteus</i> has a wide host range including durian, lychee, bitter orange and mangosteen (García Morales et al. 2019). This species is present in China and India, and is widespread in South East Asia (García Morales et al. 2019; Williams 2004). The host range and geographic distribution of this pest suggest that it is capable of establishing and spreading in Australia.	Yes. <i>Pseudococcus baliteus</i> attacks several commercial tropical fruit crops including lychee and mangosteen (Evans & Dooley 2013; García Morales et al. 2019), and it has been recorded on oranges (Williams 2004).	Yes (EP)
<i>Pseudococcus comstocki</i> (Kuwana, 1902) [Pseudococcidae] Comstock's mealybug	Yes (García Morales et al. 2019)	No records found	No. Associated with leaves (USDA 1999).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Pseudococcus cryptus</i> Hempel, 1918 [Pseudococcidae] Citriculus mealybug	Yes (García Morales et al. 2019)	Yes. Qld (QDAF 2018b) Regulated as a Declared Organism (Prohibited (s. 12)) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	Yes. This species feeds on the leaves, twigs, fruit and trunk of host plants (Yiğit & Telli 2013) and is associated with the export fruit pathway for longan (USDA-APHIS 2011).	Yes. This species feeds on host plants in 41 plant families including avocado, banana, citrus, guava, lychee, mango and grape as well as several widely grown ornamental shrubs and trees (García Morales et al. 2019). Widespread in South East Asia, east Africa, Central and South America and the Pacific (Williams 2004).	Yes. This species rapidly became a serious pest of citrus when accidentally introduced into Israel (Williams 2004).	Yes (EP, WA)
<i>Pulvinaria polygonata</i> Cockerell, 1905 [Coccidae] Cottony citrus scale	Yes (García Morales et al. 2019)	Yes. Qld (Plant Health Australia 2019) Regulated as a Declared Organism (Prohibited (s. 12)) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	No. Associated with leaves and stems (Miller et al. 2014).	Assessment not required	Assessment not required	No
<i>Pyrops candelaria</i> Linnaeus, 1758 Synonym: <i>Laternaria candelaria</i> (Linnaeus, 1758) [Fulgoridae] Lantern bug	Yes (Encyclopedia of Life 2019)	No records found	No. This species feeds on sap from the branches and trunk of the tree (Encyclopedia of Life 2019).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Pyrops lathburii</i> (Kirby, 1818) Synonym: <i>Laternaria lathburii</i> (Kirby, 1818) [Fulgoridae]	Yes (Constant & Pham 2017)	No records found	No. Associated with stems (USDA 1999).	Assessment not required	Assessment not required	No
<i>Pyrops spinolae</i> (Westwood, 1842) [Fulgoridae] Lantern bug	Yes (Constant & Pham 2017)	No records found	No. Associated with stems (USDA 1999).	Assessment not required	Assessment not required	No
<i>Rastrococcus truncatispinus</i> Williams, 1985 [Pseudococcidae] Rastrococcus mealybug	Yes (PPD 2017)	Yes. NSW, Qld, SA (Plant Health Australia 2019) Regulated as a Declared Organism (Prohibited (s. 12)) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	No. Feeds on leaves (Gullan 2000).	Assessment not required	Assessment not required	No
<i>Saissetia coffeae</i> (Walker, 1852) [Coccidae] Hemispherical scale	Yes (García Morales et al. 2019)	Yes. ACT, NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Saissetia oleae</i> (Olivier, 1791) [Coccidae] Black scale	Yes (García Morales et al. 2019)	Yes. NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Siphanta acuta</i> (Walker, 1851) [Flatidae] Green plant hopper	Yes (PPD 2017)	Yes. ACT, NSW, Qld, SA, Tas., Vic., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Tessaratomia javanica</i> (Thunberg, 1783) [Tessaratomidae] Litchi stink bug	Yes (CABI 2019)	No records found	No. Adults and nymphs feed on the terminals, flowers, twigs and fruit and usually cause premature drop of fruit (Peña, Sharp & Wysoki 2002). Eggs are laid in conspicuous groups on the underside of leaves (Kumar & Singh 2007). Tessaratomid species are easily detected and removed in the field (Peña, Sharp & Wysoki 2002). Therefore this species will not be associated with harvested fruit.	Assessment not required	Assessment not required	No
<i>Tessaratomia longicorne</i> Dohrn, 1863 [Tessaratomidae]	Yes (PPD 2017)	No records found	No. This species feed on sap of leaves (International Tropical Fruits Network 2012).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Tessaratomia papillosa</i> (Drury, 1770) [Tessaratomidae] Litchi stink bug	Yes (CABI 2019; Pham 2016)	No records found	No. Adults and nymphs of this species feed on the terminals, flowers, twigs and fruit and usually cause premature drop of fruit (Peña, Sharp & Wysoki 2002). Adults and nymphs are highly visible and abandon the host if disturbed (DAFF 2013). Therefore, this species will not be associated with harvested fruit.	Assessment not required	Assessment not required	No
<i>Toxoptera aurantii</i> (Boyer de Fonscolombe, 1841) [Aphididae] Camellia aphid	Yes (CABI 2019; FAO 2004)	Yes. NSW, NT, Qld, SA, Tas., Vic., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
Lepidoptera						
<i>Acanthoecia larminati</i> (Heylaerts, 1904) [Psychidae]	Yes (Sobczyk 2011)	No records found	No. Not associated with fruit (USDA 1999).	Assessment not required	Assessment not required	No
<i>Achaea janata</i> (Linnaeus, 1758) [Noctuidae] Castor semilooper	Yes (CABI 2019)	Yes. NSW, NT, Qld, SA, WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Adoxophyes privatana</i> Walker, 1863 [Tortricidae] Apple leaf-curling moth	Yes (CABI 2019)	No records found	No. Eggs are laid in batches on the leaves (Meijerman & Ulenberg 2016). Larvae web several leaves together to form a nest for feeding. This nest can include fruit, but larvae are very active and will wriggle away or drop to the ground when disturbed (Meijerman & Ulenberg 2016). Therefore, this species will not be associated with harvested fruit.	Assessment not required	Assessment not required	No
<i>Archips micacaena</i> Walker, 1863 [Tortricidae] Leaf roller	Yes (PPD 2017)	No records found	No. Feeds on leaves (Nair 2001).	Assessment not required	Assessment not required	No
<i>Clania variegata</i> (Snellen, 1879) Synonyms: <i>Eumeta variegata</i> Snellen, 1879 <i>Cryptothelea variegata</i> Snellen, 1879 [Psychidae] Bagworm	Yes (CABI 2019)	Yes. NT, WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Conogethes punctiferalis</i> (Guenée, 1854) [Pyralidae] Yellow peach moth	Yes (CABI 2019; PPD 2017)	Yes. NSW, NT, Qld, SA, WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Conopomorpha cramerella</i> Snellen, 1904 [Gracillariidae] Cocoa pod borer	Yes (PPD 2017)	No. Successfully eradicated in 2014 (DAFF 2014)	No. Though there are some records of <i>C. cramerella</i> feeding on longan (Robinson et al. 2019) it is morphologically similar to the longan-feeding <i>C. sinensis</i> and is easily misidentified as this species (Nguyen 2002). Surveys confirm that <i>C. sinensis</i> is found on longan, not <i>C. cramerella</i> (PPD 2018; Waite & Hwang 2002).	Assessment not required	Assessment not required	No
<i>Conopomorpha litchiella</i> Bradley, 1986 [Gracillariidae] Litchi leaf miner	Yes (PPD 2017)	No records found	No. This species feeds on leaves (Waite & Hwang 2002; Wen & Liou 2008).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Conopomorpha sinensis</i> Bradley, 1986 [Gracillariidae] Litchi fruit borer	Yes (Encyclopedia of Life 2019)	No records found	Yes. Larvae of this species feed on leaves and fruit (Wen & Liou 2008). Eggs are laid on the fruit (Waite & Hwang 2002).	Yes. <i>Conopomorpha sinensis</i> feeds on longan and lychees. It has been reported from China, India, Thailand, Taiwan (Kuroko & Lewvanich 1993; Waite & Hwang 2002) and Vietnam (Encyclopedia of Life 2019). The host range and geographic distribution of this pest suggest that it is capable of establishing and spreading in Australia.	Yes. <i>Conopomorpha sinensis</i> is a major economic pest of longan and lychees in mainland China, Taiwan and Thailand (Waite & Hwang 2002).	Yes (EP)
<i>Cryptophlebia ombrodelta</i> (Lower, 1898) [Tortricidae] Macadamia nut borer	Yes (CABI 2019)	Yes. NSW, NT, Qld, WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Dasychira mendosa</i> (Hübner, 1809) Synonym: <i>Olene mendosa</i> Hübner, 1809 [Lymantriidae] Tussock caterpillar	Yes (Robinson et al. 2019)	Yes. NT, Qld (Plant Health Australia 2019) Regulated as a Declared Organism (Prohibited (s. 12)) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	No. This species feeds on leaves (Lok et al. 2012; Waterhouse 1993).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Dudusa synopla</i> Swinhoe, 1907 [Notodontidae] Leaf-eating caterpillar	Yes (Schintlmeister 2008)	No records found	No. This species feeds on leaves (Hoskins 2012; Kuroko & Lewvanich 1993; Waterhouse 1993).	Assessment not required	Assessment not required	No
<i>Eudocima fullonia</i> (Clerck, 1764) Synonym: <i>Othreis fullonia</i> Clerck, 1764 [Noctuidae] Fruit-piercing moth	Yes (PPD 2017)	Yes. NSW, NT, Qld, WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Eudocima salamina</i> Cramer, 1777 [Noctuidae] Fruit-piercing moth	Yes (Kuroko & Lewvanich 1993; PPD 2017)	Yes. NSW, NT, Qld (Plant Health Australia 2019) Regulated as a Declared Organism (Prohibited (s. 12)) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	No. Adults of this species feed externally on fruit at night but egg laying and larval feeding occur on leaves on unrelated hosts (QDAF 2012b).	Assessment not required	Assessment not required	No
<i>Euproctis fraterna</i> Moore, 1883 [Lymantriidae] Coffee hairy caterpillar	Yes (Robinson et al. 2019)	No records found	No. This species feeds on leaves (Kuroko & Lewvanich 1993; Waterhouse 1993).	Assessment not required	Assessment not required	No
<i>Gatesclarkeana idia</i> Diakonoff, 1973 [Tortricidae]	Yes (Encyclopedia of Life 2019)	No records found	No. This species feeds on flowers (Kuroko & Lewvanich 1993).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Homona coffearia</i> (Nietner, 1861) [Tortricidae] Coffee tortrix	Yes (PPD 2010b)	No. <i>Homona coffearia</i> does not occur in Australia and Australian records under this name should be referred to as <i>Homona spargotis</i> (Whittle et al. 1987).	No. This species feeds on leaves (Kuroko & Lewvanich 1993; Waterhouse 1993).	Assessment not required	Assessment not required	No
<i>Hypolycaena erylus</i> (Godart, 1823) [Lymantriidae] Common tit	Yes (Spitzer & Jaroš 2008)	No records found	No. This species feeds on leaves and flowers (Hawkeswood, Dunn & Sommung 2016).	Assessment not required	Assessment not required	No
<i>Hyposidra talaca</i> Walker, 1860 [Geometridae] Black looper	Yes (Robinson et al. 2019)	Yes. Qld, WA (Herbison-Evans & Crossley 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Indarbela dea</i> (Swinhoe, 1890) [Cossidae] Bark borer	Yes (PPD 2010b)	No records found	No. Larvae of this species feed on the bark of stems and branches (CABI 2019; PPD 2010b).	Assessment not required	Assessment not required	No
<i>Neostauropus alternus</i> (Walker, 1855) Synonym: <i>Stauropus alternus</i> Walker, 1855 [Notodontidae] Lobster caterpillar	Yes (CABI 2019)	No records found	No. Larvae of this species feed on leaves (Kuroko & Lewvanich 1993).	Assessment not required	Assessment not required	No
<i>Ophiusa coronata</i> (Fabricius, 1875) [Noctuidae] Fruit piercing moth	Yes (PPD 2017)	Yes. NSW, NT, Qld, WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Ophiusa tirhaca</i> Cramer, 1780 [Noctuidae] Fruit piercing moth	Yes (PPD 2017)	Yes. NSW, NT, Qld, WA (Discover Life 2019; Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Orgyia postica</i> (Walker, 1855) Synonym: <i>Notolophus australis posticus</i> (Walker, 1855) [Lymantriidae] Cocoa tussock moth	Yes (PPD 2017)	No records found.	No. Larvae of this species feed on leaves (Kuroko & Lewvanich 1993). While this species has been recorded attacking fruit on mango trees, this feeding causes visible damage to the fruit and causes it to drop from the tree prematurely (Gupta & Singh 1986). Therefore this species will not be associated with harvested fruit.	Assessment not required	Assessment not required	No
<i>Orgyia turbata</i> Butler, 1879 [Lymantriidae] Tussock moth	Yes (CABI 2019)	No records found	No. Larvae of this species feed on leaves (Tan, Wei & Lan 1998).	Assessment not required	Assessment not required	No
<i>Parasa lepida</i> Cramer, 1779 [Limacodidae] Nettle caterpillar	Yes (CABI 2019)	No records found	No. Larvae of this species feed on leaves (Kuroko & Lewvanich 1993).	Assessment not required	Assessment not required	No
<i>Pseudonirmides cyanopasta</i> (Hampson, 1910) [Limacodidae] Leaf-eating caterpillar	Yes (Solovyev & Witt 2009)	No record found	No. Larvae of this species feed on leaves (Kuroko & Lewvanich 1993).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Rapala pheretima</i> subsp. <i>petosiris</i> Hewitson, 1863 [Lycaenidae] Copper flash butterfly	Yes (Inayoshi 2011)	No records found	No. Larvae of this species feed on flowers (Kuroko & Lewvanich 1993).	Assessment not required	Assessment not required	No
<i>Somena scintillans</i> (Walker, 1856) Synonym: <i>Euproctis scintillans</i> (Walker, 1856) [Lymantriidae] Hairy tussock caterpillar	Yes (CABI 2019; Waterhouse 1993)	No records found	No Larvae of this species feed on leaves (Kuroko & Lewvanich 1993; Waterhouse 1993).	Assessment not required	Assessment not required	No
<i>Statherotis discana</i> Felder & Rogenhofer, 1874 [Tortricidae] Litchi leaf roller	Yes (CABI 2019)	No records found	No. Larvae of this species feed on leaves (Kuroko & Lewvanich 1993).	Assessment not required	Assessment not required	No
<i>Zeuzera coffeae</i> Nietner, 1861 [Cossidae] Coffee carpenter	Yes (PPD 2017)	No records found	No. This species feeds on leaves and stems (Tan, Wei & Lan 1998).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Thysanoptera						
<i>Scirtothrips dorsalis</i> Shull, 1909 [Thripidae] Chilli thrips	Yes (PPD 2017)	Yes. Widespread in Northern Australia (Australian Government Department of Agriculture and Water Resources 2017). However, assessed as a vector of emerging quarantine orthotospoviruses (Australian Government Department of Agriculture and Water Resources 2017).	Yes. This species is known to be associated with longan (PPD 2017; Talekar 1991) and has been intercepted on commercial consignments of other types of fresh fruit imported into Australia despite its feeding and breeding preference for young leaves.	Not applicable to vector. However, the emerging quarantine orthotospoviruses vectored by this thrips have potential for establishment and spread (Australian Government Department of Agriculture and Water Resources 2017).	Not applicable to vector. However, the emerging quarantine orthotospoviruses vectored by this thrips have potential for consequences (Australian Government Department of Agriculture and Water Resources 2017).	Thrips group PRA applied (Australian Government Department of Agriculture and Water Resources 2017).
<i>Thrips tabaci</i> Lindemann 1889 [Thripidae] Onion thrips	Yes. (PPD 2017)	Yes. Widespread (Australian Government Department of Agriculture and Water Resources 2017). However, assessed as a vector of emerging quarantine orthotospoviruses (Australian Government Department of Agriculture and Water Resources 2017).	Yes. This species is known to be associated with longan (PPD 2017) and has been intercepted on commercial consignments of other types of fresh fruit imported into Australia despite its feeding and breeding preference for young leaves.	Not applicable to vector. However, the emerging quarantine orthotospoviruses vectored by this thrips have potential for establishment and spread (Australian Government Department of Agriculture and Water Resources 2017).	Not applicable to vector. However, the emerging quarantine orthotospoviruses vectored by this thrips have potential for consequences (Australian Government Department of Agriculture and Water Resources 2017).	Thrips group PRA applied (Australian Government Department of Agriculture and Water Resources 2017).

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Trombidiformes						
<i>Aceria litchii</i> (Keifer, 1943) Synonym: <i>Eriophyes litchii</i> Keifer, 1943 [Eriophyidae] Litchi gall mite	Yes (PPD 2017)	Yes. NSW, NT, Qld (Plant Health Australia 2019; Waite 1999)	Assessment not required	Assessment not required	Assessment not required	No
<i>Eriophyes dimocarp</i> Kuang, 1997 [Eriophyidae] Longan gall mite	Yes (Mo et al. 2017)	No records found	No. <i>Eriophyes dimocarp</i> feeds on leaves and is not associated with the longan fruit export pathway (USDA-APHIS 2007).	Assessment not required	Assessment not required	No
<i>Oligonychus biharens</i> (Hirst, 1924) Synonym: <i>Paratetranychus biharens</i> Hirst, 1924 [Tetranychidae] Cassava red mite	Yes (Vacante 2016)	Yes. Qld (Halliday 2000). Regulated as a Declared Organism (Prohibited (s. 12)) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	No. This mite feeds on leaves and rarely leaves the shelter of webs spun on the leaves of its host (Vacante 2016).	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Oligonychus coffeae</i> (Nietner, 1861) [Tetranychidae] Tea red spider mite	Yes (Vacante 2016)	Yes. NSW, NT, Qld (Plant Health Australia 2019) Permitted (s. 11) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	Assessment not required	Assessment not required	Assessment not required	No
<i>Shevtchenkella longitubercula</i> sp. nov. Mo, Tan & Wang, 2017 [Eriophyidae]	Yes (Mo et al. 2017).	No records found	No. This species is only associated with the underside of longan leaves (Mo et al. 2017).	Assessment not required	Assessment not required	No
<i>Tetranychus urticae</i> Koch, 1836 [Tetranychidae] Two-spotted spider mite	Yes (PPD 2017)	Yes. NSW, NT, Qld, SA, Vic., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
ALGAE						
<i>Cephaleuros virescens</i> Kunze ex EM Fries 1832 [Trentepohliales: Trentepohliaceae] Algal leaf spot, green scurf	Yes (PPD 2010b)	Yes. NSW, NT, Qld, Vic. (Plant Health Australia 2019) Permitted (s. 11) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
BACTERIA						
<i>Xanthomonas campestris</i> pv. <i>mangiferaeindicae</i> (Patel, Moniz and Kulkarni 1948) Robbs, Ribiero and Kimura 1974 [Xanthomonadales: Xanthomonadaceae] Bacterial black spot of mango	Yes (PPD 2009)	Yes. NT, WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
CHROMALVEOLATA						
<i>Phytophthora litchii</i> (C.C. Chen ex W.H. Ko, H.S. Chang, H.J. Su, C.C. Chen & L.S. Leu) Voglmayr, Göker, Riethm. & Oberw. Synonyms: <i>Peronophythora litchii</i> C.C. Chen ex W.H. Ko, H.S. Chang, H.J. Su, C.C. Chen & L.S. Leu [Pythiales: Pythiaceae] Brown blight	Yes (Vien et al. 2001)	No. Burgess et al. (2017) collected genetic material consistent with <i>Phytophthora litchii</i> from the general environment in Qld. However, the department has considered this evidence and assessed it as insufficient to define presence in Australia.	Yes. This species is found to cause leaf and stem rot of longan seedlings in Taiwan (Ann, Tsai & Yang 2012). Found on lychee fruit in Vietnam (Vien et al. 2001). <i>Phytophthora</i> spp. have been recorded on longan, causing fruit rot and leaf blight (Anupunt & Sukhvibul 2005; PPD 2017).	Yes. The pathogen can disperse through rain splash as flagellate zoospores or sporangia. The pathogen is polycyclic allowing sporangia and zoospores to be produced repetitively and over a wide area (Sun et al. 2017). The pathogen can overwinter as mycelia and oospores on the remnants of leaves (Wang et al. 2009).	Yes. <i>Phytophthora litchii</i> is a serious pathogen of lychee in China (Wang et al. 2009), and Australia's lychee and longan production is located in areas with similar climates. Spread of other <i>Phytophthora</i> spp. in Australia has caused serious environmental damage to forest tree species (O'Gara, Huberli & Hardy 2005)	Yes (EP)
<i>Phytophthora palmivora</i> (E.J. Butler) E.J. Butler [Pythiales: Pythiaceae] Coconut budrot	Yes (Dau et al. 2008)	Yes. NSW, NT, Qld, Vic. (Plant Health Australia 2019) Regulated as a Declared Organism (Prohibited (s. 12)) by	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
		<p>WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).</p> <p>This species has not been assessed further as, although interstate quarantine regulations are in place to prevent the introduction of this species into WA, routine visual inspection is not considered to be an adequate measure to verify freedom from this species, as budrot-affected longan fruit may not display external symptoms at the time of import. Additionally, there are no specific measures or treatment requirements in place to manage its entry into WA for similar or higher risk hosts or pathways from NSW, NT, Qld or Vic., where the species is present (DAFWA 2019).</p>				

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
FUNGI						
<i>Albonectria rigidiuscula</i> (Berk. & Broome) Rossman & Samuels Synonyms: <i>Calonectria rigidiuscula</i> (Berk. & Broome) Sacc., <i>Michelia</i> <i>Fusarium decemcellulare</i> C. Brick [Hypocreales: Nectriaceae] Green point gall	Yes (Burgess & Burgess 2009)	Yes. NSW, Qld (Plant Health Australia 2019) Regulated as an Unlisted Organism (s. 14) by WA under the <i>Biosecurity and Agriculture Management Act 2007</i> (Government of Western Australia 2018).	No. This species infects the twigs and branches of weakened hosts through wounds or galls formed by other pests (Booth & Waterston 1964; Singh & Singh 1978). Not associated with the longan fruit export pathway.	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Capnodium ramosum</i> Cooke [Capnodiales: Capnodiaceae] Sooty mould of mango	Yes (PPD 2017)	No records found	No. <i>Capnodium ramosum</i> grows superficially, as a sooty mould, on fruit, stems and leaves (Devasahayam & Christdhas Henry 2009). Mycelia grow on the fruit surface and are easily removed through postharvest washing and brushing (Cooke, Persley & House 2009). The fungus does not penetrate the host tissues, only growing on the surface when there are sugary residues present as a result of feeding activity by sap-sucking insects (Devasahayam & Christdhas Henry 2009).	Assessment not required	Assessment not required	No
<i>Cochliobolus lunatus</i> Nelson & Haasis Synonym: <i>Curvularia lunata</i> (Wakker) Boedjin [Pleosporales: Pleosporaceae] Head mould of grasses, rice and sorghum	Yes (CABI 2019; Pham, Nguyen & Hoang 1991)	Yes NSW, Qld, Vic., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
<i>Colletotrichum gloeosporioides</i> (Penz.) Penz. & Sacc. Synonym: <i>Glomerella cingulata</i> [Glomerellales: Glomerellaceae] Anthracnose	Yes (Nguyen et al. 2010)	Yes. NSW, NT, Qld, Vic., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Geotrichum candidum</i> Link. [Saccharomycotina: Ascomycota]	Yes (Hong-Thao et al. 2016)	Yes. NSW, Qld, Tas., Vic., WA (Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No
<i>Lasiodiplodia theobromae</i> Griffon & Maubl. [Ascomycota: Botryosphaerales] Diplodia pod rot of cocoa	Yes (Nguyen et al. 2006)	Yes. NSW, NT, Qld, SA, WA (CABI EPP0 2010; Plant Health Australia 2019)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in Vietnam	Present within Australia	Potential to be on pathway	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
DISEASES OF UNKNOWN AETIOLOGY						
<i>Longan Witches' Broom Disease</i> (LWBD)	Yes (PPD 2017)	No records found	Yes. The disease affects fruit, branches and panicles, and is potentially vectored by the mite species <i>Eriophyes dimocarpi</i> and the litchi stink bug (<i>Tessaratoma papillosa</i>) (Chen, Chen & Xu 2001; Hoat et al. 2017). While LWBD has not been associated with seed transmissible agents in Vietnam (Hoat et al. 2017), longan seeds and budwood have been shown to potentially carry the disease in other longan producing countries (Chen, Chen & Xu 2001).	Yes. There are several arthropod species present in Australia with potential to be vectors for LWBD (DAFF 2004; Plant Health Australia 2019).	Yes. Large crop losses have been attributed to this disease (Hoa et al. 2014). The causal agent of the disease is not known and therefore its host range is also unknown (Hoa et al. 2014). The longan industry in Australia is valued at around \$10 million.	Yes (EP)

Appendix B: Issues raised in stakeholder comments

This section includes key technical issues raised by stakeholders during consultation on the draft report, and the department's responses. Additional information on other issues commonly raised by stakeholders, which may be outside the scope of this technical report, is available on the department's website.

Issue 1: The outcome of the assessment for *Zeugodacus cucurbitae* as being associated with longan fruit was questioned, suggesting that the literature does not support the case.

Response: The department has reconsidered the assessment for *Z. cucurbitae* and has determined that this fruit fly is not associated with the longan fruit export pathway (commercially grown and packed longan fruit) from Vietnam, based on the lack of evidence and records of longan fruit as a host of this species, and the absence of interception records on longan fruit pathway from other countries. The assessment of *Z. cucurbitae* in the pest categorisation table has been updated to reflect this position.

Doubt was raised during the stakeholder consultation period for the draft report about the host status of longans for the fruit fly *Z. cucurbitae*. The department has since reviewed all available scientific literature on the host plant associations.

White and Elson-Harris (1992) and McQuate, Liquido and Nakamichi (2017) reported that early records-associating *Z. cucurbitae* with longans either required further confirmation or should be considered as doubtful hosts. The department reviewed the original records (McBride & Tanada 1949) and found that they were based on unpublished notes and did not list any relevant details that supported longan fruit as being a host of *Z. cucurbitae*, such as the state of the fruit being collected or methods of identification of the flies.

Furthermore, longans were originally classified in McBride and Tanada (1949) as being a doubtful host. There have been no subsequent host status tests that meet current international standards to demonstrate that commercially grown longans are a viable host of *Z. cucurbitae*. A previous assessment of longan and lychees from both China and Thailand determined that *Z. cucurbitae* was not associated with longan fruit (DAFF 2004) and the species has never been intercepted in Australia on longan fruit imports from these countries.

Issue 2: Concerns raised over the potential for insect vectors of *Longan Witches' Broom Disease* being on the importation pathway.

Response: The department has considered the risk of introduction of *Longan Witches' Broom Disease* (LWBD) into Australia through insect vectors as part of the pest risk assessment of LWBD associated with fresh longan fruit (with or without pedicel attached) from Vietnam. The department has determined that the likelihood of importation of LWBD on this pathway is very low and therefore the overall unrestricted risk of this disease syndrome meets the appropriate level of protection (ALOP) for Australia.

The causal agent of LWBD is not present in Australia. For this reason, LWBD was identified during pest categorisation as a potential quarantine pest requiring further consideration in a pest risk assessment (section 4.7, pages 41–42).

LWBD is known to be vectored by external sap feeding arthropod pests, including the stink bug *Tessaratoma papillosa* and the mite *Eriophyes dimocarpus*. The potential of these vectors to harbour the disease, then enter Australia as carriers of LWBD as a result of importing fresh longans from Vietnam and, finally, spread the disease throughout Australia have all been considered in this risk analysis at pest categorisation, Appendix A (see pages 78 and 87) and in the pest risk assessment of LWBD (see page 41). As these vectors feed only on leaves, or abandon the plant entirely if disturbed, they are considered not to be associated with fresh longan fruit that has been picked and commercially processed for export to Australia. Should a potential vector of LWBD remain on harvested longans, it would then be removed through the packing house procedures outlined in section 3.6 (page 23).

Additionally, consignments of fresh longans will be subject to two visual inspections, which would allow for the detection of these vectors—a 600 unit pre-export inspection by Vietnam's National Plant Protection Organisation (section 5.2.6, page 55), and an on-arrival 600 unit inspection conducted by departmental biosecurity officers (section 5.2.7, pages 55–56). If the vectors were detected during on-arrival inspection, remedial action (treatment, export, or destruction) would be taken (section 5.2.8, page 56).

Other issues

The department has made a number of changes in this document following consideration of stakeholder comments on the draft report and subsequent review of the literature. These include:

- amendments to the text in the pest categorisation table (Appendix A) to clarify measures that are in place to prevent the spread of *Zeugodacus cucurbitae* from the external territories of Australia (i.e. Christmas Island and Torres Strait Islands) where this species is present, or occasionally introduced, into mainland Australia
- amendments to the pest categorisation table (Appendix A) to address some minor issues relating to taxonomy or distribution (for example, the reclassification of *Oxycetonia jucunda* to the genus *Gametis*)
- the inclusion of two additional mealybug species, *Planococcus angkorensis* and *Pseudococcus baliteus* in the pest categorisation table (Appendix A) due to a review of available scientific literature determining that both species are present in Vietnam and can be associated with longan trees
 - *Planococcus angkorensis* was assessed as not being associated with the longan fruit export pathway and therefore was not assessed further in the pest categorisation
 - *Pseudococcus baliteus* was assessed in the pest categorisation process as being associated with the longan fruit export pathway, and as a potential quarantine pest for Australia, therefore requiring a pest risk assessment. The species was included in the pest risk assessment for mealybugs and assessed as not achieving the appropriate level of protection. Risk management measures are therefore recommended for this species

- amendments to the pest risk management section (Chapter 5) to include requirements for containers and updated the hyperlink to information on packaging requirements
- minor corrections, rewording and editorial changes for consistency, clarity and web-accessibility.

Glossary

Term or abbreviation	Definition
Additional declaration	A statement that is required by an importing Vietnam to be entered on a phytosanitary certificate and which provides specific additional information on a consignment in relation to regulated pests (FAO 2019a).
Appropriate level of protection (ALOP)	The level of protection deemed appropriate by the Member establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory (WTO 1995).
Appropriate level of protection (ALOP) for Australia	The <i>Biosecurity Act 2015</i> defines the appropriate level of protection (or ALOP) for Australia as a high level of sanitary and phytosanitary protection aimed at reducing biosecurity risks to very low, but not to zero.
Area	An officially defined Vietnam, part of a Vietnam or all or parts of several countries (FAO 2019a).
Area of low pest prevalence	An area, whether all of a Vietnam, part of a Vietnam, or all parts of several countries, as identified by the competent authorities, in which a specific pest occurs at low levels and which is subject to effective surveillance, control or eradication measures (FAO 2019a).
Arthropod	An organism belonging to the phylum Arthropoda, which is largest phylum of animals, and includes the insects, arachnids and crustaceans.
Asexual reproduction	The development of new individual from a single cell or group of cells in the absence of meiosis.
Australian territory	Australian territory as referenced in the <i>Biosecurity Act 2015</i> refers to Australia, Christmas Island and Cocos (Keeling) Islands.
Biosecurity	The prevention of the entry, establishment or spread of unwanted pests and infectious disease agents to protect human, animal or plant health or life, and the environment.
Biosecurity measures	The <i>Biosecurity Act 2015</i> defines biosecurity measures as measures to manage any of the following: biosecurity risk, the risk of contagion of a listed human disease, the risk of listed human diseases entering, emerging, establishing themselves or spreading in Australian territory, and biosecurity emergencies and human biosecurity emergencies.
Biosecurity import risk analysis (BIRA)	The <i>Biosecurity Act 2015</i> defines a BIRA as an evaluation of the level of biosecurity risk associated with particular goods, or a particular class of goods, that may be imported, or proposed to be imported, into Australian territory, including, if necessary, the identification of conditions that must be met to manage the level of biosecurity risk associated with the goods, or the class of goods, to a level that achieves the ALOP for Australia. The risk analysis process is regulated under legislation.
Biosecurity risk	The <i>Biosecurity Act 2015</i> refers to biosecurity risk as the likelihood of a disease or pest entering, establishing or spreading in Australian territory, and the potential for the disease or pest causing harm to human, animal or plant health, the environment, economic or community activities.
Calyx	A collective term referring to all of the sepals in a flower.
Consignment	A quantity of plants, plant products or other articles being moved from one Vietnam to another and covered, when required, by a single phytosanitary certificate (a consignment may be composed of one or more commodities or lots) (FAO 2019a).
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO 2019a).
Crawler	Intermediate mobile nymph stage of certain Arthropods.
Diapause	Period of suspended development/growth occurring in some insects, in which metabolism is decreased.
The department	The Department of Agriculture and Water Resources.

Term or abbreviation	Definition
Endangered area	An area where ecological factors favour the establishment of a pest whose presence in the area will result in economically important loss (FAO 2019a).
Endemic	Belonging to, native to, or prevalent in a particular geography, area or environment.
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 (FAO 2019a).
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO 2018).
Fresh	Living; not dried, deep-frozen or otherwise conserved (FAO 2019a).
Fumigation	A method of pest control that completely fills an area with gaseous pesticides to suffocate or poison the pests within.
Genus	A taxonomic category ranking below a family and above a species and generally consisting of a group of species exhibiting similar characteristics. In taxonomic nomenclature the genus name is used, either alone or followed by a Latin adjective or epithet, to form the name of a species.
Goods	The <i>Biosecurity Act 2015</i> defines goods as an animal, a plant (whether moveable or not), a sample or specimen of a disease agent, a pest, mail or any other article, substance or thing (including, but not limited to, any kind of moveable property).
Host	An organism that harbours a parasite, mutual partner, or commensal partner, typically providing nourishment and shelter.
Host range	Species capable, under natural conditions, of sustaining a specific pest or other organism (FAO 2019a).
Import permit	Official document authorising importation of a longan in accordance with specified phytosanitary import requirements (FAO 2019a).
Infection	The internal 'endophytic' colonisation of a plant, or plant organ, and is generally associated with the development of disease symptoms as the integrity of cells and/or biological processes are disrupted.
Infestation (of a longan)	Presence in a longan of a living pest of the plant or plant product concerned. Infestation includes infection (FAO 2019a).
Inspection	Official visual examination of plants, plant products or other regulated articles to determine if pests are present or to determine compliance with phytosanitary regulations (FAO 2019a).
Intended use	Declared purpose for which plants, plant products, or other regulated articles are imported, produced or used (FAO 2019a).
Interception (of a pest)	The detection of a pest during inspection or testing of an imported consignment (FAO 2019a).
International Plant Protection Convention (IPPC)	The IPPC is an international plant health agreement, established in 1952, that aims to protect cultivated and wild plants by preventing the introduction and spread of pests. The IPPC provides an international framework for plant protection that includes developing International Standards for Phytosanitary Measures (ISPMs) for safeguarding plant resources.
International Standard for Phytosanitary Measures (ISPM)	An international standard adopted by the Conference of the Food and Agriculture Organization, the Interim Commission on Phytosanitary Measures or the Commission on Phytosanitary Measures, established under the IPPC (FAO 2019a).
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO 2019a).
Larva	A juvenile form of animal with indirect development, undergoing metamorphosis (for example, insects or amphibians).
Lot	A number of units of a single longan, identifiable by its homogeneity of composition, origin et cetera, forming part of a consignment (FAO 2019a). Within this report a 'lot' refers to a quantity of fruit of a single variety,

Term or abbreviation	Definition
	harvested from a single production site during a single pick and packed at one time.
Mature fruit	Commercial maturity is the start of the ripening process. The ripening process will then continue and provide a product that is consumer-acceptable. Maturity assessments include colour, starch, index, soluble solids content, flesh firmness, acidity, and ethylene production rate.
National Plant Protection Organization (NPPO)	Official service established by a government to discharge the functions specified by the IPPC (FAO 2019a).
Nymph	The immature form of some insect species that undergoes incomplete metamorphosis. It is not to be confused with larva, as its overall form is already that of the adult.
Official control	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 (FAO 2019a).
Orchard	A contiguous area of longan trees operated as a single entity. Within this report a single orchard is covered under one registration and is issued a unique identifying number.
Pathogen	A biological agent that can cause disease to its host.
Pathway	Any means that allows the entry or spread of a pest (FAO 2019a).
Pest	Any species, strain or biotype of plant, animal, or pathogenic agent injurious to plants or plant products (FAO 2019a).
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 (FAO 2019a).
Pest free area (PFA)	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 (FAO 2019a).
Pest free place of production	Place of production in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained for a defined period (FAO 2019a).
Pest free production site	A defined portion of a place of production in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained for a defined period and that is managed as a separate unit in the same way as a pest free place of production (FAO 2019a).
Pest risk analysis (PRA)	The process of evaluating biological or other scientific and economic evidence to determine whether an organism is a pest, whether it should be regulated, and the strength of any phytosanitary measures to be taken against it (FAO 2019a).
Pest risk assessment (for quarantine pests)	Evaluation of the probability of the introduction and spread of a pest and of the magnitude of the associated potential economic consequences (FAO 2019a).
Pest risk assessment (for regulated non-quarantine pests)	Evaluation of the probability that a pest in plants for planting affects the intended use of those plants with an economically unacceptable impact (FAO 2019a).
Pest risk management (for quarantine pests)	Evaluation and selection of options to reduce the risk of introduction and spread of a pest (FAO 2019a).
Pest risk management (for regulated non-quarantine pests)	Evaluation and selection of options to reduce the risk that a pest in plants for planting causes an economically unacceptable impact on the intended use of those plants (FAO 2019a).
Pest status (in an area)	Presence or absence, at the present time, of a pest in an area, including where appropriate its distribution, as officially determined using expert judgement on the basis of current and historical pest records and other information (FAO 2019a).

Term or abbreviation	Definition
Phytosanitary certificate	An official paper document or its official electronic equivalent, consistent with the model of certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements (FAO 2019a).
Phytosanitary certification	Use of phytosanitary procedures leading to the issue of a phytosanitary certificate (FAO 2019a).
Phytosanitary measure	Phytosanitary relates to the health of plants. Any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO 2019a). In this risk analysis the term 'phytosanitary measure' and 'risk management measure' may be used interchangeably.
Phytosanitary procedure	Any official method for implementing phytosanitary measures including the performance of inspections, tests, surveillance or treatments in connection with regulated pests (FAO 2019a).
Phytosanitary regulation	Official rule to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests, including establishment of procedures for phytosanitary certification (FAO 2019a).
Polyphagous	Feeding on a relatively large number of hosts from different plant family and/or genera.
PRA area	Area in relation to which a pest risk analysis is conducted (FAO 2019a).
Practically free	Of a consignment, field or place of production, without pests (or a specific pests) in numbers or quantities in excess of those that can be expected to result from, and be consistent with good cultural and handling practices employed in the production and marketing of the longan (FAO 2019a).
Production site	In this report, a production site is a continuous planting of longan trees treated as a single unit for pest management purposes. If an orchard is subdivided into one or more units for pest management purposes, then each unit is a production site. If the orchard is not subdivided, then the orchard is also the production site.
Pupa	An inactive life stage that only occurs in insects that undergo complete metamorphosis, for example butterflies and moths (Lepidoptera), beetles (Coleoptera) and bees, wasps and ants (Hymenoptera).
Quarantine	Official confinement of regulated articles for observation and research or for further inspection, testing or treatment (FAO 2019a).
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 (FAO 2019a).
Regulated article	Any plant, plant product, storage place, packaging, conveyance, container, soil and any other organism, object or material capable of harbouring or spreading pests, deemed to require phytosanitary measures, particularly where international transportation is involved (FAO 2019a).
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 impact and which is therefore regulated within the territory of the importing contracting party (FAO 2019a).
Regulated pest	A quarantine pest or a regulated non-quarantine pest (FAO 2019a).
Restricted risk	Restricted risk is the risk estimate when risk management measures are applied.
Risk analysis	Refers to the technical or scientific process for assessing the level of biosecurity risk associated with the goods, or the class of goods, and if necessary, the identification of conditions that must be met to manage the level of biosecurity risk associated with the goods, or class of goods to a level that achieves the ALOP for Australia.
Risk management measure	Conditions that must be met to manage the level of biosecurity risk associated with the goods or the class of goods, to a level that achieves the ALOP for

Term or abbreviation	Definition
	Australia. In this risk analysis, the term 'risk management measure' and 'phytosanitary measure' may be used interchangeably.
Saprophyte	An organism deriving its nourishment from dead organic matter.
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO 2019a).
SPS Agreement	WTO Agreement on the Application of Sanitary and Phytosanitary Measures.
Stakeholders	Government agencies, individuals, community or industry groups or organizations, whether in Australia or overseas, including the proponent/applicant for a specific proposal, who have an interest in the policy issues.
Surveillance	An official process which collects and records data on pest occurrence or absence by surveying, monitoring or other procedures (FAO 2019a).
Systems approach(es)	The integration of different risk management measures, at least two of which act independently, and which cumulatively achieve the appropriate level of protection against regulated pests.
Trash	Soil, splinters, twigs, leaves and other plant material, other than fruit as defined in the scope of this risk analysis. For example, stem and leaf material, seeds, soil, animal matter/parts or other extraneous material
Treatment	Official procedure for the killing, inactivation or removal of pests, or for rendering pests infertile or for devitalisation (FAO 2019a).
Unrestricted risk	Unrestricted risk estimates apply in the absence of risk management measures.
Vector	An organism that does not cause disease itself, but which causes infection by conveying pathogens from one host to another.
Viable	Alive, able to germinate or capable of growth.
Viet GAP	Vietnam Good Agriculture Practice. A scheme under which Vietnamese farmers can be accredited by the government in clean and safe agricultural production procedures

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