Submission to the Senate Rural and Regional Affairs and Transport Committee

on

Importation of Apples from New Zealand

Submitted by Apple & Pear Australia Ltd

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Executive Summary

Pests and Diseases of Quarantine Concern

Despite the fact that in 2000 when the first draft IRA was produced, Biosecurity Australia (BA) assured the apple and pear industry that the document was based on thorough scientific assessment of the threats to the Australian industry and the Australian environment in general, the list of pests and diseases of concern is greater in the 2004 revised draft IRA. This raises doubts as to the accuracy of BA's analysis.

What would the list look like if the IRA were re-done in 2006 or 2008?

Would there be another different list?

If the 2000 draft IRA had not been challenged, would Australian farmers and the Australian environment been exposed to these other risks without any protection?

How can the Australian people be confident that the current list is complete when BA personnel seem likely to change their minds every time they consider the issue?

European Canker

The revised draft IRA "suggests" that an orchard inspection be carried out to ensure that European canker is not present in the orchard, however, symptoms of this fungus infection can be impossible to see. Pre-export inspections may also miss the fungus infection, according to the science quoted in the revised draft IRA. The revised draft IRA also tells us that the fungus can survive cool storage for long periods.

European canker is spreading in New Zealand. It can cause major losses of fruit and fruit trees.

Despite the fact that no new science has been quoted in the revised draft IRA, BA has reduced the proposed protocols for reducing the risk of bringing this fungal disease to Australia.

Leaf Rollers

In the case of leaf rollers, BA has again lowered its standard from the 2000 draft to the 2004 revised draft, despite the fact that no new science is quoted in the revised draft IRA.

Apple Leaf Curling Midge

The revised draft IRA quotes no new science, nevertheless BA has recommended a less stringent protocol in 2004 than in 2000.

Thrips

Why are there no protocols designed to exclude thrips from Australia in the revised draft IRA?

The revised draft risk analysis states that the concern regarding the thrips is that apple fruit will be contaminated by thrips moving from nearby stone fruit orchards (p.268), so why is there no requirement to have a detection zone around REBs that is free of stone fruit?

Fire Blight

The protocols to reduce the risk of transmitting fire blight to Australia have been reduced from the 2000 draft IRA to the 2004 revised draft IRA. The requirements are also very lax by international standards.

APAL will contest that three proposed protocols are ineffectual. The proposed protocols make no allowance for know risk factors namely:

- Historical infection of orchards.
- Proximity of infected hosts to blocks from which exports are sourced.

- Cross contamination by machinery.
- Ability to remove symptoms pre inspection.
- Contamination of fruit during packing process.
- Ability of other pests to act as a vector during cool storage.
- Possibility of fruit from non-designated blocks being included in process.
- Climatic conditions pre harvest.

Risk Matrix

In APAL's response to the original draft IRA, a major issue was the unsuitability of the risk matrix that is used by BA, these objections have not changed and APAL will challenge the validity of the matrix in its response to BA.

BA has produced other, different versions of the risk matrix. Why use the one in the revised draft IRA, rather than any other?

Internationally, other systems of estimating risk are used. APAL suggests that BA carry out an international search of various methods of risk assessment and that the results be published along with BA's reasoned position for using the current risk matrix instead of any of the other models available.

Other Protocols

Other countries insist upon using protocols that are far more stringent than those proposed by BA for pests that far less economically risky than fire blight and, in some cases, far less likely to occur than fire blight. These protocols can incur great costs for growers and extreme inconvenience. Australia even has protocols for other horticulture products coming from New Zealand that are for more stringent. Why would BA propose such lax protocols for such a potentially devastating disease as fire blight, when there are many examples of much more stringent protocols that could be adopted?

Apple & Pear Australia Limited

SUBMISSION TO THE RURAL AND REGIONAL AFFAIRS AND TRANSPORT COMMITTEE OF THE SENATE OF AUSTRALIA

Introduction

This submission focuses on the phytosanitary proposals for apple imports from New Zealand. It compares the proposal of the 2000 Draft IRA with the proposals of the 2004 revised draft IRA and highlights the inconsistencies and weaknesses in the proposals. This submission also compares the proposed phytosanitary conditions for apple imports from New Zealand with the requirements with which Australian exporters must comply when sending products to other markets. The risk matrix is also considered and alternatives to the Biosecurity Australia (BA) risk matrix are discussed.

Pests and Diseases of Quarantine Concern

2000 Draft IRA	2004 Revised Draft IRA
Ctenopseustis herana (leafrollers)	Ctenopseustis herana (leafrollers)
Ctenopseustis obliquana (leafrollers)	Ctenopseustis obliquana (leafrollers)
Planototrix excessana (leafrollers)	Planototrix excessana (leafrollers)
Planototrix octo (leafrollers)	Planototrix octo (leafrollers)
Tortricinae species (leafrollers)	Pyrgotis plagiatana (native leafroller)
Dasineura mali (apple leaf curling midge)	Dasineura mali (apple leaf curling midge)
Pseudococcidea species (mealybugs)	
Thrips obscuratus (thrips)	Thrips obscuratus (thrips)
Eriophyes mali (apple blister mite)	
Erwinia amylovora (fire blight)	Erwinia amylovora (fire blight)
Nectria galligena (fungus causing European canker)	Nectria galligena (fungus causing European canker)
	Graphania mutans (grey brown cutworm)
	Strathmopoda horticola (garden featherfoot)
	For WA Only
	Cydia pomonella (codling moth)
	Diaspidiotus ostreaeformis (oystershell sclae)
	Grapholita molesta (oriental fruit moth)
	Planococcus mali (mealybugs)
	Pseudococcus calcceolariae (citrophilus mealybug)
	Panonychus ulmi (European red mite)
	Venturia Inaequalis (apple scab)
	Contaminants of apple fruit
	Arhopalus ferus (Burt pine longhorn beetle)
	Conoderus exsul (click beetle)
	Nysius huttoni (wheat bug)

European Canker

Action	2000 draft IRA	2004 revised draft IRA
Detection zones	Presumably the same as recommended for fire blight i.e. 100 m around the REB	none
Orchard inspection	Annual visual inspections of the REBs and detection zones at full bloom or fruitlet stage.	MAFNZ to provide assurance that apples are sourced from areas free of disease symptoms determined, for example, by surveillance.
Pre-export inspection	Fruit to be inspected prior to export for symptoms of infection (eye rot).	None
On arrival inspection	None	Inspection of 600 pieces of fruit per lot. Nil tolerance for canker damage (eye rot).

European Canker is a serious disease that can cause loss of 10% to 60% of fruit in an infected orchard. Severe infections can cause loss of trees with replacement being from 10% of trees to full plantations.

To ensure this disease is kept out of Australia, BA proposes that MAFNZ should assure Australia that orchards are symptom free however only suggests that surveillance MAY be the way to do this. There is no determination as to when or how often the inspections should take place and no insistence that it should occur at all. This is probably just as well as the Plant Pathology Department at the University of Nebraska – Lincoln tells us that "No external evidence of infection may be visible in the early stages of disease development. Young, developing cankers appear as small circular or elliptical areas of brown tissue" (http://plantpath.unl.edu/peartree/homer/disease.skp/Hort/Trees/PomeNectriaCnk.html). So, sourcing fruit from orchards found to be free of symptoms by visual inspection will not necessarily reduce the risk of including fruit from infected orchards.

So can pre-import inspections ensure that infected fruit is not imported? BA tells us that infection can take place through the open calyx and in the stem end without showing lesions on the surface. Also infections have been observed to spread to the seed cavity (revised draft IRA p. 125) where presumably there are no surface symptoms. Further, in varieties of lower sweetness – "cooking varieties" – infections can remain latent and develop only during storage over a period as long as three to seven months. Apple varieties vary in susceptibility but no variety is immune (revised draft IRA p. 125). The research that refers to "cooking varieties" is at least 30 years old and so is unlikely to take into account the changing sweetness profiles of modern apples.

European canker seems to be spreading in New Zealand. The research quoted in the revised draft IRA is all very recent, but still shows that the disease has spread between 1999 and 2002. It is known to be currently present in areas that provide 41% of export apples.

In the case of European canker, the revised draft IRA is not only less strict than the previous draft IRA, but in reality provides no better protection than would be the case if there were no protocols in place. Why has BA downgraded the protocols for European canker from the 2000 draft IRA when they have quoted no new science in their assessment of it?

Leaf Rollers

Action	2000 draft IRA	2004 revised draft IRA
Pre-harvest orchard survey	Orchard inspection required for ascertaining the presence of leaf rollers. AND	New Zealand growers expected to control this pest in their IFP management (no verification required).
Phytosanitary inspection	Detailed examination of the calyx of all fruit in sample including the use of knife or forceps if required. OR	Inspection in New Zealand or Australia
Enhanced on-arrival inspection	As for phytosanitary inspection (above).	

In the case of leaf rollers, BA has again lowered its standard from the 2000 draft to the 2004 revised draft. What has changed in the interim? No new science has been quoted in the revised draft IRA, but the proposals for protecting Australia from this unwanted pest have still been reduced. Apple and pear growers of Australia want to know why.

Apple Leaf Curling Midge

Action	2000 draft IRA	2004 revised draft IRA
Pre harvest orchard inspection	Orchard inspection required for ascertaining the presence of leaf rollers. AND	New Zealand growers expected to control this pest in their IFP management (no verification required).
Phytosanitary inspection	Detailed examination of the calyx of all fruit in sample including the use of knife or forceps if required. OR	Inspection in New Zealand or Australia
Enhanced on arrival inspection	As for phytosanitary inspection (above).	

In 2002 BA described ALCM larvae as “small and not brightly coloured and may escape standard on-arrival inspection”(p 107). In 2004 BA described the same pest by saying “mature larvae are bright orange-red in colour and pupae brown in colour and thus are clearly visible” (p482). The revised draft IRA quotes no new science, nevertheless BA has recommended a less stringent protocol in 2004 than in 2000.

Thrips

Action	2000 draft IRA	2004 revised draft IRA
Pre harvest orchard inspection	Orchard inspection required for ascertaining the presence of leaf rollers. AND	None
Phytosanitary inspection	Detailed examination of the calyx of all fruit in sample including the use of knife or forceps if required. OR	None
Enhanced on arrival inspection	As for phytosanitary inspection (above).	

Although thrips are seen by BA as a pest of quarantine concern to the extent that the thrips are included in the detailed risk assessment section of the revised draft IRA, no protocols to assist in keeping the pest out of

Australia are proposed. Again this is a change of position from 2000 and a significant reduction of the previously proposed inspection regime.

The revised draft risk analysis states that the concern regarding the thrips is that apple fruit will be contaminated by thrips moving from nearby stone fruit orchards (p.268), but there is no requirement to have a detection zone around REBs that is free of stone fruit. This stone fruit free zone along with the inspection regime proposed in 2000 would be the minimum safeguard expected by Australian apple and pear growers.

Fire Blight

Below is presented a brief summary of the differences between the Draft Import Risk Assessment (2000) and the Revised Import Risk Assessment (2004). This summary was compiled by Shane Hetherington of NSW Agriculture.

Action	2000 draft IRA	2004 revised draft IRA
Registered Export Blocks (REB) free from fire blight	- REB trace back possible. List of blocks maintained by NZ but available to Australia. - Three inspections per season (fruitlet, full bloom, two weeks before harvest) by NZ	- REB trace back possible. List of blocks maintained by NZ but available to Australia. Unique number to identify all orchards and growers. - NZ will inspect fruit for export immediately before harvest - Detection leads to suspension of that REB from the export program.
Detection zones	- 50 metre zone around an orchard containing no hosts except apples - detection leads to no export for two seasons	Not included
Disinfestation of harvesting bins	- Bins to be used for export to Australia only - Chlorine dip (100ppm), pressure or steam clean Trash removed	Not included
Disinfestation of fruit	- Fruit dipped 1min 100ppm chlorine (pH 5.0 – 6.5; no sprays)	- Fruit dipped100ppm chlorine (pH 5.0 to 6.0)
Sanitation of the packing line	- Surfaces sanitised	- Packinghouse equipment and storage areas clean - NZ to audit packinghouses
Sorting, grading and packing procedures	- Packinghouses registered - Fruit free of trash - New cartons	- Packinghouses registered - Packinghouses to have ISO 9002 certification. - Exports suspended from non-compliant packinghouses
Packaging and labelling		- No plant trash - No unprocessed packaging of plant origin - Origin of fruit to be displayed on each carton
Storage		- Fruit must be stored at 0-4°C for 6 weeks
		- Packed cartons immediately loaded into a shipping container or vehicle and transported to the wharf.
Inspection and certification	- 600 fruit per REB per day inspected (= ‘a lot’) - Rejected ‘lots cannot be	- 600 fruit per REB per day inspected (= ‘a lot’) - If pests/disease of ‘quarantine concern’ or trash found that consignment is rejected unless the lot

	resubmitted - 2 rejections and that REB withdrawn for that season.	can be traced back in which case only fruit from that REB is rejected. - NZ to issue a phytosanitary certificate for each consignment with relevant information and declarations.
Registration of exporters	- Export packinghouses only source fruit from REBs	- Export packinghouses only source fruit from REBs
Fruit security in storage	- Fruit for Australia segregated from fruit for other markets	- Fruit for Australia segregated from fruit for other markets
AQIS Audits	- Australian inspectors visit NZ every year	- Random audits of the entire pathway by NZ and Australia.
On-arrival inspection	- Detection leads to suspension of trade - Broken seals, incomplete documentation leads to rejection of the consignment	- Importer must have a valid import permit - Shipment must have a phytosanitary certificate - Incomplete documentation leads to destruction or re-export. - 600 fruit per consignment inspected. - Nil tolerance for quarantine pests, trash, immature or damaged fruit. - Quarantine pests lead to fruit re-exported, destroyed, or treated to ensure the pest is no longer viable.

The above table illustrates the significant degree to which requirements for the export of apples from New Zealand has been reduced. The information presented below indicates that the requirements are not only less than those proposed in the 2000 draft IRA but are very lax by international standards.

In its scientific response to the revised draft IRA, APAL will contend most vigorously that the three major protocols proposed for fire blight (symptom free orchards, chlorine dipping and cool storage) will not reduce the risk to Australia and will not allow imported New Zealand apples to meet Australia's ALOP.

Additionally, the response will show that there is a range of risk factors for which no protocol has been proposed. These include:

- Historical infection of orchards.
- Proximity of infected hosts to blocks from which exports are sourced.
- Cross contamination by machinery.
- Ability to remove symptoms pre inspection.
- Contamination of fruit during packing process.
- Ability of other pests to act as a vector during cool storage.
- Possibility of fruit from non-designated blocks being included in process.
- Climatic conditions pre harvest.

Reducing Risk

Australian apple and pear growers expect that, if New Zealand apples are imported into this country, the protocols that will be put into place will significantly reduce the risk of importing pests and diseases. Neither reducing the stringency of the protocols without new science to support the reductions nor ignoring risk scenarios when proposing protocols will provide the protection that apple and pear growers and Australia's ALOP demands.

Risk Matrix

In APAL's response to the original draft IRA, a major issue was the unsuitability of the risk matrix that is used by BA. The points made in that document are worth revisiting and are reproduced in Attachment 1 of this document.

The main points made in Attachment 1 are:

- Despite very specific criticism in the report of the Senate Rural and Regional Affairs and Transport Legislation Committee inquiry titled '*An appropriate level of protection? The Importation of Salmon Products*' (June 2000) that a quantitative assessment of risk should be made in import risk analyses, Biosecurity Australia has perpetuated the use of a qualitative approach.
- The Nairn '*Australian Quarantine – a shared responsibility*' Quarantine Review Committee report examined the use of qualitative and quantitative import risk analyses and concluded that each had their advantages but that a Key Centre for quarantine-related risk analysis should be established to enhance Australia's standing in this field (this has not been done).
- While the likelihoods are stated to be qualitative, reference to Table 8 (page 42) shows that a quantitative approach lies behind the qualitative terms. This is inconsistent with a normal distribution of probabilities. The matrix rules for combining likelihoods makes the critical assumption that the events are independent, that is the likelihood of one event is entirely independent of the likelihood of a second.
- The problem is further exacerbated when current Draft IRA effectively draws on four (4) differing methodologies for determining the probability of entry, establishment and spread. The separate methodologies are:
    - AQIS IRA Process Handbook 1998
    - ISPM No. 2 *Guidelines for Pest Risk Analysis* (IPPC, 1996)
    - ISPM *draft* *Pest Risk Analysis for a Quarantine Pest* (IPPC, September 1999)
    - WG *draft* *Integrated Measures for Pest Risk Management –systems approaches* (July 2000)
- It is submitted that the inclusion within a likelihood matrix of an additional step described as 'spread' and then using the combined likelihood in a risk estimation matrix with 'economic consequence' is double counting.
- A qualitative scale has been introduced which combines the direct and indirect consequences. These classifications are arbitrary in the extreme! Their use to develop a risk estimation table is also very coarse! The Draft IRA approach to economic consequences is limited by:
    - a one-sided approach to consequence
    - lack of quantification
    - the use of an arbitrary scale
    - lack of a time scale
- The ISPM draft *Pest Risk Analysis for Quarantine Pests* (IPPC, September 1999) recommends that in assessing economic consequences 'wherever appropriate, quantitative data that will provide monetary values should be obtained.' It appears that no attempt has been made by Biosecurity Australia to quantify the economic consequences. Where these are likely to be profound it is inappropriate to use a qualitative scale. The estimation of consequences without an underlying and clearly understood monetary basis to confirm its rigour misleads the overall analysis.
- As no time scale is included it must be assumed that a category of consequence higher than 'extreme' would need to be included if a long-term change were to occur.

- There is no precedent for the 'risk estimation matrix' introduced in Table 9 (page 48) in any of the ISPMs, draft ISPMs

It is interesting to note that BA has also produced another risk matrix that is quite different and would give a different result if it were used. This risk matrix appears in documents produced to assist in creating industry biosecurity plans. Why has BA created a different risk matrix? Why would not the biosecurity plan matrix be used for imports? Why is the import matrix not suitable for biosecurity plans? Attachment 2 shows the different BA risk matrices used in 2000, 2004 and for biosecurity planning.

It is also worth noting that other countries use a different method of risk assessment altogether. The USA for example, uses a system of allocating points for each risk point (see Attachment 3). This means that risk factors accumulate from one issue to the next until a final score is achieved. This is an interesting contrast from the BA multiplication model that can allow high risks to be substantially discounted by low risks.

APAL suggests that BA carry out an international search of various methods of risk assessment and that the results be published along with BA's reasoned position for using the current risk matrix instead of any of the other models available.

Other Import Protocols

Bearing in mind that the economic consequences of importing fire blight will be extreme and that the unrestricted risk of importing fire blight is high, it would be reasonable to expect that the protocols suggested by BA would be stringent. So how do they compare with the protocols demanded by other countries for Australian product?

<u>Australia to USA</u>

USA provides that a USDA inspector should come to Australia to inspect apples and pears at the time of packing for export. Blocks must be registered and inspected. Fruit must be cold treated for fruit fly unless it comes from a fruit fly free area. To comply with the USA requirements, extensive paperwork is required – far more than other countries.

<u>Korea to USA</u>

In importing apples from Korea, the USA demands among other things that;

- The apples be grown in a certified orchard in an APHIS-approved export production area by growers registered with the Korean Ministry of Agriculture
- The export production area be surrounded by a 200- metre-wide buffer area
- The packhouse is prohibited from accepting fruit from any orchard not certified for export

(from 2000 protocols)

<u>Codling Moth Areas to Taiwan</u>

When apples produced in an area or country known to be a host of codling moth are exported to Taiwan an extensive workplan must be complied with. Among many other items the work plan includes:

- Details of the installation of codling moth trap placement and monitoring
- A buffer zone of 500 metres
- Orchards must be registered.
- Complete and adequate separation of fruit from registered blocks from fruit in non-registered blocks during storage
- Two months before harvest the exporting country must invite inspectors from Taiwan to inspect the production area.
- Annual certification of packing establishments
- Packing house must be fully insect-proofed.

- Apples must be sorted at least twice before packing
- When fruit is being transported, insect-proofing measures must be in place.
- At least 2% of the cartons in a given lot must be inspected and at least 50 apples from each of those cartons must be inspected.
- Finding of any coddling moth or other insect pest will result I the entire lot being rejected.
- An alternative to trapping and buffer zones is to fumigate the fruit.

South Africa to Mexico

When South African apples are exported to Mexico, the main requirement is for fruit to be cold sterilised or fumigated, however the work plan requires extensive inspections, verifications and paperwork for each part of the process (taking 17 pages todescribe). Inspection of the fruit require that at least one carton from each pallet is inspected and that 40 pieces of fruit from each opened carton be inspected.

Australia (Tasmania) to Japan

When Australian (Tasmanian) apples are exported to Japan apples must be residue tested prior to harvest. The fruit must be fumigated at temperatures that are borderline in causing damage to the apples. Fumigation must take place in the presence of an official from Japan. After fumigation the fruit is inspected by the Japanese official who samples fruit from 2 cartons from each pallet (2 out of every 63 cartons or more than 3%). The fumigation must take place in a special quarantine area and the fruit must not again leave this area prior to export. The cost of fumigation, special cooling and the Japanese inspector are all met by the fruit growers.

New Zealand to Australia

When stone fruit and kiwifruit come from New Zealand to Australia, an AQIS inspector travels to New Zealand to carry out inspections. AQIS officers also travel to China to inspect pears bound for Australia.

Australia (citrus) to Korea and Japan

Both Korea and Japan insist that their own inspectors are present when fruit is cold sterilised for the removal of fruit fly. All processes are checked with great precision and any deviation from the process will result in the period of sterilisation being restarted or the fruit rejected.

For Korea all fruit must come from registered export blocks with paperwork provided and verified by AQIS. The paperwork is checked in exacting detail and any discrepancy can result in the fruit being returned to the grower.

The inspectors from each country stay in Australia for the entire exporting season - about six months. The cost of the inspectors is met by the fruit growers. The full cost can amount to $150,000 to $200,00 per country per year.

Once inspected, and treated the fruit must be kept entirely within an insect-proof environment until the shipping container is sealed. Adherence to the insect-proofing protocols is also checked in great detail by the inspectors. Maintaining this environment is a costly exercise.

The nature of the inspections is such that the program for Korea is under threat this year due to the high number of consignments rejected last year.

Information in this section provided through internet documents and interviews with Colin Repacholi the AQIS Export Supervisor for Victoria and Mark Hall, Managing Director of Valley Pack in the Goulburn Valley.

Conclusion

APAL will submit to BA a full scientific response to the revised draft IRA. This submission highlights major inconsistencies between the 2000 draft IRA and the revised draft and points out areas of risk for fire blight not addressed by the revised draft IRA.

This submission also indicates that APAL does not believe that the risk matrix used by BA is appropriate. It also points out that BA uses at least two different risk matrices in different circumstances. This submission suggests that BA should investigate the risk assessment procedures used in other countries.

Finally, this submission shows that the protocols suggested by BA are much looser than many used internationally. If international standards are to prevail, then the risk-reducing protocols suggested by BA need to be much tighter.

Attachment 1 – Extract from the AAPGA submission to the 2000 Draft IRA

4.0 Pest Risk Analysis (PRA) methodology

Biosecurity Australia has conducted the current Draft IRA using a Pest Risk Analysis (PRA) framework which involves:

Stage 1 Initiation of the PRA
Stage 2 Risk Assessment
Step 1 Pest categorisation
Step 2 Assessment of entry, establishment and spread potential
Step 3 Assessment of potential economic consequences (including environmental impact)
Stage 3 Risk Management

Stage 1 Initiation

The initiation stage identified a biological pathway that represents a potential (actual) pest hazard. The steps in the pathway have been exhaustively dissected into entry (importation and distribution), establishment and spread.

The '*importation scenario*' has been described as:

Importation (see Draft IRA page 37, Table 5)
Step 1 sourcing of fruit from orchards in New Zealand

Step 2 packing house procedures
Step 3 storage and transportation to Australia
Step 4 on-arrival inspection procedures in Australia

Distribution (see Draft IRA page 40, Table 7)
Step 1 storage and distribution of imported fruit in Australia
Step 2 infected/infested fruit discarded as waste
Step 3 distribution of infected/infested waste to the environment
Step 4 transfer of pests from the environment to a susceptible host in an endangered area

Establishment (see Draft IRA page 43)
Availability, quantity and distribution of hosts, environmental suitability, potential for adaption of the pest, reproductive strategy of the pest, method of pest survival
Spread (see Draft IRA page 44)
Suitability of the natural and/or managed environment for natural spread, artificial movement of the pest, intended use of the commodity, potential vectors for the pest, natural enemies of the pest

4.1 Qualitative nomenclature for likelihood

Despite very specific criticism in the report of the Senate Rural and Regional Affairs and Transport Legislation Committee inquiry titled '*An appropriate level of protection? The Importation of Salmon Products*' (June 2000) that a quantitative assessment of risk should be made in import risk analyses, Biosecurity Australia has perpetuated the use of a qualitative approach. The Nairn '*Australian Quarantine – a shared responsibility*' Quarantine Review Committee report examined the use of qualitative and quantitative import risk analyses and concluded that each had their advantages but that a Key Centre for quarantine-related risk analysis should be established to enhance Australia's standing in this field.

In Table 6 of the current Draft IRA document (page 39) the likelihood (or probability) of an 'event' is described. An 'event' is any phenomenon whose occurrence can be represented by a probability. While the likelihoods are stated to be qualitative, reference to Table 8 (page 42) shows that a quantitative approach lies behind the qualitative terms. Further the quantitative probabilities are expressed as having a range. By deduction the values set out in Table 1 appear to have been used.

Table 1 Biosecurity Australia qualitative likelihoods and their probability range

Likelihood	Description	Quantitative probability range
Extreme	Virtually certain to occur	>0.99
High	Likely to occur	0.7 to 0.99
Moderate	Occur with an even probability	0.3 to 0.7
Low	Unlikely to occur	0.01 to 0.3
very low	Very unlikely to occur	0.0000001 to 0.01
negligible	Almost certainly not occur	$<10^{-7}$

From the quantitative probability range it can be seen that while the probabilities appear to be distributed around 'moderate' (Pr = 0.5) there is a bias to the lower probabilities. This is inconsistent with a normal distribution of probabilities. Put another way, if the probabilities are 'normally distributed' there should be three qualitative categories below 'moderate' and three above. To allow for this a category of 'very high' should be included before 'extreme'.

A further problem arises if it is considered that the probability of 'extreme' and 'negligible' should be equal and opposite. i.e. Pr(extreme) + Pr(negligible) = 1.0 If a normal distribution of likelihood is assumed and the importance of an unbiased (Lickert) scale is noted, then Table 6 (page 39) should be adjusted to reflect the values set out in Table 2.

Table 2 Unbiased qualitative likelihoods and their probability range

Likelihood	Description	Quantitative probability range
Extreme	Virtually certain to occur	>0.9999999
Very high	Very likely to occur	0.99 to 0.9999999
High	Likely to occur	0.7 to 0.99000
Moderate	Occur with an even probability	0.3 to 0.69999
Low	Unlikely to occur	0.01 to 0.29999
Very low	Very unlikely to occur	10^{-7} to 0.00999
Negligible	Almost certainly not occur	$<10^{-7}$

It is curious that Table 8 does not show a range of outcomes when the probabilities of two independent 'events' are combined. This suggests a further assumption has been made to derive Table 8. That is, the median values for each 'event' have been used to calculate the combined likelihood and then the result checked against the likelihood range to decide in what category it lies.

Two examples illustrate this,

Example 1 calculates the resulting likelihood when two independent '*extreme*' events are combined:

Range for '*extreme*' likelihood = | 0.99 - 1.00 | *(1)*

Median value for '*extreme*' = (0.99 + 1.0) / 2 *(2)*

= 0.995

Product of '*extreme*' x '*extreme*' = 0.995 x 0.995 *(3)*

= 0.99

Therefore the product lies in the '*extreme*' range *(4)*

Example 2: calculates the resulting likelihood when two independent '*moderate*' events are combined:

Range for '*moderate*' likelihood = | 0.3 - 0.7 | *(5)*

Median value for '*moderate*' = (0.3+ 0.7) / 2 *(6)*
= 0.5

Product of '*moderate*' x '*moderate*' = 0.5 x 0.5 *(7)*
= 0.25

Therefore the product lies in the '*low*' range *(8)*

Using this approach to develop a matrix which is 'normally distributed' around a 'moderate' likelihood has the effect of giving Table 8 (Draft IRA page 42) an extra category and the appearance shown in Table 3.

Table 3 Matrix rules for combining descriptive likelihoods

		Likelihood 2						
		extreme	**very high**	**high**	**moderate**	**Low**	**very low**	**negligible**
Likelihood 1	**extreme**	extreme						
	very high	very high	very high					
	high	high	high	high				
	moderate	moderate	moderate	moderate	low			
	low	low	low	low	low	low		
	very low	very low	very low	very low	very low	very low	very low	
	negligible	negligible	negligible	negligible	negligible	negligible	negligible	negligible

There are no particular mysteries with the outcome as the matrix differs little from that developed in Table 8 (page 42) other than by the inclusion of a category 'very high'. However, the median values and ranges which lie behind the qualitative likelihoods become critically important when a risk matrix is to be developed.

4.2 Delineating entry, establishment and spread

The matrix rules for combining likelihoods make the critical assumption that the events are independent, that is the likelihood of one event is entirely independent of the likelihood of a second.

The '*importation scenario'* described above is assumed to be independent but several steps are influenced by the previous step and the whole scenario duplicates 'establishment' and to some extent 'spread'.

Examples of the lack of independence include:

1. When large numbers of fruit are infested (or infected) in an orchard in New Zealand the probability of eliminating the infestation/infection during packhouse procedures will decrease compared with the probability when low numbers are infested (or infected).

2. When low (but non-zero) numbers of fruit are infested following storage and transportation then it is less likely that on-arrival inspection will identify a problem than when high numbers of infested fruit are present.
3. The probability of transfer of a bacterial or fungal pest (importation step 4) will be influenced by the numbers of other pests present (insects, mites).
4. Storage and transportation to Australia (import) and storage and transportation in Australia (distribution) are the same event. They are not independent. Only the second step should be considered as 'storage and transportation to the point of consumption (or discard as waste)'.

Where events are not independent a different set of rules are required to combine the likelihoods.

In the current Draft IRA 'entry' is described as including 'importation' (4 steps) and 'distribution' (4 steps). However, steps 3 and 4 of distribution, namely, 'distribution of infected/infested waste to the environment' and 'transfer of pests from the environment to a susceptible host in an endangered area' are the necessary steps for establishment to be completed. The likelihood that the pest will be transferred to a susceptible host in an endangered area takes into account the number, quantity and distribution of hosts, the environmental suitability, and the other aspects of the host and pest required for establishment.

The problem is further exacerbated when current Draft IRA effectively draws on four (4) differing methodologies for determining the probability of entry, establishment and spread. The separate methodologies are:

AQIS	IRA Process Handbook 1998
ISPM No. 2	*Guidelines for Pest Risk Analysis* (IPPC, 1996)
ISPM *draft*	*Pest Risk Analysis for a Quarantine Pest* (IPPC, September 1999)
WG *draft*	*Integrated Measures for Pest Risk Management –systems approaches* (July 2000)

For the purposes of this paper the 'importation scenario' is taken to include all eight (8) steps of 'importation' and 'distribution'. These steps are sufficient for both entry and establishment to be completed.

'Spread' in the current Draft IRA is the approximate equivalent to consequence in that affected geographic regions increase with increasing scale of consequence. This is best illustrated by looking at the opportunities to contain or eradicate a pest once established. If one state has an effective surveillance program to overcome the 'extreme' consequences of a pest then both 'consequence' and spread will be affected. Steps to operate an effective surveillance program are likely to include

- control of the artificial movement of the pest (interstate quarantine)
- control of the intended use of the fruit (restricted distribution, controlled waste disposal)
- control of the potential vectors of the pest (control of bee hives, removal of suspected plants)
- and possibly use of natural enemies

All the above factors would potentially reduce the consequence but also reduce the probability of spread.

It is submitted that the inclusion within a likelihood matrix of an additional step described as 'spread' and then using the combined likelihood in a risk estimation matrix with 'economic consequence' is double counting.

It is to be hoped that the current Draft IRA has simply confused the delineation of 'entry, establishment, spread' and 'economic consequence' erroneously rather than as an attempt to describe an artificially long pathway with a number of relative low likelihoods in order imply that a resulting risk is negligible.

A realistic calculation of the risk estimation matrix relates the eight (8) importation and distribution steps (entry and establishment) to the 'economic consequence', which has already taken account of 'spread'.

4.3 Economic consequences

Biosecurity Australia has made economic assessments based on the impact (both direct and indirect) of incursion of each quarantine pest. Direct consequences noted in the current Draft IRA document include: crop losses, control and surveillance measures and environmental effects. A series of indirect consequences are also noted.

A qualitative scale has been introduced which combines the direct and indirect consequences. These classifications are arbitrary in the extreme! Their use to develop a risk estimation table is also very coarse! The Draft IRA approach to economic consequences is limited by:

- a one-sided approach to consequence
- lack of quantification
- the use of an arbitrary scale
- lack of a time scale

One-sided approach to consequence

It is proposed that these classifications can be interpreted in dollar terms, in social terms or as a combination of both. Why then is the scale one-sided? If the economic consequences can be negative then there should be circumstances where they could be positive. Current economic thinking suggests that the purpose of WTO Membership, the SPS Agreement and liberalised trade are to improve overall economic consequences through to a triple bottom line (economic, environmental and social) for Australia. If this is true then an analysis of economic consequences to Australia on a more objective basis should be able to show a positive consequence.

Analysis to this detail is most important where the consequences are likely to be extreme. Under these circumstances the likelihood that the consequence will not eventuate, and the likelihood that it will, should be weighted and an overall assessment made.

Lack of quantification

The ISPM draft *Pest Risk Analysis for Quarantine Pests* (IPPC, September 1999) recommends that in assessing economic consequences 'wherever appropriate, quantitative data that will provide monetary values should be obtained.' It appears that no attempt has been made by Biosecurity Australia to quantify the economic consequences. Where these are likely to be profound it is inappropriate to use a qualitative scale.

Arbitrary scale

It is relatively simple to determine a zero consequence as one where the impact is entirely unnoticed. It is however very difficult to conceive an extreme consequence if no monetary values are introduced. The current Draft IRA states that the 'extreme' consequence would be 'highly significant at the national level' and 'of significant national concern. Economic stability, societal values or social wellbeing would be seriously affected in more than one geographic region.'

It is entirely possible to conceive of circumstances where an extra classification is needed. It would involve serious impact on economic stability not only in more than one geographic region but also at a national level. An example would be a significant change in the value of the

Australian dollar induced by the collapse of trading partners' confidence in Australia's productive capacity.

It is also assumed that the scale used is logarithmic. That is, the impact increases by a factor of (say) 10 with each step. If this is true then there is a 100,000-fold increase in consequence between 'negligible and 'extreme' or a one million-fold increase between a zero effect and an 'extreme'. In dollar terms an 'extreme' consequence must be regarded as having a greater value than $1 million for the economic consequence to have any practical credibility. **The estimation of consequences without an underlying and clearly understood monetary basis to confirm its rigour misleads the overall analysis.**

Lack of a time scale

The current Draft IRA classification of consequences does not describe the time scale of the impacts. However there is an implied time scale in the probability of entry, establishment and spread of an event occurring within one year. It is not clear whether any recovery is possible from a consequence or whether any containment or eradication strategy might be undertaken. Containment and eradication leading to a change in economic consequence over time suggests that a longer time scale than one year is required. As no time scale is included it must be assumed that a category of consequence higher than 'extreme' would need to be included if a long term change were to occur.

4.4 Risk estimation matrix

There is no precedent for the 'risk estimation matrix' introduced in Table 9 (page 48) in any of the ISPMs, draft ISPMs, working group drafts or the AQIS IRA Process Handbook (1998) and there is a distinct lack of transparency about its development.

At first sight it appears that the same units have been used for the Probability scale (Y-axis) and the Consequence scale (X-axis) in Table 9. However closer examination using quantitative values rather than simple classifications shows that a different scale is used for Consequence.

Following discussion with Biosecurity Australia staff it appears that a logarithmic scale has been used for Consequence. Therefore it can now be deduced that unlike probabilities which range between zero and one (Pr = 0 – 1) the value given to 'extreme' must be greater than one if a risk outcome of 'very low' is to be the result.

The exact nature of the logarithmic scale increase from 'negligible' to 'extreme' used in the current Draft IRA document is unclear. However it is quite clear that arbitrary selection of the scale used will have considerable effect on the outcome.

From an examination of Table 9 in the current Draft IRA document (see page 48) it can be seen that to achieve the iso-risk curve in Figure 5 an arbitrary increase in values from 'negligible' to 'extreme' has been made. (See Graph 1.) Further if the same values used in the Table 8 matrix for combining likelihoods are used in Table 9 the risk estimation matrix changes to that shown in Table 4.

Table 4 Risk estimation table (approximation of Biosecurity Australia)

Probability of entry, Establishment and spread						
Extreme	Negligible	Very low	Very low	Very low	Extreme	Extreme
High	Negligible	Very low	Very low	Very low	High	Extreme
Moderate	Negligible	Negligible	Very low	Very low	Moderate	Extreme
Low	Negligible	Negligible	Negligible	Very low	Low	Moderate
Very low	Negligible	Negligible	Negligible	Negligible	Very low	Low
Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Very low
	Negligible	**Very low**	**Low**	**Moderate**	**High**	**Extreme**

Consequence of entry, establishment and spread

It can be seen from Table 4 above that despite having the same cells with 'very low' categories, other cells contain different risk outcomes to those shown in Table 9

The values behind the qualitative table also suggest that to obtain a 'very low' risk estimate when combining a 'negligible' likelihood of entry, establishment and spread, and an 'extreme' economic consequence must lie between $2.2 million and $20 billion. These are very coarse groupings with which to analyse the apple and pear industry and need to be refined in order to better understand the risks being taken by the industry and all Australians.

A more appropriate quantitative estimate of the Consequence scale can be made by reference to the economic loss to Australian industries if the disease fire blight were to be introduced. Oliver *et al*. (1997) calculated the economic losses associated with fire blight becoming established in Australia and concluded the following:

- nationwide annual impact: $98 million revenue loss for growers; $25 million annual loss of export sales; 1,377 lost jobs in first year.
- nationwide five year effect: $827 million revenue loss for growers; $183 million lost export revenue; 2,484 jobs
- single geographic region (Goulburn Valley) annual impact: $44 million revenue loss for growers; $67 million annual revenue loss for other industries and the region; 614 lost jobs in first year.
- single geographic region five year effect: $368 million revenue loss for growers; $410 million lost revenue in allied industries and the region; 1,102 jobs lost.

For the purposes of establishing a scale, two figures can be implied from Oliver *et al*. (1997) and quantitative estimates made for the resulting impacts. First, the impact of any pest which cannot be contained or eradicated will continue to be felt for many years. So, an appropriate measure for an 'extreme' consequence, one where economic stability, societal values and social well-being are affected in more than one geographic region (and probably all), can be assigned an approximate figure of $1,010 million[2] (plus approximately 2,484 lost jobs).

It is also submitted that it is reasonable to include a 'very high' classification in the economic consequence scale to provide the same number of classifications as the probability scale. This allows a total of six (6) classifications to be included and the classifications detailed in the current Draft IRA (page 46) to be re-assigned to reflect the economic consequence of each classification.

An appropriate 'very high' consequence, one where the serious effect on economic stability, societal values and social well-being is limited to a given geographic region, can be assigned an *annual* figure of up to $111 million[1,2] (plus approximately 614 lost jobs).

[1] These values are based on an analysis undertaken in 1997. Current values of the losses are likely to have increased more rapidly than CPI due to: rapid growth in horticulture within the region and realisation by the local processors

If it is assumed that a 'negligible' consequence has a value of one (1) then the consequence scale involves a 1,000 million-fold increase to 'extreme'. Using a log scale to give values to each of the classifications the following descriptions and figures apply:

Classification	Description	Value
Negligible	The impact is unlikely to be recognised by directly affected parties.	>$1
Very low	The impact on any given criterion is likely to be minor to directly affected parties and unlikely to be discernable at any other level.	>$30
Low	The impact is likely to be recognised within an affected geographic region, and significant to directly affected parties. It is not likely that the impact will be recognised at the national level.	>$1000
Moderate	The impact is likely to be recognised at a national level, and significant within affected geographic areas. The impact is likely to be highly significant to directly affected parties.	>$30,000
High	The impact is likely to be significant at a national level, and highly significant within affected geographic regions. This classification implies that the impact would be of national concern. However, the serious effect on economic stability, societal values or social wellbeing would be limited to a given geographic region (one producing region but not the Goulburn Valley).	>$1,000,000
Very high	The impact is likely to be highly significant at a national level, and very highly significant within affected geographic regions. This classification implies that the impact would be of national concern. However, the serious effect on economic stability, societal values or social wellbeing would be limited to the Goulburn Valley alone or one producing regions other than the Goulburn Valley.	>$30,000,000
Extreme	The impact is likely to be highly significant at the national level, and extreme within affected geographic regions. This classification implies that the impact would be of national concern. Economic stability, societal values or social wellbeing would be seriously affected in most if not all producing regions.	>$1000,000,000

It can be seen that a different table of economic consequences must be developed for each Import Risk Analysis product (or product range) and that the economic consequences will change quite significantly depending on the rate of development of a particular industry.

A recalculation of Table 9 in the Draft IRA document using a log base which has 'negligible' and 'extreme' consequences at $1 and $1,000 million respectively and provides for seven levels of likelihood and seven of consequence allows the risk estimation matrix to be developed as shown in Table 5.

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that pome fruit processing efficiencies are inextricably linked to the efficiencies for the entire range of products handled.

[2] The *annual* loss for any one geographic region (state) was determined by Oliver *et al* (1997) to be in the range $5 million (Tasmania) and $111 million (Victoria).

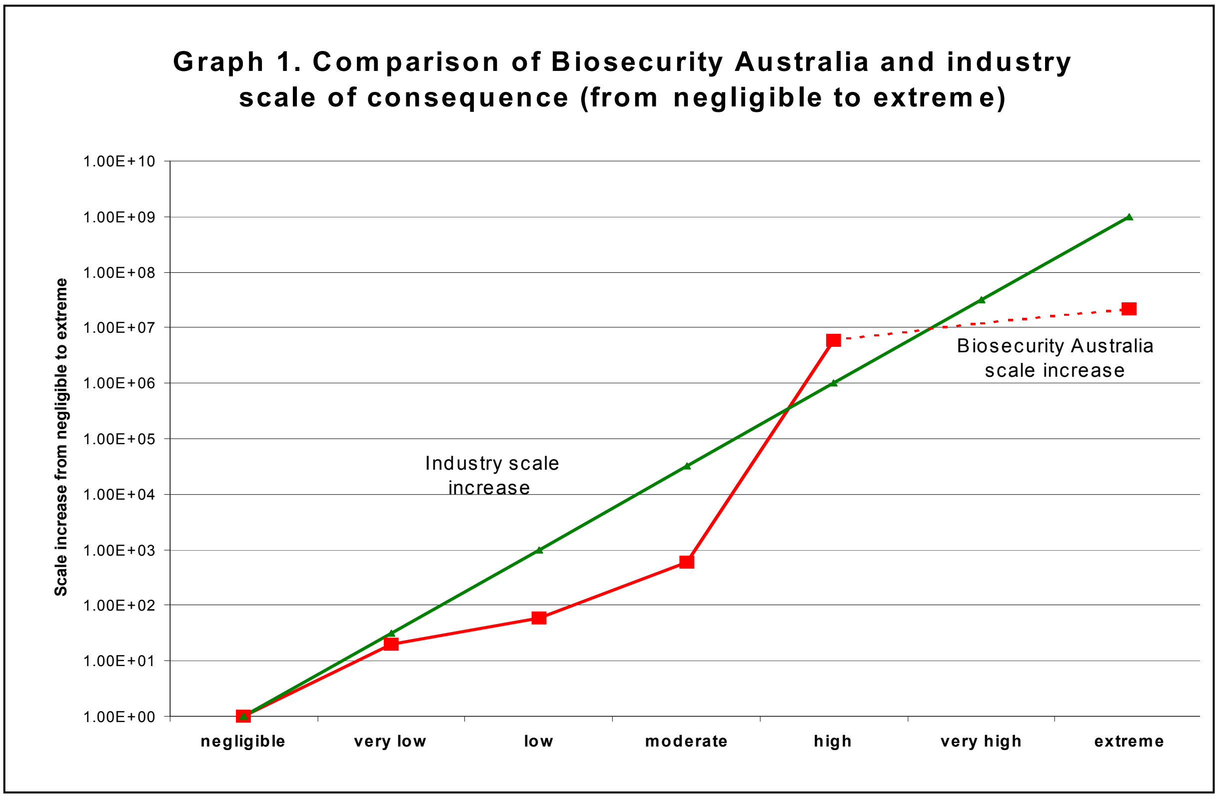
Table 5 Risk estimation table (AAPGA calculation)

Pr of entry, establishment and spread							
Extreme	Very low	Very low	Low	Extreme	Extreme	Extreme	Extreme
Very high	Very low	Very low	Low	Extreme	Extreme	Extreme	Extreme
High	Very low	Very low	Low	Extreme	Extreme	Extreme	Extreme
Moderate	Very low	Very low	Low	High	Extreme	Extreme	Extreme
Low	Very low	Very low	Very low	Low	Extreme	Extreme	Extreme
Very low	Negligible	Very low	Very low	Very low	Low	Extreme	Extreme
Negligible	Negligible	Negligible	Negligible	Very low	Very low	Very low	Low
	Negligible	**Very low**	**Low**	**Moderate**	**High**	**Very high**	**Extreme**

Consequence of entry, establishment and spread

From Table 9 a ‘negligible’ probability combined with an ‘extreme’ consequence results in a ‘very low’ risk. However when the extra category and accurate log scale are introduced then the ‘negligible’ probability combined with an ‘extreme’ consequence results in a ‘low’ risk!

To emphasise the importance of an accurate and graduated log scale the estimated scale for the current Draft IRA and the log base used to develop the industry risk estimation matrix in Table 5 of this response have been plotted together in Graph 1.



Graph 1. Comparison of Biosecurity Australia and industry scale of consequence (from negligible to extreme)

Clearly the economic consequences should the quarantine pest - fire blight - become established and spread within Australia, would be *extreme.* The impact would be felt in most if not all geographic regions of Australia. In addition to direct economic impacts, there would be environmental effects; social effects and effects on export trade. These are likely to be of the order given in the example above.

Clearly a proper log scale is required for calculations of this type and a much more critical appraisal made of the risk estimation methodology. A quantitative approach, such as that outlined above, must be developed in proper consultation with industry stakeholders and qualified statisticians before this type of risk estimation can be realistically proposed. The ramifications of these risk calculations and the methodology on which they are based will have far-reaching effects on all Australian agriculture and horticultural industry sectors.

Attachment 2 - BA Risk Matrix Versions

The risk assessment matrix used by BA in the revised draft IRA p.10

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

Risk Estimation Matrix used by BA in the draft IRA (2000) p.48

Likelihood of entry establishment or spread						
Extreme	Negligible risk	Very low risk	Low risk	Moderate risk	High risk	Extreme risk
High	Negligible risk	Very low risk	Low risk	Moderate risk	High risk	Extreme risk
Moderate	Negligible risk	Negligible risk	Very low risk	Low risk	Moderate risk	High risk
Low	Negligible risk	Negligible risk	Negligible risk	Very low risk	Low risk	Moderate risk
Levy Low	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very low risk	Low risk
Negligible	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very low risk
Consequences	Negligible	Very low	Low	Moderate	High	Extreme
	Consequences of entry, establishment or spread					

A version of Risk Estimation Matrix provided to Plant Health Australia by BA for use in Biosecurity Planning.

	Economic/Environment/Social consequences				
Likelihood	Negligible	Low	Medium	High	Extreme
Extremely High	High	High	Extreme	Extreme	Extreme
High	Moderate	High	High	Extreme	Extreme
Moderate	Low	Moderate	High	Extreme	Extreme
Low	Low	Low	Moderate	High	Extreme

Negligible	Low	Low	Moderate	High	High

Attachment 3 – Risk Assessment Process Used by the USA

The US Department of Agriculture and APHIS uses a points system for judging the degree of risk posed by imported fresh foods.

Six risk issues are assessed and scored. The first five have only one major element and the sixth has six sub elements.

The first five issues are;

- climate,
- host range,
- dispersal potential,
- economic impact and
- environmental impact.

Each of these items is scored for risk with

- 1, (low)
- 2, (medium)or
- 3 (high)

The lowest possible score is 5 and the highest possible score is 15. The sum of the points is then adjudged with 5 – 8 points indicating a low risk, 9 – 12 points indicating a medium risk and 13 – 15 points indicating a high risk.

The sixth risk issue is pest opportunity, survival and access to suitable hosts. This has six sub-elements and they are:

- Quantity imported (<10 containers = 1) (10 – 100 containers = 2) (>100 containers = 3)
- Ability to survive post harvest treatment
- Ability to survive shipment
- Ability not to be detected at point of entry
- Imported into or moved to an area of suitable environment
- Possible contact with host material.

Apart from the first of these items, each is scored according to probability with <0.1% being low and scoring 1, 0.1% to 10% being medium and scoring 2, and >10% being high and scoring 3.

When the sub-elements of the sixth risk issue are summed the results are categorised as 6 – 9 points low, 10 – 14 points medium and 15 – 18 points high.

When all items are added together the results are classified as:

- 11 – 18 points low denoting that the product will require point of entry inspection
- 19 – 26 point medium denoting that specific protocols to reduce risk may be required.
- 27 - 33 points high denoting that specific protocols are required.

If Australia were to use such a system, then the risk analysis would then be repeated assuming that the product has been subjected to the proposed protocols to see if the risk has been reduced sufficiently.