



Australian Government

Biosecurity Australia

Revised conditions for importing fresh
mango fruit from India

Final report



April 2011

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Cover image: Mango fruit

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Acronyms and abbreviations

Term or abbreviation	Definition
ALOP	Appropriate level of protection
AQIS	Australian Quarantine and Inspection Service
DAC	Department of Agriculture and Cooperation
DAFF	Australian Government Department of Agriculture, Fisheries and Forestry
FAO	Food and Agriculture Organization of the United Nations
HWDT	Hot Water Dipping Treatment
IPC	International Phytosanitary Certificate
IRA	Import Risk Analysis
ISPM	International Standard for Phytosanitary Measures
NPPO	National Plant Protection Organization
SPS	Sanitary and phytosanitary
UP	Uttar Pradesh
VHT	Vapour Heat Treatment
WTO	World Trade Organisation

Abbreviations of units

Term or abbreviation	Definition
°C	degree Celsius
Gy	Gray
mm	millimetre

Summary

This report assesses a request from India for establishing alternative measures to irradiation for exporting fresh mango fruit to Australia.

Australia has existing policies for fresh mango fruit (*Mangifera indica* L.) from a number of countries including India, Haiti, Mexico, the Philippines (Guimaras Island and proposed for Davao del Sur) and Taiwan. Australia completed the import risk analysis (IRA) on fresh mango fruit from India and published the final IRA report in August 2008. The IRA report specifies the recommended quarantine measures as being pre-export gamma irradiation treatment at 400 Gray, supported by an operational system to maintain and verify quarantine status.

Prior to irradiation being considered, other equivalent measures for fresh mango fruit from India were previously specified in the 2004 draft IRA report. Those measures were reassessed for this policy amendment and found to be appropriate measures of equivalence for fruit flies, mango pulp and seed weevils and mealybugs, subject to meeting the specific quarantine requirements of the policy amendment. Additionally, annual surveys have been determined appropriate risk mitigation measures for red-banded mango caterpillar.

This report recommends that the importation of fresh mango fruit from all commercial production areas of India be permitted under the amended arrangements, subject to a range of quarantine conditions, including verification of pest status in the areas nominated by India to export mango fruit to Australia. To date DAFF officers have visited Uttar Pradesh (UP), one of the three states nominated. The remaining two, Gujarat and Maharashtra, and any additional areas nominated by India to export mango fruit to Australia in the future, will also require verification of their pest status before export can occur under the amended arrangements.

India had requested recognition of UP as a pest free area for mango seed and pulp weevils. However, due to the absence of appropriate regulatory controls for domestic fruit movement, state-wide pest free area status is not currently possible. Pest free places of production or production sites can be recognised subject to the results of annual surveys in accordance with India's National Standard: *Requirements for Establishment of Pest Free Area for Mango Nut (Seed) Weevil (Sternochetus mangiferae) and Pulp Weevil (S. frigidus)*.

The recommended alternative quarantine measures to irradiation are a combination of risk management measures and an operational system that will reduce the risk associated with the importation of fresh mango fruit from India, specifically:

- pre-export vapour heat treatment (VHT) or hot water dipping treatment (HWDT) for managing the risk of fruit fly species including *Bactrocera caryeae*, *B. correcta*, *B. cucurbitae*, *B. dorsalis*, *B. invadens*, *B. tau* and *B. zonata*
- designated pest free places of production or production sites for managing the risks of mango pulp weevil, *Sternochetus frigidus* (MPW), mango seed weevil, *S. mangiferae* (MSW) and red-banded mango caterpillar, *Deanolis sublimbalis* (RBMC)
- inspection and remedial action for other identified quarantine pests
- supporting operational systems to maintain and verify phytosanitary status.

1 Introduction

1.1 This amendment to existing policy

Australia has well established policies for the importation of fresh mango fruit from various countries. Import conditions include irradiation, heat treatment, pest free areas, specific orchard controls and inspections. Alternative pest risk mitigation measures specified in this amendment to existing policy are implemented in full or in part in other established mango import policies and comply with the requirements for measures of equivalence specified in ISPM 24 *Guidelines for the determination and recognition of equivalence of phytosanitary measures* (2005). This amendment to existing import policy provides alternative arrangements to facilitate trade in fresh mango fruit from India.

1.1.1 Background

Prior to 1996, India exported fresh mango fruit to Australia with a mandatory on-arrival fumigation treatment using ethylene di-bromide (EDB). Imports of fresh mango fruit from India were suspended in 1996 as a result of the global phase-out of the use of EDB on the basis of concerns for worker health and safety. Following the EDB phase-out, India was requested to propose equivalent measures and provide appropriate efficacy data to support these proposed measures.

In 2000, the Agricultural and Processed Food Products Export Development Authority (APEDA) and India's Ministry of Agriculture provided an import proposal for fresh mango fruit (*Mangifera indica* L.) to Australia. A comprehensive pest list was included with this request.

In 2002 and 2003, India provided supporting information on production practices and additional pests associated with fresh mango fruit in India. India's existing commercial production practices were observed by DAFF officers in April 2003.

On 12 September 2003, DAFF advised stakeholders in Biosecurity Australia Policy Memorandum 2003/27 that the pest risk analysis on fresh mango fruit from India would be progressed as a review based on existing policy. A draft policy report was issued in July 2004 for stakeholder comment.

The draft report proposed vapour heat treatment or hot water dipping treatment for fruit flies and the use of designated 'pest free areas' for mango weevils. Visual inspection and remedial action were also proposed for the red-banded mango caterpillar, mealybugs and scale insects. Specific measures as outlined in the 2004 draft policy were:

- pre-export vapour heat treatment (VHT) or hot water treatment (HWDT) for the management of fruit fly species including *Bactrocera caryeae*, *B. correcta*, *B. cucurbitae*, *B. dorsalis*, *B. invadens*, *B. tau* and *B. zonata*
- designated pest free places of production or production sites for the management of mango pulp weevil, *Sternochetus frigidus* (MPW) and mango seed weevil, *S. mangiferae* (MSW)
- inspection and remedial action for other identified quarantine pests
- supporting operational systems to maintain and verify phytosanitary status.

In October 2006, India requested Australia's consideration of irradiation as a quarantine measure for fresh mango fruit. In view of this, the quarantine measures proposed in the 2004

draft report, including VHT, HWDT and pest free areas, were not considered further. These measures were replaced with irradiation treatment at 400 Gray, supported by an operational system to maintain and verify quarantine status.

Although import policy was established, no imports of fresh mango fruit from India have occurred. In May 2009, India proposed the use of VHT and HWDT as alternative quarantine measures to irradiation. Although heat treatment would be appropriate for mitigating the risk of fruit flies, supporting data for considering measures for MSW, MPW and the red-banded mango caterpillar, *Deanolis sublimbalis* (RBMC) was required.

In February 2010, at the India-Australia Bilateral Plant Quarantine Technical Discussions in New Delhi, India undertook to provide the requested survey information.

In April and August 2010, India provided the requested information on surveys conducted for MSW, MPW and RBMC in the states of Uttar Pradesh (UP), Gujarat and Maharashtra.

In July 2010, DAFF officers visited India's key mango production areas in UP and inspected the VHT facility in Saharanpur, UP to verify that the alternative measures being considered are appropriate.

A draft report recommending alternative measures to irradiation was released for a 30 day comment period on 10 December 2010. Two submissions were received, one from the Australian Mango Industry Association, and the other from the Indian government.

1.1.2 Scope

The scope of this review is limited only to establishing alternative phytosanitary measures to irradiation which satisfy the requirements of equivalence as specified in ISPM 1 section 1.10 (FAO 2006).

2 Pest risk management

Pest risk management evaluates and selects risk management options to reduce the risk of entry, establishment or spread of quarantine pests identified with an unrestricted risk exceeding Australia's ALOP.

Equivalence is described as a basic principle in ISPM1 section 1.10 (FAO 2006) – Equivalence – Importing contracting parties should recognize alternative phytosanitary measures proposed by exporting contracting parties as equivalent when those measures are demonstrated to achieve the appropriate level of protection determined by the importing contracting party. In other words, if the exporting country objectively demonstrates that its measures achieve the ALOP of the importing country then members shall accept sanitary and Phytosanitary (SPS) measures of other members as equivalent.

2.1 Existing risk management measures for fresh mango fruit

Australia has well established policies to import mango fruit from Haiti, India, Mexico, the Philippines and Taiwan. The range of phytosanitary measures currently applied to mango imports are listed in table 1. In addition to these country specific conditions, all imports of fresh mango fruit for consumption are subject to the general fruit and vegetable import requirements (C6000). The general requirements include:

- an AQIS import permit
- a quarantine entry must be lodged
- a Phytosanitary Certificate
- freedom from regulated articles
- secure packaging
- on-arrival inspection by DAFF.

Table 1: Existing phytosanitary measures for quarantine pests of fresh mango fruit imports

Pest	Common name	Measure
Weevils [Coleoptera: Curculionidae]		
<i>Sternochetus frigidus</i>	Mango pulp weevil	1. Irradiation at 400 Gy – India 2. Pest Free Areas – the Philippines
<i>Sternochetus mangiferae</i> (WA)	Mango seed weevil	
Fruit flies [Diptera: Tephritidae]		
<i>Bactrocera caryeae</i>		1. Irradiation at 400 Gy – India 2. Vapour Heat Treatment – Taiwan and the Philippines 3. Hot Water Treatment – Mexico
<i>Bactrocera correcta</i>	Guava fruit fly	
<i>Bactrocera cucurbitae</i>	Melon fruit fly	
<i>Bactrocera dorsalis</i>	Oriental fruit fly	
<i>Bactrocera invadens</i>		
<i>Bactrocera zonata</i>	Peach fruit fly	

Pest	Common name	Measure
Mealybugs [Hemiptera: Pseudococcidae]		
<i>Ferrisia virgata</i> (WA)	Striped mealybug	1. Irradiation at 400 Gy – India 2. Inspection and remedial action – Taiwan and the Philippines
<i>Ferrisia malvastra</i> (WA)	Malvastrum mealybug	
<i>Planococcus lilacinus</i>	Coffee mealybug	
<i>Rastrococcus iceryoides</i>	Downey snowline mealybug	
<i>Rastrococcus invadens</i>	Mango mealybug	
<i>Rastrococcus spinosus</i>	Philippine mango mealybug	
Caterpillar [Lepidoptera: Pyralidae]		
<i>Deanolis sublimbalis</i>	Red-banded mango caterpillar	1. Irradiation at 400 Gy – India 2. Inspection and remedial action – the Philippines
If applicable, Australian regional quarantine pests are indicated with the region(s) concerned in parentheses		

2.2 Proposed risk management measures

DAFF considers that existing policy is adequate to address risks posed by fruit flies, mealybugs, MSW and MPW associated with mango fruit from India. However, the existing measure for RBMC specified in the extension of policy for mango imports from the Philippines is not currently applicable to Indian mangoes. This measure requires mandatory fruit bagging which is a standard commercial practice in the Philippines but not in India. Given the known distribution of RBMC in India and the survey requirements for other quarantine pests, DAFF proposes that the risk associated with RBMC can be mitigated by the alternative measures specified in this report.

2.2.1 Management for fruit flies

Pre-export vapour heat treatment

DAFF considered this measure in the 2004 draft and proposes this as an appropriate alternative to irradiation for fruit flies. The proposed measure is a pre-export VHT at either 46.5 °C (fruit pulp temperature) for 30 minutes or 47.5 °C for 20 minutes for all mango cultivars from India as an effective treatment against all quarantine fruit flies identified in the existing import policy. The total treatment time would be for a minimum of two hours, including both the warming and cooling periods to bring the fruit to the target temperature. Treatments would commence when the fruit pulp temperature of all monitored fruit reaches, or is above, the required temperature of 46.5 °C or 47.5 °C and the temperature is maintained for the required period of 30 or 20 minutes respectively. Specific requirements are provided in section 2.3.4 below.

Hot water dipping treatment

Hot water dipping treatment (HWDT) is used as an effective disinfestation treatment for some species of *Anastrepha* and *Ceratitis* fruit flies in certain fruits in international trade. Australia

accepts HWDT as an effective phytosanitary measure for the disinfestation of these fruit flies, such as the use of HWDT to mitigate the risk of fruit flies of quarantine concern associated with mango fruit from Mexico.

India has developed and standardised an alternative heat disinfestation treatment for fruit fly in mango fruit using hot water and has provided relevant efficacy data to DAFF. Eggs and larvae were killed when mango fruit were submerged in hot water at 48 °C for 60 minutes.

DAFF proposes an option of a pre-export hot water treatment for specified mango fruit weight classes. The water temperature and dipping times for these are:

- 48 °C or above for 60 minutes for mango fruit up to 500 grams
- 48 °C or above for 75 minutes for mango fruit between 501 and 700 grams, or
- 48 °C or above for 90 minutes for mango fruit between 701 and 900 grams.

Specific requirements for this treatment method are provided in section 2.3.5 below.

2.2.2 Management for mango seed and pulp weevils

Mango pulp weevil, *Sternochetus frigidus*, and mango seed weevil, *S. mangiferae* enter the developing mango and feed internally on the seed and/or pulp. As there are no clear visual signs of infestation, visual inspection alone is not considered to be an appropriate risk management measure.

The Agricultural and Processed Food Products Export Development Authority (APEDA) of India proposed the use of designated pest free places of production or pest free production sites as a risk management measure for these internal feeding weevils, and sent survey data on pest free places of production or pest free production sites in 2003, 2004 and 2010, which supports freedom from these pests in Uttar Pradesh. DAFF therefore proposes pest free places of production and pest free production sites as phytosanitary risk management options for these pests.

The DAC would be responsible for establishing, maintaining and verifying pest freedom for MPW and MSW in Pest free places of production and pest free production sites, in accordance with India's National Standard: Requirements for Establishment of Pest Free Area for Mango Nut (Seed) Weevil (*Sternochetus mangiferae*) and Pulp Weevil (*S. frigidus*).

The DAC would be responsible for the establishment of production area pest freedom by verification of pest free places of production or pest free production sites by official surveys and monitoring. Monitoring would involve field inspections and fruit cutting as specified in the National Standard. These monitoring surveys would be conducted during each year of mango production for each pest free area and would specifically target DAC nominated export orchards. The results would be submitted to DAFF for consideration before consignments would be permitted for export to Australia.

The DAC would maintain production area pest freedom and specify the measures in place to prevent the introduction of the pest into the place of production or production site or to destroy previously undetected infestations. Prior to the commencement of each export season, the DAC would advise DAFF of the nominated export orchards within the designated pest free places of production or pest free production sites. The DAC is required to notify DAFF of any pest detected during routine monitoring and surveys conducted during the production season.

Based on the survey data provided by the DAC in 2010, designated pest free areas have been established for the Uttar Pradesh production areas of Barabanki and Malihabad in the Lucknow region, and Saharanpur. The areas of Navsari and Valsad in Gujarat and the areas of Devgad, Kudal, Malvan, Sawantwadi and Vengurla in Maharashtra are not currently recognised by DAFF as being designated pest free areas and will require verification of the pest status and measures in place to maintain freedom before being approved for export to Australia under the amended conditions.

The phytosanitary security of the product from these quarantine pests must be maintained after harvest and pre-export phytosanitary inspection of the harvested fruit would be conducted by DAC. A Phytosanitary Certificate confirming that MPW and MSW are not known to occur in the designated places of production or pest free production sites and that the product is free from this pest would be issued by the DAC.

DAFF considers that this measure is appropriate to reduce the risk associated with MPW and MSW to below Australia's ALOP.

2.2.3 Management for red-banded mango caterpillar

Red-banded mango caterpillar, *Deanolis sublimbalis*, has limited distribution in India, confined to parts of the east coast (Royer 2009). The surveys conducted for mango seed and pulp weevils also target red-banded mango caterpillar, as demonstrated by similar surveys conducted in the Philippines (DAFF 2010). Red-banded mango caterpillar has never been detected in the surveys conducted in the states of Uttar Pradesh, Gujarat and Maharashtra.

Based on the survey data provided by DAC in 2010, designated pest free areas have been established for the Uttar Pradesh production areas of Barabanki and Malihabad in the Lucknow region, and Saharanpur. Prior to the commencement of each export season, the DAC would advise DAFF of the nominated export orchards within the designated pest free places of production or pest free production sites. A Phytosanitary Certificate confirming that red-banded mango caterpillar is not known to occur in the designated places of production or production sites and that the product is free from this pest would be issued by the DAC.

DAFF considers that annual surveys are an appropriate measure to reduce the risk associated with red-banded mango caterpillar to below Australia's ALOP.

2.2.4 Management for mealybugs

Mango fruit will be inspected by DAC for the presence of arthropod pests. Sample rates must achieve a confidence level of 95% that not more than 0.5% of the units in the consignment are infested. This equates to a level of zero units infested by quarantine pests in a random sample size of 600 units from the homogenous lot¹ in the consignment. The 600-unit sample must be selected randomly from every lot in the consignment. Where mealybugs are found, a suitable treatment, e.g. fumigation of the entire lot with methyl bromide, is to be applied, or lots are to be rejected for export to Australia.

Records of the interceptions made during these inspections (live quarantine pests, dead fruit flies and regulated articles) are to be maintained by DAC and made available to DAFF as

¹ An inspection 'lot' is no greater than all mango fruit treated for export to Australia on one day from one registered treatment centre.

requested. This information will assist in future reviews of this import pathway and consideration of the appropriateness of the phytosanitary measures that have been applied.

The objective of visual inspection is to ensure that consignments of mango fruit from India infested with mealybugs are identified and subjected to appropriate remedial action. The remedial action will reduce the risk associated with mealybugs to a very low level to meet Australia's ALOP.

Remedial action, if required, could include any treatment known to be effective against the target pests. Currently, standard methyl bromide fumigation rates for external pests are recognised. However, DAFF would also consider any other treatment that DAC proposes, if it provides an equivalent level of protection.

The consignment would not be released from quarantine until the remedial action has been undertaken.

2.3 Operational systems for the maintenance and verification of phytosanitary status

DAFF requires, regardless of treatment method, an operational system for the maintenance and verification of the quarantine status of fresh mango fruit for consumption from India.

It is necessary to have a system of operational procedures in place to ensure that the phytosanitary status of fresh mango fruits from India is maintained and verified during the process of export to Australia. DAFF proposes a system that is consistent with, and equivalent to, the systems currently in place for the importation of fresh mango fruit from the Philippines and Taiwan, with the exception of the fruit bagging requirement to mitigate the risk of red-banded mango caterpillar in Davao del Sur, the Philippines.

Details of the operational system, or equivalent, will be determined by agreement between India's NPPO, or other relevant agency nominated by the NPPO and DAFF that describes the phytosanitary procedures for the pests of quarantine concern for Australia and the various responsibilities of all parties involved in meeting this requirement. The components of the proposed operational system would include the following:

2.3.1 Registration of export orchards

All mangoes for export to Australia must be sourced from export orchards registered with India's DAC. Copies of the registration records must be made available to DAFF if requested. The DAC is required to register export orchards prior to commencement of exports.

All export orchards are expected to produce mango fruit under standard commercial cultivation, harvesting and packing activities, for example, in-field hygiene and management of pests (e.g. orchard control program), cleaning and hygiene during packing and commercial quality control activities.

2.3.2 Registration of packinghouses and treatment facilities and auditing of procedures

All treatment facilities and packinghouses intending to export mango fruit to Australia must be registered with DAC.

DAFF will only accredit designated and identified VHT and HWDT facilities and packinghouses that are registered by DAC. Prior to the commencement of trade, officers from DAFF will visit and audit the treatment facilities and packinghouses. DAFF accreditation of facilities and packinghouses will be contingent on registration by DAC and subsequent verification and audit by DAFF officers.

DAFF requires that all VHT and HWDT facilities and packinghouses must:

- be registered by DAC
- have systems in place to ensure traceability of fruit to the DAC registered export orchard of production (where packinghouses are separate from treatment facilities, traceability to the orchard must be continuous via the respective treatment facility)
- be designed to prevent the entry of fruit flies and other pests into areas where unpacked treated fruit is held
- ensure all areas of the facility are hygienically maintained (cleaned daily of damaged, blemished, infested fruit)
- maintain complete isolation of treated fruit from untreated fruit (untreated fruit must not be stored in the same storage room as treated fruit)
- ensure a minimum of one metre segregation of fruit for export to Australia from fruit for other markets throughout the treatment, packing, storage and transport stages, before exports commence (if cool storage is used, segregation can be reduced to 100 mm)
- maintain records of treatments of all fruit lots for DAC audit and DAFF monitoring purposes.

In addition to these requirements, DAFF requires that all VHT and HWDT facilities must:

- have heat treatment equipment capable of achieving and holding the required fruit pulp temperatures
- ensure that treated fruit is discharged directly into insect proof and secure packing rooms, or
- where packinghouses are separate from treatment facilities, treated fruit is discharged directly into insect proof and secure handling and dispatch rooms for transfer to registered packinghouses under insect secure transport.

Managers of the treatment facilities and packinghouses will be required to provide details of the systems in place to ensure compliance with DAFF requirements during all stages of fruit handling, before export commences. DAC will audit the facilities and packinghouses to ensure compliance with DAFF requirements before the initiation of exports.

After the approval of registered treatment facilities and packinghouses in the initial export season, DAFF will require DAC to audit facilities and packinghouses at the beginning of each subsequent season to ensure they comply with DAFF requirements. Once DAC auditing has occurred at the start of an export season, registration of that facility or packinghouse can be renewed. DAC will then monitor the treatment facilities and packinghouses on an ongoing basis during their operational season to ensure their continued compliance with DAFF requirements. Reports of audits, noting any non-conformity together with appropriate corrective action, will be submitted to DAFF.

DAC must supervise all VHT and HWDT treatments. The phytosanitary security of the product must be maintained after treatment to prevent reinfestation by fruit flies or external pests. Phytosanitary inspection of the treated fruit must be conducted by DAC and the details of the treatment included on the Phytosanitary Certificate. For treated fruit securely

transferred from a treatment facility to a separate packinghouse, DAC must conduct its phytosanitary inspection at the packinghouse. DAFF may audit the treatment facilities and packinghouses at any time to ensure continued compliance.

2.3.3 Packing and labelling

The fruit is to be packed in new cartons sealed with a DAC sticker or seal securely placed across the carton opening. No unprocessed packing material of plant origin is to be used.

Any openings in cartons are to be either screened with mesh no greater than 1.6 mm diameter or covered with tape to ensure any opening greater than 1.6 mm diameter is closed.

All cartons will be marked “For Australia”, labelled with packing date, registered packing house name or number and registered treatment centre establishment name or number.

The objectives of the requirement for packaging and labelling are to ensure that:

- mangoes exported to Australia are not contaminated by quarantine pests or regulated articles (e.g. trash, soil and weed seeds)
- unprocessed packing material (which may vector pests not identified as being on the pathway) is not imported with the mango fruit
- all wood material used in packaging of the commodity complies with AQIS conditions (see AQIS publication ‘Cargo Containers: Quarantine aspects and procedures’)
- secure packaging is used to prevent post-treatment infestation
- the packaged mango fruit is labelled in such a way as to identify the treatment facility and DAC nominated export orchard for the purposes of trace-back in the event that this is necessary.

2.3.4 Pre-export vapour heat treatment requirements

It is mandatory that where VHT is used as a phytosanitary treatment, VHT of mango fruit takes place prior to export. This process can only be undertaken in facilities that have been registered with DAC for this purpose. VHT sensors will be calibrated by the appropriate DAC officer using a certified thermometer. All certified thermometers will be checked annually against a reference thermometer calibrated by the appropriate national standards authority. Calibration records will be retained for DAC audit and DAFF monitoring purposes.

The number and location of fruit sensors in each chamber will depend on the make and model of the treatment unit, which will be specified by DAFF.

Sensors will be placed in fruit chosen from amongst the largest size fruit in each chamber load. Placement of probes within the chamber and the method used to insert probes will be specified by DAFF.

Treatment time will commence when the pulp core temperature of all probe monitored fruit reaches 46.5°C or 47.5°C, and this temperature will be maintained for 30 minutes or 20 minutes respectively. The total treatment time would be for a minimum of two hours, including both the warming and cooling periods to bring the fruit to the target temperature.

DAC will ensure that copies of the data logger records for each treatment, supplied to DAC by the respective registered facility operators after each treatment, are forwarded to DAFF.

This documentation will include the Phytosanitary Certificate numbers and import permit number that are applicable to that treatment. Information regarding the mode of conveyance and port of entry will be included in the relevant sections on the Phytosanitary Certificate.

2.3.5 Pre-export hot water dipping treatment requirements

As with VHT, it is mandatory that where HWDT is used as a phytosanitary treatment, HWDT of mango fruit takes place prior to export. This process can only be undertaken in facilities that have been registered with DAC for this purpose. HWDT sensors will be calibrated by the appropriate DAC officer using a certified thermometer. All certified thermometers will be checked annually against a reference thermometer calibrated by the appropriate national standards authority.

The number and location of fruit sensors in each unit will be specified by DAFF and depend on the type of system employed; continuous flow system, batch tank system or batch tank basket system.

For continuous flow systems, a minimum of 10 evenly spaced sensors per tank are required. At least two sensors are required per tank for batch tank systems, and for batch tank systems using multiple baskets, there must be at least one sensor per basket. In all systems, sensors must be positioned in the lower third of the tank.

Prior to treatment, mangoes must be pre-sorted by weight class (refer table 2). Each weight class will be treated independently of other weight classes and treatment of mixed loads is not allowed.

Table 2: Hot water dipping time for Indian mango weight classes

Fruit weight (grams)	Water temperature	Dip time**
up to 500 grams	48 °C or above	60 minutes
500 to 700 grams	48 °C or above	75 minutes
701 to 900 grams	48 °C or above	90 minutes

** dipping time must be extended for an additional 10 minutes if hydrocooling starts immediately after the hot water immersion treatment.

Mangoes would be treated with a hot water submersion treatment in accordance with the following schedule:

1. Fruit pulp temperature would be 21 °C or above prior to commencing treatment.
2. Fruit would be submerged at least 10 cm below the water surface.
3. Water would circulate constantly and be kept at 48 °C or above throughout the treatment period, with the following tolerances:
 - a) During the first five minutes of the treatment – temperatures may fall as low as 47.4 °C provided the temperature is at least 48 °C at the end of the five minute period.
 - b) For treatments lasting 60 minutes temperatures may fall as low as 47.4 °C for no more than 10 minutes.

- c) For treatments lasting 75 to 90 minutes temperatures may fall as low as 47.4 °C for no more than 15 minutes.
4. The dip time must be extended for an additional 10 minutes if hydrocooling starts immediately after the hot water immersion treatment.

HWDT would be conducted in India in facilities registered with and audited by DAC. Temperature values need to be recorded to standards agreed between DAC and DAFF and monitored by DAC.

The phytosanitary security of the product would be maintained after HWDT to prevent reinfestation by fruit flies. Phytosanitary inspection of the treated fruit would be conducted by DAC and the details of the treatment included on the Phytosanitary Certificate (see measure 2.3.8).

2.3.6 Storage and movement of treated fruit

The objective of this proposed procedure is to ensure that the phytosanitary status of the product is maintained during storage and movement as required under section 2.3.2 above.

Packed product and packaging is to be protected from pest contamination during and after packing, during storage and during movement between locations (that is, packing house to storage/depot, to inspection point, to export point). Product for export to Australia that has been inspected and certified by DAC must be maintained in secure conditions that will prevent mixing with untreated fruit, fruit for domestic consumption or for export to other destinations. Security of the consignment is to be maintained until release from quarantine in Australia.

Arrangements for secure storage and movement of produce are to be developed by DAC in consultation with DAFF.

2.3.7 Pre-export inspection by the NPPO

The objective of this proposed procedure is to ensure that all consignments are inspected by DAC in accordance with official procedures for all visually detectable quarantine pests and other regulated articles (including soil, animal and plant debris) at a standard 600 unit sampling rate per lot whereby one unit is one mango fruit.

An inspection 'lot' is no greater than all mango fruit treated for export to Australia on one day from one registered treatment centre.

Vapour heat and hot water treated fruit

Pre-export inspection is to be completed after VHT or HWDT. The inspection undertaken by DAC will be required to provide a confidence level of 95% that not more than 0.5% of the units are infested with pests of quarantine concern in the consignment. This equates to a level of zero units infested by quarantine pests in a random sample size of 600 units from the homogenous lot in the consignment. The 600-unit sample must be selected randomly from every lot in the consignment. Any fruit in the sample showing suspect signs of internal infestation must be cut.

Detection of live quarantine pests, dead quarantine pests for which area freedom was claimed, or other regulated articles will result in failure of the consignment. If a consignment fails

inspection by DAC, the exporter will be given the option of treatment and re-inspection of the consignment or removal of the consignment from the export pathway.

Internal feeding insects found in the sampled fruit must be identified by a designated technical expert and the resulting determinations together with the source and date of harvest submitted to DAFF. No fruits are permitted to be exported to Australia while identification is pending.

2.3.8 Phytosanitary certification by the NPPO

DAC will issue an International Phytosanitary Certificate (IPC) for each consignment after completion of the pre-export treatments and pre-export phytosanitary inspection. The objective of this proposed procedure is:

- to provide formal documentation to DAFF verifying that the relevant measures have been undertaken offshore.

Each IPC is to contain the following information that is consistent with ISPM 7: *Export Certification Systems* (FAO 1997):

Description of consignment

The pack-house registration number/treatment facility registration number, number of boxes per consignment, and container and seal numbers (as appropriate, for sea freight only); to ensure trace-back to the orchard in the event that this is necessary.

Additional declarations

“The mangoes in this consignment have been produced in India in accordance with the conditions governing entry of fresh mango fruit to Australia and inspected and found free of quarantine pests”

*“The mangoes in this consignment have been sourced from (name of the designated place of production or production site in India) which is free of *Sternochetus mangiferae* and *S. frigidus*”*

*“The mangoes in this consignment have been sourced from (name of the designated place of production or production site in India) which is free of *Deanolis sublimbalis*”*

Treatments

Details of disinfestation treatments, including date of treatment, dose rate and treatment facility number.

2.3.9 Monitoring by DAFF in India

DAFF officers will observe the application of the treatments and the phytosanitary inspection by DAC officers in India at the commencement of the export season and at other times as necessary. This requirement will be reviewed annually.

2.3.10 On-arrival quarantine inspection by DAFF

DAFF will undertake a documentation-compliance examination for consignment verification purposes, followed by inspection before release from quarantine. The following conditions will apply:

- The shipment must have a Phytosanitary Certificate that identifies registered packing houses and bears the required additional declaration.
- Any shipment with incomplete documentation or certification that does not conform to conditions may be refused entry, with the option of re-export or destruction. DAFF would notify DAC immediately of such action, if taken.
- DAFF will draw a representative sample of the consignment (usually 600 fruit) and inspect the sample for signs of quarantine pests. Any fruit showing suspect symptoms of internal infestation will be cut.

2.3.11 Remedial action(s) for non-compliance

Where inspection lots are found to be non-compliant with requirements, remedial action must be taken. The remedial actions for consignments where quarantine pests are detected will depend on the type of pest and the mitigation measure that the risk assessment has determined for that specific pest. Remedial actions could include:

- re-export of the consignment
- destruction of the consignment

OR

- treatment of the consignment and re-inspection to ensure that the pest risk has been addressed.

Separate to the corrective measures mentioned above, other remedial actions may be necessary depending on the specific pest intercepted and the risk management strategy put in place against that pest in the protocol.

If consignments are found to be repeatedly non-compliant, DAFF reserves the right to suspend the export program and conduct an audit of the risk management systems in India. The program will recommence only after DAFF (in consultation with the relevant state departments if required) is satisfied that appropriate corrective action has been taken.

2.4 Review of policy

Australia reserves the right to review and amend the import policy after a substantial volume of trade has occurred, or earlier if phytosanitary circumstances change.

The NPPO, or other relevant agency nominated by the NPPO, must inform DAFF immediately on detection of any new pests of mango fruit that are of potential quarantine concern to Australia.

References

Biosecurity Australia (2010) Extension of existing policy for the importation of fresh mango fruit from the Republic of the Philippines to Australia – inclusion of the additional growing area of Davao del Sur, Mindanao Island. Biosecurity Australia, Canberra.

FAO (1997) International standards for phytosanitary measures. Export certification system. Secretariat of the International Plant Protection Convention, Food and Agricultural Organization of the United Nations, ISPM Publication No. 7, Rome.

FAO (2006) International standards for phytosanitary measures. Phytosanitary principles for the protection of plants and the application of phytosanitary measures in international trade. Secretariat of the International Plant Protection Convention, Food and Agricultural Organization of the United Nations, ISPM Publication No. 1, Rome.

Royer J (2009) Spread of red-banded mango caterpillar, *Deanolis sublimbalis* Snellen (Lepidoptera: Pyralidae), in Cape York Peninsula, Australia. *Australian Entomologist* 36(3), 119-130.