Ministry for Primary Industries
Manatū Ahu Matua

Risk Management Proposal:

Fresh Onion for Consumption

September 2016

New Zealand Government

Growing and Protecting New Zealand

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Submissions

The Ministry for Primary Industries (MPI) invites comment from interested parties on the proposed new import health standard (IHS) for Fresh Onion for Consumption (MPI.IHS.FP.ONIONS) which is supported by this Risk Management Proposal (RMP).

The meaning of an IHS is defined in section 22(1) of the Biosecurity Act 1993 as "An import health standard specifies requirements to be met for the effective management of risks associated with importing risk goods, including risks arising because importing the goods involves or might involve an incidentally imported new organism".

MPI therefore seeks comment on the requirements (including measures) in the proposed IHS. MPI has developed this proposal based on the available scientific evidence and assessment of this evidence. If you disagree with the measures proposed to manage the risks, please provide either data or published references to support your comments. This will enable MPI to consider additional evidence which may change how risks are proposed to be managed.

The following points may be of assistance in preparing comments:

- Wherever possible, comments should be specific to an IHS requirement (referencing section numbers or pest names as applicable).
- Where possible, reasons, data and supporting published references to support comments are requested.
- The use of examples to illustrate particular points is encouraged.

MPI encourages respondents to forward comments electronically. Please include the following in your submission:

- The title of the consultation document in the subject line of your email;
- Your name and title (if applicable);
- Your organisation's name (if applicable); and
- Your address.

Send submissions to: plantimports@mpi.govt.nz.

However, should you wish to forward submissions in writing, please send them to the following address to arrive by close of business on 14 October 2016.

Plant Imports
Plants, Food & Environment Directorate
Ministry for Primary Industries
PO Box 2526
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Submissions received by the closure date will be considered during the development of the final IHS. Submissions received after the closure date may be held on file for consideration when the issued IHS is next revised/ reviewed.

Official Information Act 1982

Please note that your submission is public information and it is MPI policy to publish submissions and the review of submissions on the MPI website. Submissions may also be the subject of requests for information under the Official Information Act 1982 (OIA).

The OIA specifies that information is to be made available to requesters unless there are sufficient grounds for withholding it, as set out in the OIA. Submitters may wish to indicate grounds for withholding specific

information contained in their submission, such as the information is commercially sensitive or they wish personal information to be withheld.

Any decision to withhold information requested under the OIA is reviewable by the Ombudsman.

Contents

Purpose

(1) The purpose of this risk management proposal (RMP) is to:

a) summarise the phytosanitary measures considered for managing pests that may be associated with the import of fresh onion (*Allium cepa*: Liliaceae) bulbs for consumption;

b) identify how the measures proposed in the draft import health standard (IHS) for "Fresh Onion for Consumption" effectively manage biosecurity risks identified through risk assessment; and

c) explain how these measures are consistent with New Zealand's domestic legislation and international obligations.

(2) The draft IHS is the subject of consultation under section 23(3) of the Biosecurity Act (1993). This RMP provides information to support the consultation on the draft IHS but is not itself the subject of consultation. However MPI will accept comments and suggestions on the RMP in order to improve future IHS consultations.

Scope

(3) This RMP lists the information and process used to determine the phytosanitary measures proposed in the draft IHS for Fresh Onion for Consumption. The RMP includes:

- a summary of pests potentially associated with onion at the point of export from a new country (People's Republic of China, PRC) requesting market access for onions to New Zealand;
- a description of pre-export phytosanitary measures and their effectiveness considered for managing pests potentially associated with imported fresh onions.

(4) This RMP is in three parts:

- Part 1 provides the background and context used to inform development of the IHS for fresh onions for consumption from all countries.
- Part 2 provides information specific to the fresh onion for consumption pathway, and outlines the types of measures which may effectively manage risks associated with importing fresh onion for consumption from all countries
- Part 3 considers the regulated pests associated with fresh onion, and determines the appropriate measure to effectively manage risks associated with importing fresh onion for consumption from the PRC.

Background

(5) IHSs have previously been issued for the importation of fresh onions from Australia, Japan and the United States of America (USA).

(6) The majority of consignments of fresh onions are imported from the USA, with imports occurring between June and December annually. Occasional consignments are imported from Australia and no onions have been imported from Japan since 1999.

(7) The PRC have requested market access for fresh onions to New Zealand. This request initiated a review of pests associated with this pathway, and consistency of measures across pathways for the same pests from other countries currently exporting to New Zealand.

(8) The draft IHS has been developed to improve clarity and consistency of measures across onion import pathways. It is proposed that this style of IHS will replace country: commodity IHS. Existing IHS's will be replaced by the new IHS for fresh onions for consumption when resources allow.

Note: while the draft IHS is for all countries, imports cannot occur under the new IHS until an *Export Plan* (or equivalent) has been developed between MPI and the exporting country.

Part 1: Context

Domestic

(9) The New Zealand biosecurity system is regulated through the Biosecurity Act 1993. Section 22 of the Act describes the meaning of an IHS, and requires that the IHS specifies requirements to be met for the effective management of risks associated with importing risk goods (including plants and plant products) into New Zealand.

(10) The Ministry for Primary Industries (MPI) is the government authority responsible for the effective management of risks associated with the importation of risk goods into New Zealand (Part 3, Biosecurity Act 1993).

(11) MPI engages with interested parties and/or affected New Zealand stakeholders and the exporting country requesting market access during the development of an IHS.

(12) MPI follows MPI policies and procedures for the development of an IHS and consultation.

International

(13) Where possible, phytosanitary measures are aligned with international standards, guidelines, and recommendations as per New Zealand's obligations under Article 3.1 of the World Trade Organisation (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement), WTO 1995 and section 23(4)(c) of the Biosecurity Act 1993.

(14) The SPS Agreement states that phytosanitary measures must not discriminate unfairly between countries or between imported or domestically produced goods, and where there is a choice of phytosanitary measures to reduce risk to an acceptable level, WTO members must select the least trade restrictive measure.

New Zealand's Biosecurity System

(15) New Zealand operates a biosecurity system for which the phytosanitary aspect (covering plant health) is a key part.

(16) No biosecurity system is capable of reducing risk to zero. The objective of the system is to reduce to an acceptable level the likelihood of entry and establishment of regulated organisms (including pests, diseases and weeds).

(17) An organism is 'regulated' by MPI if it could cause unacceptable economic consequences (i.e. likely to cause unacceptable economic, environmental, socio-cultural or human health impacts in New Zealand) if it were to enter and establish in New Zealand, provided the following conditions are met:

a) is not present in New Zealand; or

b) it is present but under official control in New Zealand;

c) it is able to establish and spread in New Zealand.

- Entry and establishment is defined as 'introduction' by the International Plant Protection Convention (IPPC).

(18) The New Zealand phytosanitary system focuses on ensuring that the most significant pests, for example economically important fruit flies, are unlikely to ever establish in New Zealand. The system also manages risk associated with all regulated pests.

(19) The focus of the IHS for plant-based goods is to manage unacceptable phytosanitary risks identified as being associated with the goods before arrival at the New Zealand border. The expectation is that commercial consignments of plants and plant products meet New Zealand's phytosanitary import requirements on arrival (risk is managed off-shore).

(20) MPI monitors the pathway performance related to each IHS to ensure it provides the expected level of protection. This is achieved through verification and inspection activities at the border (and where

possible, identification of pests detected) and audits of the export systems and critical control points contained in the *Export Plans*.

Importing Fresh Produce

(21) Fresh produce can only be imported subject to an IHS specifying the commodity, and from a country where MPI has approved the systems, programmes and standards for regulatory oversight by the National Plant Protection Authority (NPPO). The export system is subject to audit by MPI.

(22) In circumstances where regulated pests that would cause significant harm if they became established in New Zealand are associated with the commodity, MPI requires the exporting NPPO to negotiate an *Export Plan* (see paragraph 26) with MPI. Exports to New Zealand cannot occur until the *Export Plan* has been agreed by MPI.

Strength of measures

(23) Measures are required for regulated pests (see paragraph 17) where the 'probability of introduction and spread' on a pathway is unacceptable (i.e. if it is able to enter through the pathway, find a suitable host, and able to establish and spread in New Zealand).

(24) The strength of the measure required should be no more than necessary to manage the risk the organism poses. MPI has classified measures into three categories of increasing strength: *Basic Measures*, *Targeted Measures* or *MPI-Specified Measures*.

(25) The strength of measure required depends on the risk posed by the organism on the pathway. This risk is determined by a combination of the consequences the pest may cause if it was introduced into New Zealand and the likelihood that the pest will enter and establish from a pathway. For pests that would result in very high consequences, such as economically important species of fruit fly, *MPI-Specified Measures* are required. This is because these pests would cause significant consequences to New Zealand, even if the likelihood of them entering and establishing (risk) a transient population is low.

(26) The greater the risk or consequence a pest can cause, the greater the level of assurance MPI requires that the pest is not present in a consignment unless the pest has been rendered non-viable (dead or sterile from irradiation). For *Targeted* and/ or *MPI-Specified Measures* an *Export Plan* will be developed, based on an MPI pathway assessment visit (if required). The *Export Plan* will identify how *Targeted* and *MPI- Specified Measures* will be applied. The *Export Plan* must be negotiated with and approved by MPI, and is subject to audit and review by MPI.

(27) The proposed fresh onion IHS includes all measures accepted for pests assessed as being possibly associated with the commodity.

Part 2: Approach

Commodity Description

(28) "Fresh onion for consumption" is defined as commercially produced, harvested, cured *Allium cepa* bulbs with skin, minimal root material attached and pseudostem trimmed within 15 mm of the bulb, clean and free from soil.

(29) The Import Health Standard (IHS): *Fresh Onion for Consumption* applies only to cultivated types of *Allium cepa* from the "Common Onion Group":

a) the "Common Onion Group" are large and produced from seed;

b) the "Aggregatum Group" which are smaller than common onions and form clusters of bulbs, are excluded from the scope of this RMP and the IHS Fresh Onion for Consumption.

(30) "Commercially produced" is defined as the production of export grade bulbs sourced from production sites which grow bulbs for export with recognised standard cultivation, pest management, harvest and packaging activities.

a) Commercially produced onion bulbs are brushed clean of soil, and are graded to remove:

- obviously damaged bulbs, and plant material other than bulbs;
- all plant material from species other than *Allium cepa*.

b) Private consignments and products produced through non-commercial systems (for example, 'backyard' production) do not meet the definition of commercially produced, and are excluded from the scope of this RMP and the IHS Fresh Onion for Consumption.

Information Sources

(31) The following information was used to identify risk organisms associated with fresh onions and the appropriate measures to manage the risk of their introduction (entry and establishment) into New Zealand:

a) MPI (2016) Import Risk Analysis: Fresh onion (*Allium cepa*: Liliaceae) bulbs for consumption from the People's Republic of China (PRC);

b) Information on pests and diseases associated with onion bulbs in PRC provided by the General Administration for Quality Supervision and Inspection and Quarantine of PRC (AQSIQ, 2008);

c) Pathway interception records (USA onions) from 1995 to 2008 (MAFBNZ, 2008);

d) Technical advice on pests associated with onion bulbs from PRC (MAF 2011);

e) MPI (2013) People's Republic of China Onion Pathway Assessment Report (Draft);

f) Relevant literature and database searches;

g) Industry production, harvest and post-harvest practises in the exporting country.

Assessment

(32) The above information sources were used to assess an organisms' potential to enter New Zealand via the fresh onion import pathway, be exposed to a suitable host, and establish and spread in New Zealand. The pest assessment process follows part 2.1 of the International Standard for Phytosanitary Measures (ISPM) 11: *Pest risk analysis for quarantine pests*, MPI import risk analysis procedures and considered:

a) Presence or absence in the exporting country;

b) Presence or absence in New Zealand;

c) Regulatory status in New Zealand;

d) Association with the commodity and pathway;

e) Potential for establishment and spread in New Zealand; and

f) Potential for economic consequences in New Zealand.

(33) All organisms identified as 'pests of concern' were assessed by MPI to determine the 'probability of introduction and spread' (entry into New Zealand, exposure to suitable hosts, establishment and spread) in New Zealand (following part 2.2 of ISPM 11).

Description of measures

(34) The biosecurity system in New Zealand operates a series of components or layers (pre-border, border, and post-border) that together provide a high level of assurance that pests are unlikely to establish in New Zealand. No one part of the system is able to achieve the necessary assurance on its own. The main components in the pre-border and border system include:

a) Commercial production and packhouse activities (*Basic Measures*) to reduce pest prevalence on a commodity;

b) Application of an additional measure to reduce pest prevalence on a commodity (*Targeted* and/ or *MPI- Specified Measure* where required);

c) Official pre-export inspection and phytosanitary certification to verify that pre-export measures have been undertaken and effective as required by MPI and that the consignment is free from regulated pests;

d) On-arrival inspection may be conducted in New Zealand to verify pests are not present in a representative sample (e.g. no live regulated pests in a 600 unit sample);

e) Remedial action (for example treatment) if a pest is detected prior to biosecurity clearance being given for a consignment.

(35) Measures of different strengths (*Basic*, *Targeted*, or *MPI-Specified*) are applied according to the risk of entry and establishment posed by a pest on the pathway and reduce pest prevalence to a very low level on a consignment.

Basic Measures

(36) *Basic measures* are required to manage all organisms that could enter and establish in New Zealand. *Basic measure* pests are pests identified through risk assessment as possibly being on the pathway. *Basic Measures* include (but are not restricted to) the following required components:

Commercial production

(37) All fresh produce for export to New Zealand, regardless of the associated pests, must be commercially produced using a quality system, recognised standard cultivation, pest management, harvest and packaging activities.

(38) Commercial production of onion bulbs includes:

a) Recognised standard cultivation
- production site management and hygiene practices such as in-field weed control.

b) Pest management
- grower pest monitoring;
- grower management of pests and diseases.

c) Harvest activities
- sorting of bulbs to remove extraneous matter (such as plant material and excess soil) and non-export quality produce.

d) Packaging activities
- removal of remnant soil and outer loose skins of onions bulbs;
- removal of pseudostem to within 15 mm of the bulb;
- onions packed into new, clean and inert material;
- product security maintained following export certification to prevent pest re-infestation.

(39) All fresh produce for export to New Zealand must be of export grade to minimise the likelihood of infested or infected fresh produce entering the export supply chain.

(40) For many pests *Basic Measures* are sufficient to reduce their prevalence in a consignment to a very low level thus limiting their potential to establish and spread in New Zealand if they entered undetected.

Targeted Measures

(41) *Targeted Measures* are used to manage the risk of entry and establishment of pests that are unlikely to be sufficiently managed by *Basic Measures*.

(42) Pests which present a higher risk (consequence and likelihood of introduction) require measures of a higher strength (e.g. *Targeted* Measures) compared with those pathways where the risk is lower.

(43) An *Export Plan* is required for all commodities that may be associated with pests identified by MPI as requiring *Targeted Measures*. The components of an *Export Plan* may differ between countries and commodities because the growing systems and agricultural practices differ but can be similarly effective. The *Export Plan* provides a description of how the agreed *Targeted Measures* will be applied to manage these pests (where required) and is negotiated between New Zealand and the individual exporting country NPPO.

(44) *Targeted Measures* include a very wide range of options and provide MPI with the assurance that pest populations on the exported product are reduced to a level that will not enable the pest to establish a population in New Zealand.

(45) A *Targeted Measure* may also be efficacious against non-target pests.

(46) The following measures are some that may be considered for managing pests requiring *Targeted Measures*:

a) Country freedom;
   - additional measures or an *Export Plan* are not required where 'country freedom' status is recognised by MPI for the export country.

b) Pest free area;
   - MPI will audit the management of pest free areas for compliance with ISPM 4: *Requirements for the establishment of pest free areas*.

c) Pest free place of production;
   - MPI will audit the management of pest free place of production for compliance with ISPM 10: *Requirements for the establishment of pests free places of production and pest free production sites*.

d) Pest control activities (in-field);

e) Systems Approaches;
   - Systems Approach is composed of two or more independent measures, as negotiated between MPI and the exporting country;
   - independent measures may vary between exporting countries.

f) End-point treatment.

(47) *Targeted Measures* are subject to pathway assurance audit by MPI.

MPI-Specified Measures

(48) An *Export Plan* is required for all commodities that may be associated with pests identified by MPI as requiring *MPI-Specified Measures*.

(49) *MPI-Specified Measures* are required when the consequence of establishment of a pest is very high and where entry and establishment is likely as a result of the pathway.

a) The selection of an appropriate *MPI-Specified Measure* is based largely on quantitative data that supports a high level of phytosanitary assurance. Quantitative data may be supported by qualitative information, especially with respect to approval of a systems approach.

b) A *MPI-Specified Measure* may also be effective against non-target pests.

(50) Wherever possible, MPI uses ISPMs (or regional standards if applicable) to identify the appropriate requirements for imported plant commodities.

(51) *MPI-Specified Measures* are subject to pathway assurance audit by MPI.

Certification and verification

Pre-export inspection and phytosanitary certification

(52) Pre-export inspection and phytosanitary certification by the exporting NPPO of all commercially produced fresh produce for export to New Zealand is required to provide assurances of freedom from visually detectable regulated pests. Assurance is also required that measures for pests that are not visually detectable have been applied.

(53) The phytosanitary certification process includes:

a) verification that any *Basic*, *Targeted* and *MPI-Specified* Measures required by MPI have been met;

b) sampling and inspection to determine pest freedom;

i) a minimum sample of 600 randomly selected onion bulbs must be visually inspected by the exporting country NPPO using official procedures and, where necessary, at 10x magnification to ensure detection of cryptic or small pests. The visual inspection can include removal of outer onion leaves or cutting bulbs to identify pests located within the bulb. Consistent with international practice, the inspected sample must be free from regulated pests.

ii) where any live regulated pest is found in the inspected lot, an appropriate measure must be applied (for example fumigation with an efficacious chemical) or the lot must be rejected for export to New Zealand.

c) any remedial action taken as agreed with MPI.

Verification on arrival in New Zealand

(54) MPI will inspect documentation prior to each consignment arriving in New Zealand. Upon arrival, a consignment will normally have a representative sample taken and inspected for the absence of regulated pests. Any reduction in the level of inspection from current on-arrival levels is based on sound evidence of the compliance of a pathway. In a few cases where a pathway is highly compliant inspections will be conducted on an audit basis to ensure ongoing compliance.

(55) When a consignment is found to be infested with live regulated pests on arrival in New Zealand, one of the following risk management activities will be applied:

a) Reshipment of the consignment;

b) Destruction of the consignment; or

c) Treatment of the consignment. Treatment may include:

- re-conditioning to remove infested or infected bulbs; or
- fumigation to kill regulated pests.

Part 3: Pest Risk Assessment and Management

(56) This section includes a review of pests identified by the Import Risk Assessment: *Onion (Allium cepa) Fresh Bulbs for Consumption from China* (MPI 2016).

Summary of risk from pests potentially associated with the importation of fresh onion from the PRC

(57) Pests identified as potentially associated with onion production in PRC were assessed in MPI's import risk analysis of onions (MPI 2016). These include species that use the commodity for some part of their lifecycle, as well as species where there is existing evidence to suggest they have an opportunistic association with the commodity.

(58) Pests are defined as "Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products" (ISPM 5: Glossary of Phytosanitary Terms). Pests are categorised as a quarantine pest for New Zealand if the pest:

a) is not present in New Zealand or is not widely distributed and under official control; or
b) is a vector of a quarantine pest for New Zealand; or
c) is a different strain to the pests present in New Zealand and has a different impact (e.g. host range, pathogenicity); and
d) would cause unwanted harm if the pest became established in New Zealand.

(59) Assessment of the 167 pests likely to be associated with onions identified 22 quarantine pests that present a potential risk on this import pathway because:

a) they are associated with onion bulbs; and
b) are present in the PRC.

The other 145 pests do not present a risk on the pathway because they did not meet these criteria and did not require additional assessment.

(60) Seven of the 22 pests present a potential risk on the PRC onion pathway (possibility of being on the product at point of export, capable of establishing and spreading in New Zealand and causing economic consequences), as identified in Table 1 below, and are discussed further in this section.

a) The remaining 15 organisms are not considered to present a risk on the pathway (unlikely to be on the product at point of export, or will not survive transit to New Zealand) and therefore do not require additional assessment.
b) A summary of the pest risk assessments undertaken in the Import Risk Assessment (IRA) [MPI 2016] for the 22 pests is presented in Appendix 1.

Table 1. Regulated pest groups associated with fresh onion bulbs from PRC.

Group	Pests
Insects	*Bradysia odoriphaga* *Delia antiqua* *Liriomyza chinensis* *Luperomorpha suturalis*
Pathogens Bacterial pathogens Fungal pathogens	 *Pantoea ananatis* (and the vector *Thrips tabaci*) *Alternaria palandui*

Determination of phytosanitary measures included in the draft IHS

(61) MPI requires measures to be applied to reduce to a very low level the risk of entry and establishment of a pest on a pathway. Attaining zero biosecurity risk is not possible in any system.

(62) Usually measures are applied to manage risk prior to biosecurity clearance being provided. However MPI is working with the New Zealand domestic onion industry to identify whether there is any residual risk associated with bulk onion waste in New Zealand that requires management. Processing practices of imported onions repacked for retail in domestic onion packhouses was not considered in the IRA: *Fresh onion (Allium cepa: Liliaceae) bulbs for consumption from the People's Republic of China (PRC).*

(63) While the assessment of commercial waste management for imported onions continues, the PRC has proposed that any exports from China will be exported in retail ready bags, thus avoiding repacking in New Zealand.

a) The use of retail ready packaging limits the potential for pest establishment because the very low numbers of pests present when waste is disposed of in home gardens will not be sufficient for pests to form a population.

b) The use of retail ready bags will be included in the agreed *Export Plan* for fresh onions from the PRC.

(64) The following phytosanitary measures in addition to retail ready packaging have been identified by MPI to manage pests associated with the importation of fresh onions from PRC (refer to Appendix 1 for reasons and supporting evidence).

a) The options for additional measures are not specific to one exporting country. The options require agreement by MPI and are documented in an *Export Plan* describing how they will be applied.

b) A measure identified for one pest may also reduce the likelihood of entry and establishment for **other pests** on the import pathway.

Bradysia odoriphaga

(65) *Basic Measures* are justified and sufficient to manage the risk from *Bradysia odoriphaga.*

(66) *Basic Measures* will reduce the prevalence of *B. odoriphaga* in a consignment to a very low level and limit its potential to establish and spread in New Zealand.

(67) Commercial production activities will reduce populations of *B. odoriphaga* in onion growing fields.

a) *B. odoriphaga* damage onion roots and bulbs, which affects plant growth. Monitoring for plants displaying signs/symptoms of infestation during production will identify affected plants, resulting in pest controls being applied (see Commercial Production).

(68) Harvest activities and packing activities will reduce the likelihood of *B. odoriphaga* eggs being associated with onion bulbs at export.

a) *B. odoriphaga* can lay eggs on onion leaves and in the soil. The specified commodity type 'commercially produced, harvested, cured *Allium cepa* bulbs with skin, minimal root material attached and **pseudostem trimmed within 15 mm of the bulb**, **clean and free from soil**', means there will be no leaf material or soil associated with the imported fresh onions (see Commodity Description).

(69) *B. odoriphaga* are likely to be obvious during visual inspection.

a) Adult *B. odoriphaga* are small (~2.5 mm long), dark, mosquito-like flies that are visually obvious against the golden brown of the cured onion bulb.

b) Larvae are translucent with a black head and approximately 5 mm in size. Larvae tunnel into onion bulbs with bulb decay following wounding. The specified process for 'commercially produced' export grade bulbs (including grading to remove obviously damaged bulbs) means that infested and damaged bulbs will not be export-grade and therefore will be removed during grading and packaging (see Commodity Description).

c) Eggs may be present on the axils of the remaining plant leaf material, however the eggs are yellowish-white and in contrast to the brown pseudostem making them visually obvious.

d) The morphology of the onion means that *B. odoriphaga* may occur in between layers of the onion. However, during pre-export NPPO visual inspection some outer layers of the onion can be removed and any *B. odoriphaga* that were not detected and removed during production, harvest, grading and packing are likely to be detected (see Pre-export inspection and phytosanitary certification).

e) Detection of *B. odoriphaga* will require remedial action prior to export certification.

Liriomyza chinensis

(70) *Basic Measures* are justified and sufficient to manage the risk from *Liriomyza chinensis.*

(71) *Basic Measures* will reduce the prevalence of *L. chinensis* in a consignment to a very low level and limit its potential to establish and spread in New Zealand.

(72) Commercial production will reduce populations of *L. chinensis* in onion growing fields.

a) *L. chinensis* larvae make meandering tunnels under the surface of onion leaves; this damages and deforms the onion leaves. Monitoring for plants displaying signs/symptoms of infestation during production will identify affected plants, resulting in pest controls being applied (see Commercial Production).

(73) Harvest activities will reduce the likelihood of *L. chinensis* eggs being associated with onion bulbs at export.

a) Eggs are laid into onion leaves. The specified commodity type 'commercially produced, harvested, cured *Allium cepa* bulbs with skin, minimal root material attached and **pseudostem trimmed within 15 mm of the bulb**, clean and free from soil', means there will be no leaf material associated with the imported fresh onions (see Commodity Description). Packing activities will remove *L. chinensis* pupae not located within the onion.

(74) Packing activities will remove *L. chinensis* pupae not located within the onion.

a) *L. chinensis* pupate in soil. The specified commodity type 'commercially produced, harvested, cured *Allium cepa* bulbs with skin, minimal root material attached and pseudostem trimmed within 15 mm of the bulb, **clean and free from soil**', means there will be no leaf material associated with the imported fresh onions (see Commodity Description).

(75) *L. chinensis* are likely to be obvious during visual inspection.

a) Adult *L. chinensis* are small (1-3 mm long), black and yellow leaf mining flies that have a characteristic yellow spot on their back. *L. chinensis* is visually obvious against the golden brown of the cured onion bulb.

b) The morphology of the onion means that *L. chinensis* pupae may be concealed between the onion layers. However, during pre-export NPPO visual inspection some outer layers of the onion can be removed and any *L. chinensis* pupae that were not detected and removed during production, harvest, grading and packing are likely to be detected (see Pre-export inspection and phytosanitary certification).

c) Detection of *L. chinensis* will require remedial action prior to export certification.

Luperomorpha suturalis

(76) *Basic Measures* are justified and sufficient to manage the risk from *Luperomorpha suturalis.*

(77) *Basic Measures* will reduce the prevalence of *L. suturalis* in a consignment to a very low level and limit its potential to establish and spread in New Zealand.

(78) Commercial production activities will reduce populations of *L. suturalis* in onion growing fields.

a) Adult beetles eat leaves causing wormholes and notches; while the larvae damage fibrous roots and bulbs causing rotting, poor growth and withering and wilting of leaves. Monitoring for plants displaying signs/symptoms of infestation during production will identify affected plants, resulting in pest controls being applied (see Commercial Production).

(79) Harvest activities will reduce the likelihood of adult *L. suturalis* being associated with onion bulbs at export.

a) Adults feed on green leaves, and onion leaves shrivel and brown prior to harvest. The specified commodity type 'commercially produced, harvested, cured *Allium cepa* bulbs with skin, minimal root material attached and **pseudostem trimmed within 15 mm of the bulb**, clean and free from soil', means there will be no leaf material associated with the imported fresh onions (see Commodity Description).

(80) Packing activities will remove *L. suturalis* eggs.

a) *L. suturalis* lay eggs in the soil. The specified commodity type 'commercially produced, harvested, cured *Allium cepa* bulbs with skin, minimal root material attached and pseudostem trimmed within 15 mm of the bulb, **clean and free from soil**', means there will be no soil associated with the imported fresh onions (see Commodity Description).

(81) Packing activities would display signs of larval infestation in a bulb.

a) Onions have the loose outer leaves removed during packhouse processes. Signs/symptoms of larval infestation would be more noticeable during grading and visual inspection.

(82) *L. suturalis* are likely to be obvious during visual inspection.

a) *L. suturalis* larvae tunnel into onion bulbs. During visual pre-export NPPO inspection some additional layers of the onion can be removed, and larval tunnels are easily detectable (see Pre-export inspection and phytosanitary certification).

b) Detection of *L. suturalis* will require remedial action prior to export certification.

Alternaria palandui

(83) *Basic Measures* are justified and sufficient to manage the risk from *Alternaria palandui*.

(84) *Basic Measures* will reduce the prevalence of *A. palandui* in a consignment to a very low level and limit its potential to establish and spread in New Zealand.

(85) Commercial production activities will reduce populations of the fungus *A. palandui* in onion growing fields.

a) *A. palandui* causes lesions on leaf tissue in onions, with the leaves becoming blighted as the disease advances and the bulb decaying. Affected plants also fail to flower. Monitoring during production will identify affected plants, resulting in pest controls being applied (see Commercial Production) to reduce the number of infected plants to a very low level.

(86) Harvest activities will reduce the likelihood of adult *A. palandui* being associated with onion bulbs.

a) Diseased tissue (e.g. infected leaves and plant debris) contain conidia which disperse the pathogen. The specified commodity type 'commercially produced, harvested, cured *Allium cepa* bulbs with skin, minimal root material attached and **pseudostem trimmed within 15 mm of the bulb**, clean and free from soil', means there will be no leaf material associated with the imported fresh onions (see Commodity Description).

(87) Packing activities will remove *A. palandui* spores.

a) Spores of *A. palandui* could be present on the outer surface of the onions. Removal of the loose outer skins of onions as part of packaging activities means that there will be no loose outer skins present (see Commercial Production).

b) Detection of *A. palandui* affected onion bulbs will require remedial action prior to export certification.

Delia antiqua

(88) *Targeted Measures* are required in addition to *Basic Measures* for *D. antiqua*.

(89) *Targeted Measures* will effectively manage risk from *D. antiqua* either by excluding them, reducing populations to a negligible level, limiting their potential for establishment in the New Zealand environment, or removing or eliminating them from the pathway. *Targeted Measures* options include:

Pest Exclusion

(90) Pest freedom status either at the country, area or production site will effectively exclude *D. antiqua* from the pathway. The options for pest freedom are as per the international standards for phytosanitary measures (ISPMs):

a) Country freedom;

- Additional measures are not required where 'country freedom' status is recognised by New Zealand for the export country.

b) Pest free area (PFA);

- PFAs managed as per ISPM 4: *Pest free areas* or based on historical absence as per ISPM 8: *Determination of pest status in an area*; and recognised as a PFA by MPI.

c) Pest free place of production (PFPP).

- PFPP managed in accordance with ISPM 10: *Requirements for the establishment of pest free places of production and pest free production sites* and recognised by MPI.

Pest Reduction

(91) *D. antiqua* can be reduced to a negligible level through an effective systems approach. A systems approach is comprised of two or more independent measures. The following are considered suitable options as independent measures:

a) Pre-planting activities can reduce the incidence of *D. antiqua* during production. These options include:

- Crop rotation and breakdown of organic matter in soil – this limits the pest reservoirs at production sites.

- Planting insecticide treated seed – this prevents *D. antiqua* from feeding on developing roots, young shoots and immature bulbs.
- A planting programme which is asynchronous to the *D. antiqua* lifecycle - the first generation of *D. antiqua* is the most injurious to onion plants and damage by later generations is less common as the developing bulb is difficult for larvae to penetrate.

b) In-field pest control measures can reduce the incidence of *D. antiqua* during production. These options include:
- The application of effective insecticides supported by official crop monitoring. Symptoms associated with *D. antiqua* attack include yellowing, wilting of onion leaves and often death of the plant.
- Monitoring activities are likely to detect an outbreak of *D. antiqua* at onion production sites, and effective insecticides can be applied to manage infestations.

c) Export eligibility:
- If *D. antiqua* is detected either during onion production, at post-harvest grading and packing, or at pre-export NPPO visual inspection, then the crop or consignment is ineligible for export unless an effective phytosanitary measure is applied.

Pantoea ananatis

(92) *Targeted Measures* are required in addition to *Basic Measures* for *P. ananatis*.

(93) *Targeted Measures* will effectively manage risk from *P. ananatis* either by excluding them or their vector (*Thrips tabaci*), reducing populations to a negligible level, limiting their potential for establishment in the New Zealand environment, or removing or eliminating them from the pathway. *Targeted Measures* options include:

Pest Exclusion

(94) Pest freedom status either at the country, area or production site will effectively exclude *P. ananatis* from the pathway. The options for pest freedom are as per the international standards for phytosanitary measures (ISPMs):

a) Country freedom;
- Additional measures are not required where 'country freedom' status is recognised by New Zealand for the export country.

b) Pest free area (PFA);
- PFAs managed as per ISPM 4: *Pest free areas* or, based on historical absence as per ISPM 8: *Determination of pest status in an* area; and recognised as a PFA by MPI.

c) Pest free place of production (PFPP);
- PFPP managed in accordance with ISPM 10: *Requirements for the establishment of pest free places of production and pest free production sites* and recognised by MPI.

Pest Removal or Elimination

(95) *P. ananatis* can be reduced to a negligible level through effective management of the disease and its vector. The vector *Thrips tabaci* is already present in New Zealand. However, as *T. tabaci* is a potential vector of *Pantoea ananatis* a *Targeted Measure* is required if both these pests are present in the consignment. The following are considered suitable measures to manage *P. ananatis*:

a) *Basic measures* for vector (*T. tabaci*) management

i) Commercial production activities will reduce populations of *T. tabaci* in onion growing fields.

1. *T. tabaci* initially damage heart leaves, but outer leaves are damaged with high populations. Small silvery areas develop around feeding sites. Monitoring for plants displaying signs/symptoms of infestation during production will identify affected plants, resulting in pest controls being applied (see Commercial Production).

ii) Harvest activities will removed *T. tabaci*.

1. The presence of *T. tabaci* retards plant photosynthesis, resulting in small bulb size which are unlikely to meet export quality grade. Harvest activities includes 'sorting of bulbs to remove extraneous matter (such as plant material and excess soil) and **non-export quality produce**' (see Commercial Production).

iii) Packing activities will remove *T. tabaci* pupae.

1. *T. tabaci* pupae reside in the soil. The specified commodity type 'commercially produced, harvested, cured *Allium cepa* bulbs with skin, minimal root material attached and pseudostem trimmed within 15 mm of the bulb, **clean and free from soil**', means there will be no soil material associated with the imported fresh onions (see Commodity Description).

iv) *T. tabaci* are likely to be obvious during visual inspection.

1. *T. tabaci* eggs are white or translucent with the tip of the egg visible above the plant material.
2. The morphology of the onion means that *T. tabaci* larvae and adults may occur in between layers of the onion, or near the heart leaves. However, during pre-export NPPO visual inspection some outer layers of the onion can be removed and any *T. tabaci* that were not detected and removed during production, harvest, grading and packing are likely to be detected, with the use of 10 x magnification (see Pre-export inspection and phytosanitary certification).
3. Detection of *T. tabaci* will require remedial action prior to export certification.

b) Export eligibility:

- **Bulbs from infected production sites cannot be exported to New Zealand**.
- Production sites where *P. ananatis* is detected are not eligible to export to New Zealand for the remainder of the season.

i) Monitoring for *P. ananatis* during onion production will identify disease presence and detect new outbreaks.

ii) The symptoms of *P. ananatis* infection in onion include the rapid death of the two centre above-ground leaves followed by rot of the centre of the bulb. Symptoms generally include white streaks with water-soaked margins running the length of the leaf.

Summary of proposed categories of measures

(96) MPI considers the risks associated with the importation of fresh onion will be effectively managed by applying a combination of *Basic* and *Targeted Measures* (Table 2), which will be negotiated in an *Export Plan*, specifically:

- In-field practices and pest controls;
- Harvest and packhouse activities;
- Pre-export inspection and certification, overseen by the exporting country NPPO;
- Audit of the *Export Plan* by MPI and the exporting NPPO.

(97) Each step in the export system reduces the likelihood of pests being present on the pathway. MPI will verify and inspect the consignment to ensure the requirements in the IHS have been met. Non-compliant consignments will be treated, re-shipped or destroyed.

(98) The measures MPI has identified as necessary to manage pests associated with onions are described below:

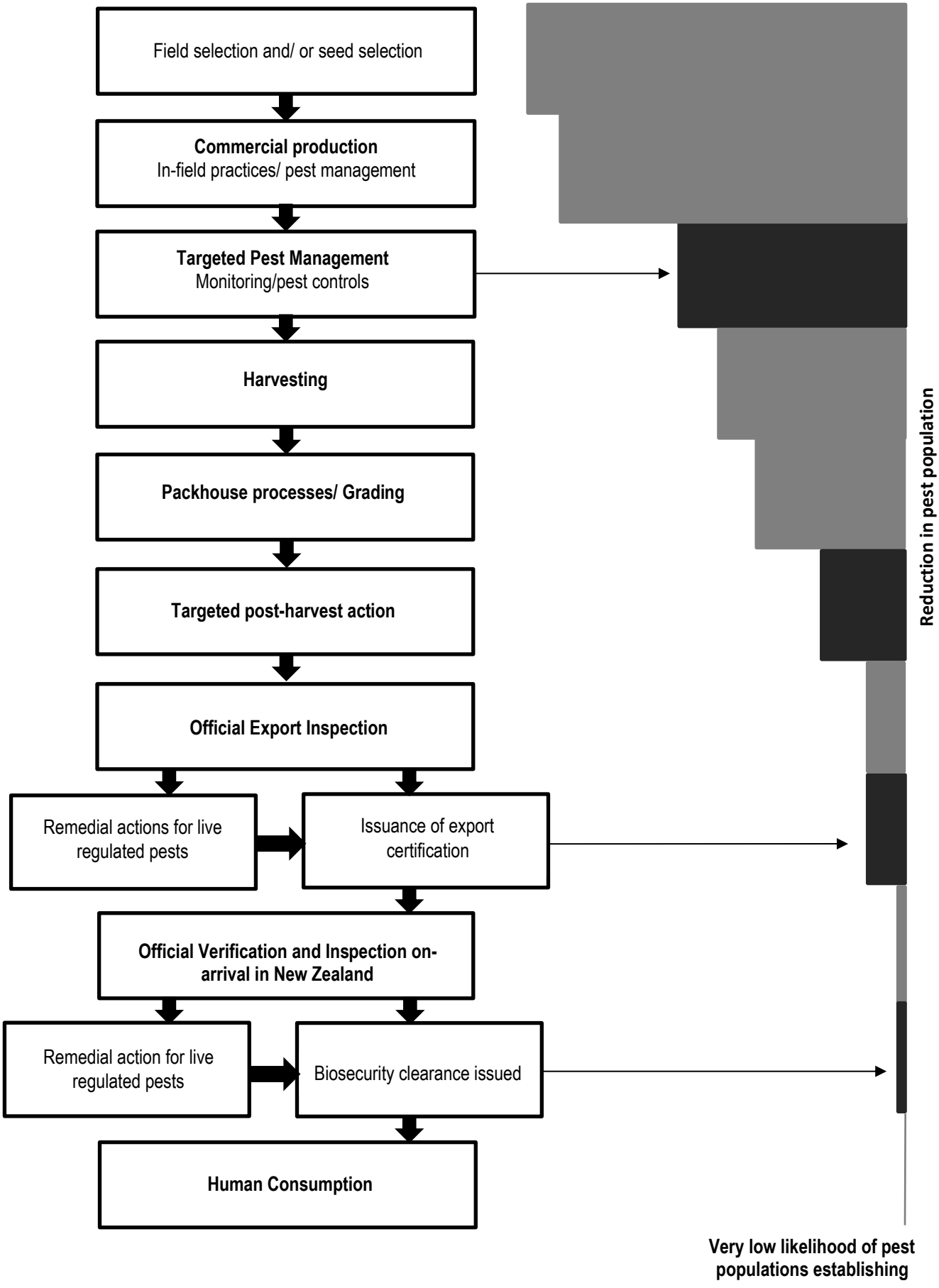
Table 2. Measure required to manage the risk associated with the onion import pathway.

Organism type	Basic Measure	Basic plus Targeted Measure
Arthropods	*Bradysia odoriphaga* *Liriomyza chinensis* *Luperomorpha suturalis* *Thrips tabaci*	*Delia antiqua*
Pathogens	**Fungi** *Alternaria palandui*	**Bacteria** *Pantoea ananatis* (and management of *Thrips tabaci*)

(99) The measures contained in the IHS are subject to regular review based on pathway compliance, emerging risk assessment, new information/intelligence, and results of audit of the *Export Plan*.

(100) MPI will monitor interceptions of all regulated pests (and hitchhikers) and the appropriateness/ effectiveness of phytosanitary measures during trade.

Table 3. Layers of protection for imported onions from New Zealand biosecurity system



Part 4: References

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BORIC, Biosecurity Organisms Register for Imported Commodities; http://mpi.govt.nz/news-and-resources/resources/registers-and-lists/biosecurity-organisms-register-for-imported-commodities/

ISPM 4. Requirements for the establishment for pest free areas. International Plant Protection Convention. Food and Agriculture Organisation.

ISPM 8. Determination of pest status in an area.

ISPM 10. ISPM 10: Requirements for the establishment of pest free places of production and pest free production sites. International Plant Protection Convention. Food and Agriculture Organisation.

ISPM 11. Pest risk analysis for quarantine pests. International Plant Protection Convention. Food and Agriculture Organisation.

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Appendix 1: Summary of justification for measures

The twenty-two organisms listed in table 4 (below) went through the risk assessment process for the importation of fresh onions from China. Evidence from these pest risk assessments is summarised in table 4 to assist in determining whether or not measures are justified for each organism. The PRAs are found in the IRA: Onion (*Allium cepa* Liliaceae) Fresh Bulbs for Consumption from China (MPI 2016).

Some organisms may not have been identified as requiring a measure in this RMP (e.g. *Basic*, *Targeted* or *MPI-Specified*). However, as they are regulated organisms, if they are intercepted on the pathway an on-arrival remedial action may be required (e.g. fumigation) prior to the fresh onions being given a clearance for their entry into New Zealand. If no suitable or approved treatment is available, the consignment will be reshipped or destroyed.

MPI may review the pests associated with a pathway (and their management) if new information becomes available, including in the following circumstances:

a) a change in host status;
b) pest status prevalence;
c) frequent interception on imported fresh onions on arrival in New Zealand; or
d) a risk on imported fresh onions is identified in MPI's Emerging Risks System.

Table 4. Summary of the evidence to support justification of a measure for organisms identified in the IRA: Onion (*Allium cepa* Liliaceae) Fresh Bulbs for Consumption from China (MPI 2016).

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
Bacteria	***Pantoea ananatis*** (Serrano, 1928) Mergaert et al. (1993). [Enterobacteriales: Enterobacteriaceae].	Has the potential to be a quarantine pest on this pathway.	*Pantoea ananatis* is associated with the pathway.	- *Pantoea ananatis* is present in China. - Is not recorded in New Zealand. - Is known to be associated with onion bulbs. Records suggest that there are low levels of *P. ananatis* in onion-growing areas in China.	**Yes**
		And is likely to establish and spread if it entered NZ.	*Pantoea ananatis* is capable of entering through the pathway, being exposed to hosts, and establishing and spreading within New Zealand.	Entry: - Infected onion bulbs may go undetected during harvest and pre-export inspection. - *P. ananatis* can survive transportation conditions. Exposure: - A small proportion of imported onions is likely to be discarded in an open compost providing a mechanism for *P. ananatis* to be exposed to the environment.	

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
				- Hosts of *P. ananatis,* such as onions, sweet corn, tomatoes and poplar trees, are grown in home gardens. These are present in regions where onions are grown commercially in New Zealand. - *P. ananatis* can be carried externally or internally on crop residues, or as free bacterial cells in soil. Insect vectors are present in New Zealand. Establishment and spread: - Environmental conditions in northern parts of New Zealand are likely to be conducive to establishment of *P. ananatis,* but conditions here may not be optimal. - A range of hosts are found in home gardens. ***Thrips tabaci* is already present in New Zealand (vector).**	
		And has the potential to cause economic consequences which are sufficient to justify phytosanitary measures on this pathway.	*Pantoea ananatis* is capable of causing economic and environmental impacts if it established in New Zealand.	- There is a lack of records suggesting that *P. ananatis* is causing economic levels of damage in China. - Reported levels of onion crop loss from *P. ananatis* vary. *P. ananatis* may cause economic impacts to non-onion crops, including *Eucalyptus*, *Lycopersicon* and *Populus*. - Affects plant species that are either socially or culturally important within the urban environment, or are from families that are closely related to native plants.	
Fungi	***Alternaria palandui*** Ayyangar, 1928. [Ascomycota: Pleosporaceae]	Has the potential to be a quarantine pest on this pathway.	*Alternaria palandui* is associated with the pathway.	- *Alternaria palandui* is present in Shandong Province, China. - Is not recorded in New Zealand. - Is known to be associated with onion	**Yes**
		And is likely to establish spread if it entered NZ.	*Alternaria palandui* is capable of entering through the pathway, being exposed to hosts, and establishing and spreading within New Zealand.	Entry: - Pre-export processes are likely to remove diseased or damaged bulbs, however some infected onion bulbs may go undetected during harvest and pre-export inspection. - *A. palandui* can survive transportation conditions. Exposure: - A small proportion of onions may be discarded in open compost in NZ providing a mechanism for *A. palandui* to be exposed to the environment. - *A. palandui* is spread by natural processes (including rain splash and air currents). - Onion appears to be the only host of *A. palandui* in home-gardens. Establishment and spread: - Environmental conditions conducive to establishment of *A. palandui* are present in at least northern parts of New Zealand. - Spread of the pathogen would require movement by rain, heavy irrigation, or movement of infested crop debris.	

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
		And the potential economic consequences are sufficient to justify phytosanitary measures on this pathway.	*Alternaria palandui* is capable of causing low level economic and environmental impacts if it established in New Zealand.	- Damage is considerable when the fungus is carried with the bulb into storage. - There is no evidence to suggest that *A. palandui* would be pathogenic to New Zealand native flora	
Coleoptera (beetles)	***Luperomorpha suturalis*** (Chen, 1938). [Chrysomelidae]	**Has** the potential to be a quarantine pest on this pathway.	*Luperomorpha suturalis* is associated with the pathway.	- *L. suturalis* is present in China. - Is not recorded in New Zealand. - Is known to be associated with onion roots and bulbs.	**Yes**
		And is likely to establish and spread in NZ if it entered NZ.	*Luperomorpha suturalis* is capable of entering via the pathway, being exposed to hosts, and establishing and spreading within New Zealand.	Entry: - Early infested bulbs showing damage and rots are likely to be discarded during the harvest and packaging processes, but larvae inside remnant onion roots and bulbs may go undetected from recently infested bulbs. - It is assumed that larvae inside onion bulbs would survive shipment to New Zealand. Exposure: - A small proportion of imported onions are likely to be discarded in open compost in NZ providing a mechanism for larvae to be exposed to the environment. - There is a restricted host range that will limit the availability of hosts within the vicinity of waste disposal sites for adults (hatched from pupae) to migrate to. Establishment and spread: - The numbers of emerging male and female adults is expected to be low. - It is assumed that adult beetles would be able to locate and fly to host plants and disperse to new locations. - The climate in parts of New Zealand is assumed to be suitable for the establishment of *L. suturalis* populations; however there is a restricted host range.	
		And has the potential to cause economic consequences which are sufficient to justify phytosanitary measures on this pathway.	It is assumed that *Luperomorpha suturalis* is capable of causing low level economic and environmental impacts if it established in New Zealand	- There is no evidence stating the level of impact *L. suturalis* has on onion crops, however this organism resulted in a 30-50% yield loss in garlic chive (*Allium ramosum)*. It is assumed there would be a similar impact on onion crops. - Narrow host range, no native species of the genus *Allium* in New Zealand.	

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
Diptera (flies)	***Bradysia odoriphaga*** (Yang & Zhang, 1985) [Sciaridae]	Has the potential to be a quarantine pest on this pathway.	*Bradysia odoriphaga* is associated with the pathway.	- *Bradysia odoriphaga* is widely found in China, but it is not known how prevalent it is in onion fields. - Is not recorded in New Zealand. - Is known to be associated with onion roots and bulbs.	**Yes**
		And is likely to establish and spread if it entered NZ.	*Bradysia odoriphaga* is capable of entering via the import pathway, being exposed to hosts, establishing and spreading in New Zealand.	Entry: - Larvae and pupae are associated with onion bulbs in the field and may be difficult to detect during grading and sorting. - It is assumed larvae and pupae can survive transit conditions to New Zealand. Exposure: - A small proportion of imported onions is likely to be discarded in open compost in New Zealand, providing a mechanism for larvae to be exposed to the environment. - Pupae and larvae would be able to continue development in the compost before emerging as flying adults. - There are likely to be suitable host plants near to the points of exposure. Establishment and spread: - The number of adult males and females emerging is expected to be low but in clusters, thus increasing the chance of mating. - *Allium* and other host plants are widely available in NZ. - Adults are weak flyers and therefore spread of these species in New Zealand is likely to be slow. - The climate in northern parts of New Zealand is likely to be suitable for establishment of *B. odoriphaga* populations.	
		And has the potential to cause economic consequences which are sufficient to justify phytosanitary measures on this pathway.	*Bradysia odoriphaga* are capable of causing low level economic and environmental impacts if it established in New Zealand**.**	- *Allium* species and other vegetable crops are likely to be affected by *B. odoriphaga.* - *Allium* crop yields are likely to be significantly reduced in the warmer regions of New Zealand. - Bulb decay following wounding by larvae of these flies can occur in field and continue in storage. Therefore this organism can result in significant post-harvest losses.	
	Delia antiqua (Meigen, 1826). [Anthomyiidae]	Has the potential to be a quarantine pest on this pathway.	*Delia antiqua* is associated with the pathway.	- *Delia antiqua* is present in China and assumed to be prevalent in onion fields. - Is not recorded in New Zealand. - Are known to be associated with onion.	**Yes**

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
		And is likely to establish and spread if it entered NZ.	*Delia antiqua* is capable of entering via the import pathway, being exposed to hosts, establishing and spreading within New Zealand.	Entry: - All life stages, especially larvae, are associated with onion bulbs in the field. - Any larvae or pupae are likely to remain associated with the onions after pack-house processing is completed and they can survive storage and transit conditions. - Life-stages present inside an onion bulb are likely to be difficult to detect by normal visual inspection of the commodity in China and New Zealand, if the resulting damage is not advanced. Exposure: - A small proportion of imported onions are likely to be discarded in open compost in NZ, providing a mechanism for emerging pupae to be exposed to the environment. - Larvae that enter New Zealand on onions are likely to be able to develop to the pupal stage after onions are discarded in compost bins/area, but if the infested bulb becomes unsuitable it is likely that only a small proportion of larvae would find another *Allium* host in sufficiently close proximity. - Adults are able to disperse if pupae hatch, and there are likely to be suitable host plants (*Allium* spp.) within range (approximately 1.5 km of the points of exposure) for adults to migrate to. Establishment and spread: - The climate in New Zealand is likely to be suitable for establishment of *D. antiqua* populations. - The number of emerging male and female adults is expected to be low but sufficient to enable mating to occur. - Flying adults would be able to disperse around New Zealand.	
		And has the potential to cause economic consequences which are sufficient to justify phytosanitary measures on this pathway.	*Delia antiqua* is capable of causing low level economic and environmental impacts if it established in New Zealand.	- Only *Allium* species are likely to be affected by *D. antiqua*. - Costs of pest control will be significantly increased if it established in NZ. - *Allium* crop yields are likely to be significantly reduced by this pest. - Bulb decay following wounding by *D. antiqua* can occur in the field and continue in storage resulting in significant post-harvest losses.	
	Liriomyza chinensis (Kato, 1949) [Agromyzidae]	Has the potential to be a quarantine pest on this pathway.	*L. chinensis* is associated with the pathway.	- *L. chinensis* is present in China and assumed to be prevalent in onion fields. - Is not recorded in New Zealand. - Are known to be associated with onion bulbs.	**Yes**

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
		And could establish and spread if it entered NZ.	*L. chinensis* is capable of entering via the import pathway, being exposed to hosts, establishing and spreading in New Zealand, although this may be limited.	Entry: - The larvae, adults and eggs of *L. chinensis* are unlikely to be associated with onion bulbs. - *L. chinensis* pupae on occasion will lodge between onion skins, and so maybe difficult to detect prior to entry into New Zealand. - Pupae are likely to survive storage and transit conditions. Exposure: - A small proportion of imported onions are likely to be discarded in open compost in NZ, providing a mechanism for emerging pupae to be exposed to the environment. - Hosts for *L. chinensis* are limited to *Allium* species, some of which are found in home gardens. Establishment and spread: - The climate in the north of New Zealand is likely to be suitable for establishment of *Liriomyza* populations. - Though newly emerged undamaged adults are capable of flying to a host plant, several males and females would need to emerge within days of each other and be close enough to locate each other under conditions suitable for mating. - Limited host range.	
		And has the potential to cause economic consequences which are sufficient to justify phytosanitary measures on this pathway.	*L. chinensis* is capable of causing low level economic and environmental impacts if it established and spread in New Zealand.	- *L. chinensis* has become an important pest of *Allium* spp. in SE Asia including Vietnam and Indonesia. Recorded as a pest of onion in China.	
Thysanoptera (thrips)	***Thrips tabaci*** (Lindeman 1889); Thysanoptera: Thripidae	Has the potential to be a quarantine pest on this pathway.	*Thrips tabaci* is associated with the pathway.	- *T. tabaci* is present in China. - Is recorded in New Zealand, however it is regulated due to being a known vector. - Known vector of *Pantoea ananatis* which is also present on the pathway. - Larvae, pupae or adults could be associated with mature onion bulbs at harvest.	**Yes**

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
		And is likely to enter, establish and spread if it entered NZ	*Thrips tabaci* is capable of entering through the pathway, being exposed to hosts, and establishing and spreading within New Zealand.	Entry: - All life stages are very small and it is possible they may not be detected during the pre-export processes, especially if infestations are low. - *T. tabaci* is assumed to be capable of surviving storage and transit conditions (as shown with interceptions of live *T. tabaci* on other onion import pathways). Exposure: - A small proportion of imported onions may be discarded in open compost in NZ, providing a mechanism for *T. tabaci* to be exposed to the environment. - Adults that enter on onions, or newly emerged adults, can be blown on the wind to host plants. - Hosts of both *T. tabaci* and the bacterium *P. ananatis* including onions and tomatoes, are likely to be present in home gardens near points of exposure. Establishment and spread: - *T. tabaci* has already established in New Zealand indicating suitable climate and host availability.	
		And has the potential to cause economic consequences which are sufficient to justify phytosanitary measures on this pathway.	*Thrips tabaci* is capable of causing additional low level economic and environmental impacts if it is responsible for the entry of *P.* anantis (as the vector) into New Zealand.	- *T. tabaci* is already established in New Zealand. Therefore the economic impact of a new population establishing from onion bulbs imported from China would be limited to the impact from *P. ananatis* if was vectored by *T. tabaci*. **An additional measure is only required for this species due to the vectoring capability of this species and the presence of *P. ananatis* in China.**	
Bacteria	**'*Candidatus* Phytoplasma asteris'** (Lee *et al.* 2004) '*Ca.* P. asteris' Aster yellows phytoplasma group (AY)	Has the potential to be a quarantine pest on this pathway.	'*Candidatus* Phytoplasma asteris' is potentially associated with the pathway.	- The Aster yellows phytoplasma group ('*Ca.* P. asteris') is present in China. - Is not recorded in New Zealand. - No record was found of '*Ca.* P, asteris' associated with onions in China, however it is assumed that subgroup 16SrI-B could occur in onion from China.	**No**

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
		However, the likelihood of introduction is not sufficient to justify phytosanitary measures on this pathway.	'*Candidatus* Phytoplasma asteris' has a limited capability of entering through the pathway, and being exposed to hosts.	Entry: - Infected onions bulbs do not exhibit significant symptoms and therefore the presence of '*Ca.* P. asteris' would not be detected in the field or in the packing shed. However the prevalence of '*Ca.* P. asteris' in onions in China is assumed to be low. - It is not known whether the vectors of '*Ca.* P. asteris' present in China vector the phytoplasma in onions. Exposure: - A small proportion of onions may be discarded in open compost in NZ, providing a mechanism for '*Ca.* P. asteris' to be exposed to the environment. - Only growing infected onion plants would be a source of inoculum for any vector. - None of the potential AY vectors in New Zealand are recorded as having significant associations with onions.	
		It is unlikely that '*Ca.* P. asteris' could enter New Zealand, and would not be able to establish from the fresh onion import pathway.			
Fungi	***Cladosporium allii-cepae*** (Ranoj.) M.B. Ellis 1976 [Ascomycetes: Mycosphaerellales]	Has the potential to be a quarantine pest on this pathway.	*Cladosporium allii-cepae* is associated with the pathway.	- *Cladosporium allii-cepae* is present in China. - Is not recorded in New Zealand. - Is known to be associated with onion leaves.	**No**
		However, the likelihood of introduction not sufficient to justify phytosanitary measures on this pathway.	*Cladosporium allii-cepae* is capable of entering through the pathway, and being exposed to hosts.	Entry: - There is no evidence that *C. allii-cepae* is associated with onion bulbs, however spores of *C. allii-cepae* could be present at time of harvest from an infected crop. - Spores on onion bulbs would not be detected during harvest and pre-export inspection. - It is assumed *C. allii-cepae* can survive transportation conditions. Exposure: - A small proportion of onions may be discarded in open compost in NZ, providing a mechanism for *C. allii-cepae* to be exposed to the environment. - The amount of inoculum on an onion bulb would be very small. - There is evidence that infected crop debris does not cause new outbreaks of leaf blotch of onion.	
		It is unlikely that *C. allii-cepae* could enter and establish in New Zealand from the fresh onion import pathway.			

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
	Puccinia asparagi DC [Urediniomycetes: Pucciniaceae].	Has the potential to be a quarantine pest on this pathway.	*Puccinia asparagi* is associated with the pathway**.**	- *P. asparagi* is present in China. - Is not recorded in New Zealand. - Is assumed to occur on onion crops, but onion is not a major host and prevalence is assumed to be low. There is uncertainty regarding natural infection of onion by *P. asparagi.*	**No**
		However, the likelihood of introduction is not sufficient to justify phytosanitary measures on this pathway.	*Puccinia asparagi* is limited in its ability to enter via the pathway, and being exposed to suitable hosts in NZ.	Entry: - Only above-ground portions of host plants are infected and little material will be present in exported onions. - Disease symptoms are not present on bulbs. It is unknown whether *P. asparagi* would develop in infected, discarded onions. Exposure: - A small proportion of onions may be discarded in open compost in NZ providing a mechanism for *P. asparagi* to be exposed to the environment. - Spores present on discarded onions can become airborne with only a slight air-current, however the number of contaminant spores is likely to be very low and the availability of host plants is a limiting factor.	
		***P. asparagi* may be able to enter New Zealand, but are unlikely to establish from the fresh onion import pathway.**			
Oomycota	***Phytophthora capsici*** Leonian [Pythiales]	Has the potential to be a quarantine pest on this pathway.	*Phytophthora capsici* is associated with the pathway.	- *P. capsici* is present in China. - Is not recorded in New Zealand. - Is known to be associated with onion bulbs, however due to the paucity of records in association with onion it is assumed not to be a common pathogen of onions in China.	
		However, the likelihood of introduction is not sufficient to justify measures.	*Phytophora capsici* is capable of entering through the pathway, being exposed to hosts, and establishing and spreading within New Zealand.	Entry: - *P. capsici* may go undetected on onions during harvest and pre-export inspection. - *P. capsici* can survive transportation conditions. Exposure: - A small proportion of onions may be discarded in open compost in NZ providing a mechanism for *P. capsici* to be exposed to the environment. - *P. capsici* having multiple infective mechanisms (Sporangia on tissue and Zoospores in water). - *P. capsici* has a wide range of hosts including tomato, cucumber and pumpkin. Establishment and spread: - Environmental conditions are marginal and only the north of New Zealand is likely to be suitable for the establishment of *P. capsici.* - *P. capsici* can be spread through water or movement of infected crop debris or soil.	
		***P. capsici* may be able to enter New Zealand, but are unlikely to establish from the fresh onion import pathway.**			

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
Diptera	***Liriomyza huidobrensis*** (Blanchard, 1926) [Agromyzidae] *and* ***Liriomyza sativae*** (Blanchard, 1938) [Agromyzidae] *and* ***Liriomyza trifolii*** (Burgess in Comstock, 1880) [Agromyzidae]	Have the potential to be quarantine pests on this pathway.	*L. huidobrensis*, *L. sativae* and *L. trifolii* are associated with the pathway.	- *L. huidobrensis, L. sativae* and *L. trifolii* are present in China. - Are not recorded in New Zealand. - Are known to be associated with onion.	**No**
		And they are likely to establish and spread if they entered NZ.	There is a low likelihood that *L. huidobrensis, L. sativae* and *L. trifolii* are capable of entering through the pathway, being exposed to hosts, and establishing and spreading within New Zealand.	Entry: - The larvae, adults and eggs of *L. huidobrensis, L. sativae* and *L. trifolii* are unlikely to be associated with onion bulbs in China; however pupae may be associated with onion bulbs at the time of harvest - There are no records of pupae lodging between skin layers of onions. Pupae may be associated with the outer skin layer, and are likely to be discarded during processing or detected during phytosanitary inspection. - Pupae are likely to survive storage and transit conditions. Exposure: - A small proportion of imported onions is likely to be discarded in open compost in NZ, providing a mechanism for emerging pupae to be exposed to the environment. - There are many suitable host species in New Zealand for *L. huidobrensis*, *L. sativae* and *L. trifolii*. Many of them are garden vegetables, likely to occur near to the points of exposure. Establishment and spread: - Though newly emerged undamaged adults are capable of flying to a host plant, several males and females would need to emerge within days of each other and be close enough to locate each other under conditions suitable for mating. - The climate in the north of New Zealand is likely to be suitable for establishment of *Liriomyza* populations. - *L. huidobrensis*, *L. sativae* and *L. trifolii* are polyphagous, and known hosts are widespread.	
		***L. huidobrensis, L. sativae* and *L. trifolii* are unlikely to enter and establish in New Zealand from the fresh onion import pathway.**			
Lepidoptera (moths)	***Acrolepia manganeutis*** (Meyrick, 1913) [Acrolepiidae] *and*	Have the potential to be a quarantine pest on this pathway.	*Acrolepia manganeutis* and *Acrolepia sapporensis* are associated with the pathway.	- *Acrolepia manganeutis* and *Acrolepia sapporensis* are present in China. - Are not recorded in New Zealand. Is known to be primarily associated with onion leaves, but reported in onion bulbs.	**No**

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
	Acrolepiopsis sapporensis (Matsumura, 1931) [Acrolepiidae]	**However,** the likelihood of introduction and level of impact is not sufficient to justify phytosanitary measures on this pathway.	*Acrolepia manganeutis* and *Acrolepia sapporensis* have a limited ability to enter NZ via the import pathway, being exposed to suitable hosts, establishing and spreading in New Zealand.	Entry: - *Acrolepia manganeutis* and *Acrolepiopsis sapporensis* are assumed to be prevalent in onion growing areas in China. - Moths are primarily associated with onion leaves, though it is assumed some larvae could be associated with the onion bulbs. - Some infested bulbs may not be detected during pack-house processing. - Life stages are assumed to be capable of surviving storage and transit conditions. Exposure: - A small proportion of imported onions are likely to be discarded in open compost in New Zealand, providing a mechanism for larvae to be exposed to the environment. - Adults entering on onions or newly emerged adults are capable of flying to host plants, however there will be limited availability of host plants within the vicinity of waste disposal sites. Establishment and spread: - The limited availability of host plants within the vicinity of waste disposal sites is likely to limit establishment and spread of these pests.	
		***A. manganeutis* and *A. sapporensis* may be able to enter New Zealand, but are unlikely to establish from the fresh onion import pathway.**			
	Loxostege sticticalis (Linnaeus, 1761) [Crambidae]	Has the potential to be a quarantine pest on this pathway.	*Loxostege sticticalis* is associated with the pathway.	- *L. sticticalis* is present in China. - Is not recorded in New Zealand. - Larvae are likely to be associated with onion bulbs in the field only if there is a population outbreak during the production period.	**No**
		However, it is unlikely to enter NZ alive in association with imported onion and therefore phytosanitary measures are not justified.	*Loxostege sticticalis* is not capable of entering via the pathway.	- Larvae would be of late instar stages when onions are harvested and would be expected to be detected during the harvest and packing processes. - Larvae are unlikely to survive sea cargo transit conditions to New Zealand.	
		***L. sticticalis* are unlikely to enter New Zealand from the fresh onion import pathway.**			
	Spodoptera exigua (Hübner, 1808) [Noctuidae]	Has the potential to be a quarantine pest on this pathway.	*Spodotpera exigua* is associated with the pathway.	- *S. exigua* is present in China. - Is not recorded in New Zealand. - Larvae are likely to be associated with onion bulbs in the field only during production periods of population outbreak.	**No**

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
		However, it is unlikely to enter NZ alive in association with imported onions and therefore phytosanitary measures are not justified.	*Spodoptera exigua* is not capable of via through the pathway.	Entry - Larvae would be of late instar stages, with body length from 2-3 cm (Azidah and Sofian-Azirun, 2007), and would be expected to be detected during the harvest and packing processes. - Larvae are unlikely to survive sea cargo transit conditions to New Zealand.	
		***S. exigua* are unlikely to enter New Zealand from the fresh onion import pathway.**			
Acari (mites)	***Steneotarsonemus furcatus*** (De Leon, 1956) [Tarsonemidae]	Has the potential to be a quarantine pest on this pathway.	*Steneotarsonemus furcatus* is associated with the pathway.	- *Steneotarsonemus furcatus* is present in China. - Is not recorded in New Zealand. - Is known to be associated with onion.	**No**
		However, the likelihood of introduction is not sufficient to justify phytosanitary measures on this pathway.	*Steneotarsonemus furcatus* has limited potential of entering establishing and spreading within New Zealand via this pathway.	Entry: - *S. furcatus* is not likely to be common in onions produced for export in China (only one primary source stating of its association with onion in India). - Mites are unlikely to be detected during pre-export processes due to their small size. - Mites are capable of surviving storage and transit conditions. Exposure: - A small proportion of onions may be discarded in an open compost providing a mechanism for *S. furcatus* to be exposed to the environment. - Adults that entered on onions, or newly emerged adults, could be blown on the wind or carried by an insect to a host plant. - Suitable hosts may occur near to the points of exposure in home gardens. Establishment and spread: - Environmental conditions are marginal and only the north of New Zealand is likely to be suitable for establishment for *S. furcatus*.	
		***S. furcatus* may be able to enter New Zealand, but are unlikely to establish from the fresh onion import pathway.**			
Nematoda: Tylenchida	***Meloidogyne graminicola*** (Golden & Birchfield, 1965); [Heteroderidae]	Has the potential to be a quarantine pest on this pathway.	*Meloidogyne graminicola* is associated with the pathway.	- *Meloidogyne graminicola* is present in China. - Is not recorded in New Zealand. - Is known to be associated with onion roots and bulbs.	**No**

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
		However, the likelihood of introduction is not sufficient to justify phytosanitary measures on this pathway.	*Meloidogyne graminicola* is limited in its ability to enter, establish and spread in NZ	Entry: - The level of nematode inoculum in the soil of onion growing areas in China is unknown but assumed to be low unless alternative hosts also grow in the area. - Nematodes are microscopic and would not be detected in any soil attached to infect onions at harvest but onions for export are expected to be clean of soil. - Infection of onion roots by *M. graminicola* may not be detected during pre-export processes. Only minimal root material is allowed under this IHS. Exposure: - A small proportion of onions may be discarded in open compost in NZ providing a mechanism for *M. graminicola* to be exposed to the environment. - No *M. graminicola* life stage can survive prolonged desiccation, but if the period between harvest and disposal is short, it is assumed that some life stages could remain viable in onions. - Contact with wet soil is required for spread from the primary source of inoculum by eggs or juvenile stages in soil. Establishment and spread: - *M. graminicola* is a tropical/sub-tropical species, and New Zealand environmental conditions are marginal for its establishment, even in the northernmost regions. - The lifecycle and wide host range would facilitate population growth.	
		***M. graminicola* may be able to enter New Zealand, but are unlikely to establish from the fresh onion import pathway.**			
	Pratylenchus zeae (Graham, 1951) [Pratylenchidae].	Has the potential to be a quarantine pest on this pathway.	*Pratylenchus zeae* is associated with the pathway.	- *Pratylenchus zeae* is present in China. - Is not recorded in New Zealand. - Is known to be associated with onion roots and bulbs. However, the lack of records suggests that this organism is not causing economic levels of damage to onion crops, suggesting low population levels in onion-growing areas, or that *P zeae* is primarily distributed outside onion-growing areas.	**No**
		However, the likelihood of entry and exposure is not sufficient to justify phytosanitary measures on this pathway.	*Pratylenchus zeae* is limited in its ability to enter, establish and spread via the pathway.	Entry: - Nematodes are microscopic and would not be detected in any soil attached to infected onions at harvest, but onions are required to be clean of soil for export. - Infection causes visible necrotic lesions, however recent infection of onion roots by *P. zeae* may not be detected during the pre-export processes. - *P. zeae* are likely to survive shipment to New Zealand. Exposure: - A small proportion of onions may be discarded in an open compost providing a mechanism for *P. zeae* to be exposed to the environment, however it is unlikely to move through the soil in the absence of host roots.	
		***P. zeae* may be able to enter New Zealand, but are unlikely to establish from the fresh onion import pathway.**			

Scientific name		Conclusion	Reason	Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
	Rotylenchulus reniformis (Linford & Oliveira, 1940) [Hoplolamidae].	Has the potential to be a quarantine pest on this pathway.	*Rotylenchulus reniformis* is associated with the pathway.	- *Rotylenchulus reniformis* is present in China. - Is not recorded in New Zealand. - Is known to be associated with onion roots and bulbs. However the lack of records suggests that this organism is not causing economic levels of damage to onions, suggesting low population levels or distribution outside onion-growing areas.	**No**
		However, it is not likely to enter via the pathway and therefore phytosanitary measures are justified.	*Rotylenchulus reniformis* is not capable of entering through the pathway.	- Nematodes are microscopic and would not be detected in any soil attached to infected onions at harvest, but onions are required to be clean of soil for export. - *R. reniformis* that are attached to roots (and egg masses surrounding females) are unlikely to survive post-harvest processes and subsequent shipping to New Zealand.	
		***R. reniformis* are unlikely to enter New Zealand from the fresh onion import pathway.**			

Table 4. Organisms that were included in the 2013 RMP. Additional technical information has been considered since the 2013 RMP underwent public consultation, and as a result there is a change in the hazard rating of the following organisms.

Scientific name	Conclusion	Reason	- Evidence to support (MPI 2016, IRA: Onions from China)	Is a measure justified?
Atherigona orientalis (Schiner; 1868)	Does not fulfil the criteria of a quarantine pest on this pathway.	*Atherigona orientalis* is not associated with the pathway.	- No primary reference has been found or any evidence of a regular association with onion bulbs in the field.	**No**
Delia floralis (Fallén 1824)	Does not fulfil the criteria of a quarantine pest on this pathway.	*Delia floralis* is not associated with the pathway.	- *D. floralis* is an important insect pest of brassica vegetable crops. No primary reference has been found for it as an onion pest.	**No**
Thrips parvispinus (Karny; 1925)	Does not fulfil the criteria of a quarantine pest on this pathway.	*Thrips parvispinus* is not associated with the pathway.	- *T. parvispinus* is a pest of shallots (*Allium cepa var. aggregatum)* in Indonesia. However, no reference has been found of an association with the bulb forming variety of *Allium cepa.*	**No**
Dickeya chrysanthemi ((Burkh.) Young *et al.* 1978)	Does not fulfil the criteria of a quarantine pest on this pathway.	*Dickeya chrysanthemi* is not associated with the pathway.	- There is no evidence that the pathovar affecting onions is present in China, nor are there records of this pathogen in China in association with onion (which would be considered evidence for the onion pathovar being present in China).	**No**
Cladosporium oxysporum (Berk. & M.A. Curtis 1868)	Does not fulfil the criteria of a quarantine pest on this pathway.	*Cladosporium oxysporum* is not associated with the pathway.	- Onions are reported to have an association with *C. oxysporum* but the nature of the association is unclear and no primary references are given.	**No**
Penicillium oxalicum (Currie & Thom 1915)	Does not fulfil the criteria of a quarantine pest on this pathway.	*Cladosporium oxysporum* is not associated with the pathway.	- Present in New Zealand.	**No**