INDUSTRY SUBMISSION

TO

THE SENATE RURAL AND REGIONAL DEVELEOPMENT AND TRANSPORT COMMITTEE

INQUIRY INTO

"Importation of Apples From New Zealand
Revised Draft IRA Report
February 2004"

Fire blight devastation in a young apple orchard

APPLE & PEAR AUSTRALIA LIMITED

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CONTENTS

Glossary of Abbreviations

ACLM	Apple Leaf Curling Midge
BA	Biosecurity Australia
DAFF	Department of Agriculture Fisheries and Forestry
DFAT	Department of Foreign Affairs and Trade
DIRA	Draft Import Risk Analysis
DSB	Dispute Settlement Body
Ec	European canker
Handbook	Import Risk Analysis Handbook DAFF 2003
IFP	Integrated Fruit Production
IPM	Integrated Pest Management
IRA	Import Risk Analysis
IRAAP	Import Risk Analysis Appeals Panel
IRAT	Import Risk Analysis Team
ISPM	International Standard Phytosanitary Measure
OSS	Oyster Shell Scale
PRA	Pest Risk Area
RDIRA	Revised Draft Import Risk Analysis
REB	Registered Export Block
TWG	Technical Working Group
USDA	United States Department of Agriculture
WTO	World Trade Organisation

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NEW DEVELOPMENT

In the last few days the Australian apple and pear industry's consultants undertook a quality assurance check by BA's own estimates of likelihoods for fire blight into BA's own model for calculating risk. Surprisingly, the outcomes achieved were different from the outcomes published in the RDIRA. Because of the significance of this the industry forwarded its quality check data to the QUT Department of Mathematics to be verified.

Where the RDIRA states that the unrestricted risk of entry, establishment and spread is "low". The calculations carried out by the industry consultants resulted in a risk of "moderate".

Where the RDIRA states that the overall unrestricted risk is "moderate" the calculations of the industry consultants result in an overall unrestricted risk of "high".

When this circumstance was brought to the attention of BA and DAFF, industry representatives were told that BA knew of the mistake in early March. The version of the RDIRA on the DAFF website had been changed to reflect this.

Despite the fact that BA knew of the mistake in the hard copy, they took no steps to correct the mistake or to inform stakeholders of the mistake. Furthermore, they continued to print and distribute hard copies of the uncorrected RDIRA.

Examining the corrected and the uncorrected versions is an interesting exercise. What transpires is that the corrected version has not changed the outcomes to show the correct results for the inputs in the RDIRA. BA has changed the estimates of likelihoods that are the inputs to the model so that the outcomes do not change.

The discussions between the industry and DAFF over this issue are not yet complete but the unofficial explanation from DAFF at the time of writing this page is that the incorrect estimates of likelihood that are the inputs to the risk calculations are "typographical errors".

All of the above has been greeted by the industry with shock and disbelief. The questions being asked are;

- Why were we not told of the errors in the printed document as soon they were discovered?
- Why did BA allow us to continue expending considerable resources responding to a document they knew was incorrect?
- How can there have been so many typographical errors in the paper?
- Why should the industry accept that there were so many typographical errors in the RDIRA when it is much more likely that the calculations were incorrect in the original RDIRA and the corrected version has merely changed the inputs to obtain the same result? After all if one sets out to type "moderate" typing "low" hardly a typographical error!

The upshot of these events is that the industry now considers that;

- The RDIRA should be immediately declared invalid.
- The lack of quality assurance in BA means that industry has lost all confidence in their work.
- A new RDIRA needs to be undertaken using a completely new team.
- The industry will be considering its position with regard to seeking compensation for the resources expended in responding to a document that BA knew was incorrect.

All of this has entirely demolished BA's claim that their processes are "transparent" and "world class".

1. Executive Summary

This executive summary presents a brief coverage of the items contained in this paper. The sub-heading numbers conform to the heading numbers in the document.

2. The RDIRA has erred in many fundamental areas and has reached conclusions that are unsupportable. Despite assurances to the contrary, the RDIRA does not consistently take a conservative approach to quarantine risk.

3. The full membership of the team that put together the RDIRA has not been disclosed. The expertise of the TWGs was not used to its full potential. The members of the TWGs do not all agree with the RDIRA conclusions.

The "Scientific Review Paper" issued in 2002 does not fulfil the requirements as outlined in the Handbook. The RDIRA team did not use independent reviewers. Consultations between BA and the states over the RDIRA clearly were not meaningful.

The appeals process illustrates the point made by industry representatives that BA makes the rules and then becomes prosecutor, judge, jury and executioner in the IRA process.

4. The RDIRA has failed to take into account the decision of the WTO panel and the appellate body in the challenge between USA and Japan over fire blight issues this is especially true with regard the risks involved in handling errors, illegal activity and the inclusion of other "product" that may be imported (e.g. trash and immature apples).

5. The RDIRA silence on the issue of trash is a major oversight that must be corrected.

6. The RDIRA fails to include any details regarding the risk mitigation process that it proposes. This makes the document incomplete because no proper response can be made and AQIS has no basis from which to commence a work plan for imported apples.

7. BA personnel made some surprising comments during consultation meetings held around Australia. In this section the Australian apple and pear industry takes the opportunity to respond to a few of them.

8. There is little doubt in the industry that as the trade in New Zealand apples matures, the majority of imports will be made in bulk bins to established Australian packing and distribution facilities, many of which are located in fruit growing districts. This means that the risk scenarios in the RDIRA need to be revised.

9. The assessment of likelihoods in the risk analysis is based on the probability that a single apple is infected or infested with a pest or disease. There is doubt as to the accuracy of estimates of such low level risks. The risk model is constructed in such a way that higher likelihood events are discounted. No account is taken of the cumulative risks of the number of pests and diseases being considered. No account is taken of the time frame of the trade or the increasing risk over a period of years. Insufficient use has been made of the qualitative descriptor "certain" even when it should be used.

The model used in the RDIRA includes several instances of double (dis)counting of the risk to Australia. This assertion is backed by examples and the opinion of an overseas expert.

10. Thorough visual inspection of orchards is a very difficult process because the inspection required presents a major visual challenge, trees in full leaf are impossible to inspect thoroughly, and the entire tree is not visible from ground level with up to 30% of the tree not able to be inspected. Multi variety blocks will need extra inspections.

11. The level of confidence that a "lot" of fruit is free from a pest or disease cannot be maintained unless fruit inspections are truly random in their nature and inspection regimes are instituted not only for pests that can be found on individual pieces of fruit but also for pests that are found in cartons and also for the inspection of bulk bins.

No inspection procedure can be effective for a disease that cannot be seen. This is true for fire blight and for European canker.

All inspections of fruit must take place in New Zealand and be carried out, or at least supervised by AQIS personnel.

12. The Australian apple and pear industry technical paper presents a range of different and new science on fire blight and plant bacterial behaviour that must be taken into account.

The RDIRA does not properly address the provisions of the ISPMs especially ISPMs 4,5, 10,11 and 14.

Fire blight is a disease that still poses a major challenge for scientists and it is clear that further research is required.

The effect of fire blight outbreaks in the vicinity of REBs or within the REBs during previous years is not taken into account in the RDIRA. Removing symptoms from orchards has implications in deciding the level of bacteria that may be on/in apples. The RDIRA involves a double discounting of risk with regard to the use of chlorine.

The current system encourages industry stakeholders to challenge the research used in the RDIRA with a different selection of research. This indicates the need to ensure that all papers used in the production of IRAs are of the highest standard, peer reviewed and that the reviews and inconsistency in the research is taken into account.

Fire blight has spread in a number of countries and in some cases the initial source of infection is unknown. The experience in the Melbourne Botanic Gardens in 1997 points up some significant issues in relation to this RDIRA.

The argument that other countries, where fire blight is endemic, still manage to produce apples in a competitive environment should not influence the RDIRA.

13. The risk model used in the RDIRA means that insect infestations that apple growers would consider to be "high" must be graded in the model as "low".

IFP means that there are higher and more diverse populations of insects in New Zealand orchards. The RDIRA has not taken full account of the ability of many of the insect pests under consideration to utilise a broad range of plant, including weeds, as hosts.

The RDIRA only considers risk scenarios that involve exposure through apple waste when other scenarios are possible.

The RDIRA fails to take into consideration regional variations of pest distribution in New Zealand. The RDIRA does not take into account data derived from New Zealand apples arriving in other markets, for example USA.

14. Despite the fact that European canker is an economically devastating and virtually ineradicable disease, there is little data available regarding its presence and impact in New Zealand. Apples with latent Ec infection are impossible to detect until they start to rot. European canker can be spread by woolly aphids, an insect not subject to quarantine scrutiny.

15. The current IRA process is, from a stakeholder's point of view, most unsatisfactory and gives rise to unseemly public battles between BA and other stakeholders. A different way of conducting the IRA process must be found.

16. The RDIRA is not a satisfactory document on a number of levels and it needs to be re-done preferably using a fully independent panel.

2. Introduction

In February Biosecurity Australia (BA) published its latest document in the saga surrounding the proposal for New Zealand to export apples to Australia. The document is very long and apparently very thorough, however it is the opinion of the Australian apple and pear industry, that the document has erred in many fundamental areas and finally reached conclusions that are not supportable.

The Australian apple and pear industry will provide BA with two submissions. The first will be a science-based technical submission in which leading scientists will evaluate the conclusions of the RDIRA. The second is this document – a layperson's response to the logic and content of the Revised Draft Import Risk Analysis Report on Importation of Apples from New Zealand (RDIRA).

Both of the industry documents will indicate major flaws in the methodology of the RDIRA, the analysis and the conclusions and demonstrate that the RDIRA, in its current form, does not provide a reasonable case to allow the importation of New Zealand apples.

BA has stated in public fora that, when decisions in relation to quarantine must be made, they will always take a conservative approach. In consultations at the most senior levels the Australian apple and pear industry has been assured by DAFF and BA that, if there is any doubt relating to either a relevant piece of science or divergent qualitative views within the scientific community, then BA will adopt the conservative option when undertaking the IRA.

Both this document and the scientific industry submission will show that BA have not taken the conservative approach in the RDIRA and that if their aim is to do so, then the RDIRA will need to be revised again.

3. Handbook Process

3.1 The IRA Team

The IRA Team (IRAT) was initially the Risk Assessment Panel (RAP) but the name was changed at the release of the new IRA Handbook in 2003.

The IRAT is however, not the group of people who carry out the work to complete and IRA. The IRAT can be compared to a Board of Directors who act on the information made available to them from the staff of the organisation for which they are the Board. The so-called IRAT was not the entire team conducting the RDIRA. The input to the IRAT was made, presumably, by BA staff members or contracted consultants. The RDIRA does not reveal the identity of these members of the team, nor does it give any indication of their qualifications. It is not even certain that the official IRAT members know who it was who provided the advice upon which they made vital decisions regarding the RDIRA.

The Handbook states on page 12 that;

> *"Membership of the team (IRAT) is governed by the availability of the required technical expertise within Biosecurity Australia and, if necessary, the extent to which expertise outside Biosecurity Australia may be required."*

This clearly implies that the bulk of the team working on the revised draft IRA was BA staff members and also that the IRAT was merely the public face of a much larger team of contributors to the process.

The identity of these unnamed team members is important because the Handbook states that;

> *It is important that the IRA team members do not have vested interests in relation to the IRA, that they are able to exercise sound scientific judgement, and that the process is objective and seen to be objective.*

If stakeholders and the general public do not know who the team members are then how can they be seen to be objective?

The Australian apple and pear industry believes that a full list of all contributors to the RDIRA should be published.

3.2 Technical Working Groups

The RDIRA notes on pages 1 and 2 that the IRAT established two technical working groups to assist in pest categorisation. The use of TWGs is an excellent step but the IRA process would have been strongly enhanced if the IRAT had continued to use the expertise of the TWGs as they worked through all the other issues. It is to be noted, for example, that the IRAT includes no specific expertise in entomology.

It should not be assumed that the members of the TWGs agree with the conclusions of the RDIRA. A review of the responses that will be received and the authors thereof should be undertaken to demonstrate the degree to which to the members of the TWGs disagree with RDIRA conclusions.

Page 15 of the Handbook states that;

> *The IRA team, on the basis of its research, and using input from TWGs and consultants as necessary, prepares the draft IRA report…*

However, in this instance the TWGs were not used in preparing the RDIRA. The valuable expertise of these groups was used only in the process of pest categorisation. It is not clear why the IRAT dispensed with the services of the TWGs at such an early stage in the process and the RDIRA does not address the matter at all.

Page 16 of the Handbook states that"

> *The IRA team, on the basis of its research, and using input from TWGs and consultants as necessary, prepares a Final IRA report.*

It is to be hoped that BA and the IRAT will consider the value of the TWGs and seek their expertise and input when preparing the Final IRA. These scientists have a view of the issues and, if they are expert enough to be consulted for one section of the process, surely can be regarded as having sufficient expertise to have input for the complete document, especially the Final IRA.

The Australian apple and pear industry believes that it is necessary to include input from the TWGs in the RDIRA and the final IRA.

3.3 Scientific Review Paper

In July 2002, in accordance with its then Handbook, BA issued a "Scientific Review Paper". This paper commented on dealing with the issues raised in the submissions to the DIRA and made many general comments about the issues and the (then) RAP's view about dealing with them. This paper cannot in any way be described as a scientific review. The Handbook issued in 2003 discusses the issuing of a Technical Issues Paper. On page 14 the Handbook states that;

The IRA team commences work by:

- *… preparing a technical issues paper*

The technical issues paper:

- *Summarises background and administrative matters pertaining to the IRA*
- *Lists the pests and diseases that the IRA team has identified as being potentially associated with the importation of the goods*
- *Categorises the pests and diseases (in some cases in a preliminary manner) according to whether they need to be considered in the subsequent risk assessment.*

The technical issues paper may also include

- *An outline of additional tasks identified at that stage, e.g. for technical working groups and consultants*
- *A list of potential independent peer reviewers*

The document published in July 2002 did summarise background and administrative issues pertaining to the IRA but it did not cover any of the other points listed in the current Handbook. The document is also not a scientific review paper in that it does not review any science nor flag any research papers upon which the IRAT will base its work.

This step in the Handbook process has not been done and this is sufficient grounds, on its own, to insist that the process be recommenced.

3.4 Independent Reviewers

There are many references in the Handbook to the use of independent reviewers although the word "may" is usually included with any mention of such review. The RDIRA does not mention that any person outside BA or the IRAT has reviewed the document in any way. There is no comment as to whether there is any intention of submitting the document to independent peer reviewers and no comment as to how those reviewers will be selected.

The Australian apple and pear industry would like to see the document reviewed independently by scientists disinterested in the outcome.

For such a contentious IRA as this has proved to be, it would be expected that BA would be very keen to avail itself of the services of independent review as provided for in its own Handbook.

3.5 Consulting with the States the Handbook states that States and Territories have a special role to play in the IRA process and talks about the importance of the "partnership approach" between BA and the States.

The Handbook provides for BA to consult with the States at two stages of the IRA process. The first is at the time that the IRA work program is being devised. The second is prior to the final IRA being published.

It would seem to anyone who is outside this process that the partnership approach between BA and the states has well and truly broken down. Most states are, like the apple and pear industry, preparing submissions to the RDIRA and these submissions are, the apple and pear industry is given to understand, for the most part critical of the document.

If the partnership between BA and the states is so important, why is there so little agreement? Why is BA pushing forward with a RDIRA to which there are so many objections even with their state-based colleagues?

Clearly the consultations with the states are not meaningful and have little or no bearing on the content of the RDIRA. BA seems even to reject the advice of state-based scientists, employing their expertise in only the most limited capacity (see Section 3.2 above).

This consultation process is either not taking place or is taking place only as a "window dressing". If the Handbook calls for consultation then it needs not only to be done but also to be done with an approach that seeks meaningful input.

3.6 The Appeals Process

3.6.1 BA influence on the Final IRA

The process of producing a final IRA is totally in the hands of BA with reference to the IRAT. The final IRA must satisfy the Executive Manager of BA on a number of points. This means that, although the final IRA must comply with various stipulations around policy and international agreements, the final outcome will be strongly influenced by the philosophy surrounding the operations of BA and the philosophical approach of the executives who manage BA.

The Australian apple and pear industry has suspected for some time that the philosophy surrounding the operation of BA is that of free trade with executives at BA being proud of their role as "world leaders" in promoting Australia's role in the construction of the trade "level playing field". The difficulty is that the apple and pear industry does not want to have its low pest and disease status and its economy of operation sacrificed on that particular altar.

This is the reason that the processes for finalising an IRA and the appeals process outlined in the Handbook are so difficult to accept.

BA wrote the Handbook that sets the finalisation process and the appeals process into place and it is always a strong position for one protagonist to be able to write the rules by which all must "play the game".

3.6.2 The Appeals Panel

The IRAAP is made up of four people, one of who is directly linked to the IRA (CPPO) and one of who is indirectly linked as s/he is a staff member of DAFF. By any objective standard, DAFF staff on the appeals panel have a conflict of interest.

There is no indication that all, or indeed any, of the IRAAP members have a scientific background and so it can be a matter for conjecture whether or not all or any of the IRAAP members will grasp the full import of the scientific arguments made in any appeal.

The appeals panel must be made up of appropriately qualified and independent people who can be clearly seen to have no conflict of interest.

3.6.3 Grounds for Appeal

The Handbook allows only two grounds for appeal. They are;

- Significant deviation from the process set out in the Handbook
- That a significant body of science was not taken into account in the IRA

The Handbook does not allow for appeals on the basis of

- The scientific merit of the IRA
- The merits of the risk management recommendations of the IRA

It is quite clear that the Handbook (written by BA) will have a major influence on the outcome.

Why should the scientific merit of the IRA not be appealed? If the unidentified team members (see Section 3.1 above) providing input to the IRAT misinterpret a piece of research, rely too heavily on what may be dubious research (see Section 12.1), fail to take into account differences or weaknesses in research methodology or fall into any other common trap in research they should be made to account for themselves. At the moment, with no appeal allowed on their judgement, they are deemed to be the highest authority in Australia on matters pertaining to IRAs. This is, in itself, a matter open to debate.

Similar comments can be made about the inability to appeal the merits of risk management recommendations. The available science can be used in many ways and one of them is to support what may be dubious risk mitigation measures.

When there are several pieces of research in one area and many arrive at different or mixed conclusions or point to a possible different approach, why should the judgement of the unidentified BA team members be taken to be better than anyone else's judgement? Why should not the interpretation placed on this research be questioned?

Closing down the avenues of appeal denies stakeholders their natural right to be heard and makes unnamed people with unknown qualifications and unknown interests ultimate arbiters of the future of the industry.

The grounds for appeal against the final IRA must be revised.

4. Impacts of WTO Decision

4.1 Background

In May 2002 the USA requested the WTO Dispute Settlement Body (DSB) to establish a panel to arbitrate on the issue of protocols imposed by Japan on USA apples destined for Japan. The report of the panel was published on 15th July 2003. Subsequently Japan appealed the decision and that appeal was disallowed.

A reading of the WTO papers of the case and the appeal indicates quite clearly that the US won the case because a major piece of research relied upon by Japan was conducted on immature fruit. Also the IRA process undertaken by Japan was deemed to be insufficiently robust.

4.2 Significant Issues in the WTO Findings

There are parts of the WTO DSB decision, which are very significant and which BA have not taken sufficiently into account in the consideration of the request from New Zealand.

Firstly, the decision has left open the option of countries importing apples from fire blight host countries to include phytosanitary measures. One of the measures most likely to be acceptable is the insistence that fruit be sourced from orchards free of fire blight, which is one of the protocols proposed by BA.

Secondly there is the issue of handling errors and illegal conduct. The DSB made it clear in its decision that Japan could legitimately consider as a risk handling errors and illegal actions that may result in the shipment of immature or infected fruit.

The appellate body also made it clear that in conducting a risk assessment the importing country is entitled to assess the risks that will flow from the importation of not only the product proposed, but also of product which, as a practical matter, may also be imported – even as a result of illegal conduct. These decisions point to a major shortcoming in the RDIRA.

4.2.1 Illegal Conduct

During a series of meetings between Australian apple and pear growers and BA personnel, the issue of handling errors and illegal conduct leading to an increased risk of the transmission of fire blight was raised on several occasions. The response, especially to the illegal conduct question, was always that BA does not deal with issues of "bio-terrorism" and so those risks have not been taken into account. While it is important to acknowledge that the vast majority of New Zealanders involved in the apple growing industry are upright and honest citizens carrying out their legitimate business in the best possible manner, there is no doubt that if Australia has fire blight the trade in apples would be easier and there are always less honest people who would resort to illegal acts to bring about their aims. Illegal conduct may not result from such a direct desire to transport fire blight to Australia. Should the New Zealand growers find the protocols imposed by Australia are difficult to comply with, then considerations of cost may lead them to short circuit the system if they can. The extent of protocols combined with a belief that they are unnecessary, is also likely to result in illegal conduct.

The WTO decisions make it clear that Australia would be within its rights to impose risk mitigation measures in consideration of illegal conduct. **The RDIRA is not complete without this issue being thoroughly canvassed.**

4.2.2 Other Products

The decision of appellant body made it clear in its decision that Australia was also within its rights to consider product that, as a practical matter, may be imported with the product under consideration. In the case of apples this means trash and immature fruit.

As the initial proposal from New Zealand was to export to Australia mature symptomless apples free of trash, BA has not considered apple trash in either its consideration of pathways to importation, establishment and spread nor has it considered protocols to exclude trash from entering Australia.

Packing apples and excluding all trash is a practical impossibility. Trash is a far more dangerous vector for fire blight than apples (see Technical response). The WTO accepts that it is reasonable to consider trash in imports in any IRA.

The RDIRA is not a complete document without the issue of trash being thoroughly canvassed.

The issue of immature fruit is also important. The research upon which Japan relied was discounted by the WTO because the results were for immature fruit, however, the research was carried out over a long period covering all stages from fruitlet through to two week prior to harvest. This begs the question, when does immature fruit become mature fruit? Mature fruit is defined by the sugar and starch content of the fruit and the right balance is only obtained a few days before harvest – this is when fruit becomes mature. However, since immature fruit poses a far greater risk than mature fruit it is important that only mature fruit be included in any shipments from New Zealand. Inspection procedures to ensure that only mature fruit is exported need to be put into place.

The RDIRA is not complete without some discussion of the risk of immature fruit and when immature fruit becomes mature fruit.

4.2.3 Risks in Handling Errors

There are three main handling errors to consider. They are breaking the cool chain, including fruit from non-REBs at time of picking and including fruit from non-REBs at time of packing.

Breaking the cool chain in points from harvest to distribution in Australia may be considered as handling errors or even as certain events that occur as a result of the manner in which fruit is handled in Australia. The RDIRA does not take into account the high likelihood that the cool chain will be broken. The implication of this are greatest in the importation of insect pests where breaks in the cool chain allow insects to develop and/or escape and also in latent infections with European canker where cool chain breaks may allow rots to develop.

Another example of handling error can occur when fruit is picked. In the real world pickers do not always follow directions exactly. Their eagerness to pick as much fruit as possible (to earn more money) means they will often pick in rows or areas of the orchard other than those indicated by their supervisor. Where REBs and non-REBs are in close proximity, the risks of handling error must be increased. This is a common occurrence and causes growers everywhere great frustration.

A further example of potential handling error is the possibility that fruit from REBs and non-REBs may be mixed in the packing facility. In an environment where efficiency depends on a continuous supply of fruit being fed into the start of the packing line the possibility of error is very real. A forklift driver may easily pick up fruit from the wrong cool room or floor space or deposit fruit at the wrong packing line. A cool store supervisor may well open the wrong cool room or add an incorrect label to a room of fruit or a collection of fruit bins within a cool room.

The RDIRA is not a complete document without the issue of handling errors being factored into the risk analysis.

5. Trash

Considerable research has been done to show that trash is a vector for fire blight (see technical response), however the RDIRA spends virtually no time on a discussion of trash. The reason given for not including trash in the RDIRA was that the proposal from New Zealand specified that the apples would be "free of trash".

5.1 Trash Freedom in the Real World

No matter what the specification in the New Zealand proposal, apple growers from around the world know that keeping apple boxes entirely free of trash is not possible. This is probably not the subject of scientific research papers because it is a self-evident fact that growers do not deny.

Freedom from trash is even harder to maintain when apples are exported in bulk bins. The trash usually finds its way to the bottom of the bin where it is least likely to be seen and most difficult to remove.

Trash is also not to be taken as comprising whole leaves or large twigs with or without leaves attached. A small piece of apple leaf lodged in the stem end of an apple also constitutes trash.

5.2 The Inspection Regime

If Australian quarantine procedures are to give a 95% level of confidence that shipments of apples are trash free then the inspection procedures must be set up to look for trash. (For further discussion on inspection and confidence levels see Section 11 below and the Australian apple and pear industry's technical response.)

The proposed inspections of 600 pieces of fruit may be statistically sound (if carried out correctly) for the detection of pests that reside on apples and are visible, but trash does not usually adhere to a piece of fruit.

If we are to accept that New Zealand apples coming to Australia will possibly include trash in the apple container, then the RDIRA needs to include discussion on the formulation of a statistically sound way of inspecting to give the required degree of confidence that all shipments are indeed trash free.

5.3 Consequences

Finally, BA needs to make perfectly clear what will be the consequences of finding trash in a shipment of New Zealand apples. Since the proposal from New Zealand specifies that all shipments will be free of trash then BA cannot do anything less than insist that **shipments found to contain any trash should be rejected outright** and not be allowed entry into Australia.

5.4 Conclusions – Trash

The RDIRA cannot be deemed to be a complete document unless the issue of trash is dealt with in detail. The issues that need to be covered are:

- Why trash is an issue
- What constitutes trash
- An effective inspection regime for trash (as opposed to the inspection regime proposed in the RDIRA which is for apples). See Section 11 below.
- The consequences of including trash in any shipment

Not including this information makes the RDIRA an incomplete document.

6. What is not in the RDIRA

Any response to the RDIRA cannot be a complete response because the document is not a complete document. The essential item that is missing from the document is any comment on the way in which risk mitigation measures will be implemented and audited.

The Australian apple and pear industry understands that the final "work plan" for importing apples from New Zealand will be formulated at a later stage by AQIS in consultation with their New Zealand counterparts, however some detail is necessary in order for the RDIRA to be considered complete, for the industry to be able to respond and to form a basis for the AQIS position in the formulation of a work plan.

Examples of the lack of detail are:

- Part of risk mitigation is orchard inspections however there is no comment as to when, how often, by whom, in what manner or under what circumstances the inspections will take place (see Section 10 below).
- Part of the risk mitigation process for fire blight is that fruit should be dipped in a chlorine solution but no firm indication is given as to the concentration of chlorine nor is there any information about maintaining the chlorine concentration, checking the dips, changing the dips, or any other detail.
- The inspection regime for fruit is consistently required to be 600 pieces randomly selected per lot but no real description of the meaning of "random selection" is given (see Section 11 below).

Without this detail how can a response be made? Orchard inspections that are carried out in a rigorous manner may possibly be deemed acceptable by apple and pear growers if some detail regarding the issues raised above were to be given, but to approve orchard inspections as a risk mitigation measure without any further details will never be acceptable to Australian apple and pear growers. Further discussion of this point can be found in sections 10 and 11 below.

7. Industry Consultations

After the release of the RDIRA, the Australian apple and pear industry requested that BA should conduct a series of industry information sessions to inform the industry participants and other interested people of the content of the RDIRA, to answer questions about the RDIRA and to listen to stakeholder comments.

BA agreed to the suggestion and a series of nine meetings were conducted through May 2004 with one meeting held in early June.

During the course of the meetings and some subsequent media interviews, the involved members of BA made many comments that shocked and surprised apple and pear growers. Some of the more interesting examples are listed below together with an industry response to each point.

BA: In at least two meetings growers were told that the likelihood of fire blight being in the orchard is "certain" with a quantitative value of 1.

Response: In the RDIRA the likelihood for Imp 1- that the bacteria will be in the orchard – is "high" with a quantitative value of 0.85. Industry agrees with the qualitative descriptor "certain" see technical response for more detail and also see discussion of "certain" in section 9.5.

BA: The danger period for transferring bacteria from waste apple to fruit trees is the two to three week period of flowering.

Response: Apple trees may only be in flower for two to three weeks (with occasional secondary flowering) but there is a large range of host plants in Australia with total flowering time extending over more than half the year. Also, the bacteria can enter plants through wounds at any time of the year and does not need to be transferred only during flowering. Outbreaks in plants other than fruit trees are potentially more dangerous because the disease is unlikely to be recognised for what is at an early stage and so will be well established before any action to contain it is taken.

BA: Any fire blight symptom found in a REB will disqualify the block from the export program.

Response: This assertion is not backed with any detail as to how and when inspections will be made see discussion in Section 10.

BA: A policy will need to be adopted to ensure that all measures are carried out properly.

Response: Again, this assertion is not backed in the IRA with any framework of exactly what the measures are or how there will be assurance that the measures will be strictly adhered to.

BA: The RDIRA methodology and outcomes have not been influenced by trade issues.

Response: The RDIRA cannot help but be influenced by trade issues either subtly or overtly. Australian government is actively pursuing free trade and this culture must have penetrated into the public service. BA is situated within DAFF in the "Market Access and Biosecurity" section which includes trade advisors and overseas trade officials. Finally, the BA team included an officer from DFAT in the final meeting at Batlow. Although Australian apple and pear growers have no solid proof that trade concerns influence BA, the circumstantial evidence is strong.

BA: We are good at our job and we don't get it wrong. The RDIRA is as strong as it needs to be. The panel has reached consensus.

Response: BA and the panel are very sure that they have produced an excellent document and the panel is also the body that will consider the submissions from stakeholders. If BA and the panel are so sure of the "excellence" of their work how can they be the appropriate body to decide whether submissions are worthy of consideration?

8. Importing Apples – The Real World Scenario

8.1 Deciding the Importation Scenarios

As part of the processes in which BA produced the RDIRA, a meeting of stakeholders was conducted specifically to discuss the possible pathways of entry for New Zealand apples and the volumes of apples that might move along each of the pathways.

Although the information contained in the RDIRA is a partial reflection of that meeting, the fact is that the meeting only considered the New Zealand apple import scenario in its initial stages. The reality of trade could well be quite different from the pathways proposed.

8.2 Pathways in Mature Trade

As imports of New Zealand apples become an established fact in the Australian apple market scene, all major suppliers of apples will be forced to consider their position with regard to imported apples.

Demand for apple supplies from customers will mean that those packing facilities that supply product to major retailers will need to ensure that their inventory is sufficient to provide continuous supply, especially in competition from other suppliers. The demand for supply from major customers will increase as the major supermarkets implement more fully their stated policies of sourcing produce direct from suppliers rather than through wholesale markets.

Within a few years of imports commencing all major apple-packing facilities will be importing New Zealand apples either to maintain the volumes of their supplies or to fill gaps in the variety lines they can supply. These imports may well be in pre-packed 12.5kg cartons or, more likely, they will be in bulk fruit bins for packing in Australia. The bulk bin imports will allow packers to present a consistent line of fruit to their customers and will probably be the most economical way of importing the product.

8.3 Implications of Mature Trade

The first implication of this more mature trade scenario will be that greater volumes of fruit than envisaged in the RDIRA will be heading directly to regions where apple growing and packing is an economically important industry.

This means that the risk scenarios in the RDIRA will need to be adjusted especially in terms of the proportion of imported product that will be passing through major apple production areas.

The second implication is that far more fruit will be shipped to Australia in bulk apple bins than in prepacked cartons.

This means that the proposed inspection regime will need to be reconsidered. Bulk bins present a range of challenges when selecting pieces of fruit at random for inspection. Certainly it would not be thorough enough or statistically "random" to select only fruit from the top of the bins. Also, ensuring freedom from trash would be more difficult as trash is likely to be found at the bottom of bins rather than at the top.

8.4 Conclusion – Mature Trade

To be considered complete the RDIRA needs to revise its allocation of fruit on various importation pathways taking into account the likely pattern of mature trade and it will need to consider an appropriate inspection regime for fruit imported in bulk bins (see comments in Sections 5 and 11).

9. Calculating Risk

The Australian apple and pear industry considers that the method used by BA to calculate the overall risk of the entry of various pests and diseases from New Zealand is fatally flawed. By this it is meant that the process used by BA is so wrong that the only response can be to redo the risk assessments. The descriptions in this paper are described in "lay person's terms" and so the technical language may not be precise. The statisticians' technical response to the calculation of risks is in the Australian apple and pear industry's technical response paper.

9.1 A Single Apple

Since the modelling is based on the risks represented by a single apple, experts assessing risk are required to estimate very low levels of risk. This represents a problem of accuracy (see Section 9.2 below).

This method of estimating risk also ignores the fact that some risks are likely to involve clusters of fruit, which will represent a significantly higher risk. The risks associated with the import of a carton, pallet or bin of apples are easier to estimate and more realistically represent the actual circumstances of fruit importation.

Further, using a single apple as the basis of risk estimation will make some risk scenarios meaningless. An example is that a single apple may be the host of a single insect, but since it takes at least two insects for establishment to take place, assessing the risk of a single apple will always lead to a zero risk even though the risk of importing many apples may lead to the conclusion that the risk is high. Biological reality has been sacrificed for statistical convenience.

It is also interesting to note that other IRAs do consider the volume of product being imported and the risks associated with a specific volume of product for example a tonne rather than a single item. The recent IRA for bananas from the Philippines is an example.

9.2 Experts and Their Estimates

For the range of steps in the process of a new pest or disease becoming part of the Australian scene, experts are required to assign a likelihood based on a qualitative assessment. The six possibilities are High, Moderate, Low, Very Low, Extremely Low and Negligible. When the probability of an event occurring is on the higher part of the scale it is easier to be accurate in estimating likelihood than it is when the probability is very low – even for experts. This phenomenon has been documented recently by Aven in 2003 (see technical paper for full reference information).

9.2.1 Certainty in Estimating Likelihoods

To conduct the RDIRA BA has asked its experts to estimate the likelihood of various events. The estimates are given as qualitative terms, which BA then converts into quantitative terms using the table on page 48 of the RDIRA. The table represents a fundamental flaw in the risk estimation methodology.

9.2.2 Certainty in Higher Likelihoods

The table on page 48 of the RDIRA indicates probability intervals that are assigned to a particular likelihood. The top three descriptors are High, Moderate and Low and each of these have large probability intervals assigned to them. Each time a qualitative estimate is made of the likelihood of an event the mid point of the assigned probability of the qualitative descriptor is used in any calculation. This method has two effects. They are;

- No matter how certain an expert is in assigning a High likelihood the mid point is always used. So if an expert thinks the likelihood of an event is 92% to 98% certain the closest the model can come to accommodating this view is "High" which is always taken as the midpoint of its probability range which is .85 (85%).
- If there are three events in a row that are rated as "High" the effect of multiplying the mid-point of High (.85) to cover these events will result in a probability of 0.61 placing it in the Moderate likelihood category. If the probability of same three events had been more accurately estimated at 0.95 (95%) the outcome of the multiplication would be 0.86, which, in the table on page 48 is still "High".

This demonstrates that the model requires to have narrower probability intervals in the higher likelihoods for two reasons. They are;

- Experts are more likely to be accurate in estimating higher likelihood events and so require narrower bands within which their more accurate estimates can be accommodated.
- The broad probability bands used in the current model ensure that errors are made in estimating the higher likelihoods and that those errors are compounded apparently to decrease risk as the number of steps in any pathway increases.

9.2.3 Certainty in Lower Likelihoods

Despite evidence that accuracy of estimation decreases as the likelihood of an event becomes lower, the method used by BA requires judgements of likelihood to be made at very low probabilities and made with a high degree of certainty.

The bands in the lower levels require estimates of likelihood to be accurate enough to accommodate likelihoods as low as 1 in 2 million, which is the mid-point for the Negligible category.

9.2.4 Probability & Likelihood Table Conclusion

The Australian apple and pear industry notes the explanation given by BA that the interest in the calculations is in lower likelihoods which is why the probability intervals in the lower ranges are so narrow and numerous, but disputes its refusal to make the higher likelihood bands narrower to accommodate the increased certainty that must occur in higher probabilities and the artificial lowering of the final risk outcome through using the midpoint of .85 to represent the highest probability interval.

To give a true estimation of risk and accommodate the expertise of scientists, the number of qualitative descriptors in the higher range must be increased and the probability intervals narrowed.

9.3 Cumulative Risk

The RDIRA considers each pest or disease independently of all other pests and diseases and concludes that the risk of each can be made acceptable to Australia using certain risk mitigation protocols but this ignores the fact that the probability of an outbreak of a pest or disease is increased as the number of pests and diseases increases. The RDIRA does not take into account the increased risk due to the number of potential pests and diseases being considered. This means that the risks for a particular pest or disease have been calculated but the risks for any one of the pests or diseases have not.

9.4 Time Frame

The RDIRA calculates risks over a period of one year. This is used as a convenient cut-off point for calculation and assists in giving clarity to expressions of risk. In the real world it is helpful only if the trade were to take place for only one year, but of course this is not the case. The RDIRA makes it clear on p. 47 that the longer trade in a commodity continues the higher will be the likelihood that at least one pest will be introduced. The same paragraph also states that the volume of trade will affect risk, yet the RDIRA bases its risk analysis on a single apple and trade over one year only. **The RDIRA is not complete without some indication of the increasing nature of risk over time**.

9.5 "High" Versus "Certain"

The use of broad probability bands in the high levels of risk estimation can be seen to lower the estimation of risk even where the descriptor "high" is the used frequently (see discussion in 9.2.2 above).

When estimating likelihoods, most scientists would be reluctant to use the term "certain" and hence a likelihood value of 1 and the RDIRA authors have also been reluctant to use "certain" even when it is the most realistic qualitative descriptor to use.

An example of this reluctance can be found in the risk estimations for insects. Where the literature states that a species or group of species occurs throughout New Zealand, it is reasonable to conclude they are certain to occur in every New Zealand orchard, even if in very low numbers. This means that Imp 1 for all such insects should be "certain" with a probability value of 1 and not "high" or "low" or any other estimation (see Australian apple and pear industry technical response for further information).

Where a process is undertaken and an estimation is required as to whether the pest or disease will survive that process then the estimation must be based on available data and not a "best guess". Where there is an action that

is highly unlikely to decrease infection/infestation of fruit then the chances of the pest or disease surviving that step must be "certain" not "high". The estimation of "high" instead of "certain" is most notably used in Imp 6 for the insect pests. Another area where "certain" should be used is for Imps 1, 6 and 8 in the risk analysis for fire blight.

The lack of use of "certain" in the estimation of likelihoods in the RDIRA has a direct impact on the final risk calculations.

9.6 Double Counting of Risks

To calculate the risk of the pest to Australia involves calculating the probability of entry, establishment and spread and then combining the result with the estimate of consequences to provide an overall risk. For Australia the overall, restricted risk must be "very low" or less to comply with its ALOP.

9.6.1 Calculating the Probability of Entry.

The first stage in calculating the risk is calculating the likelihood that the pest will enter the Pest Risk Area (PRA). In the case of fire blight, European canker and a number of insect pests the PRA is Australia. It therefore would seem reasonable that the RDIRA should conclude at the point of entry.

The RDIRA describes calculating the risk of entry using a range of eight importation factors the probability of each being combined in pathways that involve five steps each of which is associated with a probability that is less than 1.

After calculating the risk of entry, the RDIRA then goes on to discuss the groups of plants that may host the pests and where they might be found and the probability that the imported fruit that is infected/infested is distributed to "utility points". Each of these steps involves calculating a probability and multiplying the probabilities together.

Clearly the more points upon which a probability is estimated and the more times numbers less than 1 are multiplied the lower the resulting probability will be. By including more and more points of probability, BA has artificially lowered the probability of entry.

9.6.2 Probability of Establishment

On page 67 of the RDIRA the first point discussed under the heading Partial Probability of Establishment is the availability of hosts. The same point has already been dissected in the risk of entry scenario. This is a case of considering the same factor more than once and so MUST include some element of double discounting of the overall risk.

9.6.3 Partial Probability of Spread

On page 68 of the RDIRA the third point listed under the heading Partial Probability of Spread is the potential for movement with commodities or conveyances. This factor in the risk has already been taken into account in the calculation of probability of entry where the probability of distribution is included and there is a complex discussion of "utility points". This is another instance of double discounting.

9.6.4 Expert Opinion on Over-Analysis

In the USDA response to the DIRA for bananas from the Philippines, Ron Sequeira (National Science Program Leader, Pathway and Risk Analysis) expresses his concern regarding the potential for double-counting in the model. He comments;

> *I note the way the pathway is constructed includes a level of detail in some of the components that suggests that some of the components are actually sub-components of a whole. The problem here is the way the model is articulated does affect the outcome… The more variables the better the model is a false impression… In a similar way the components we can add to the pathway the lower the risk.*

Sequera then goes on to explain that in a model requiring multiplication of numbers less than 1, the more components that are included the lower the final result will be. He then concludes this discussion by noting;

> *The use of a multiplicative model is an argument for a careful discussion of how each of the pathway components is independent. Otherwise the findings (final outcomes) will be biased towards "low".*

9.6.4 Elimination of Double Counting

To give a true evaluation of the risk, the RDIRA must be scrupulously examined for double counting the factors and so artificially lowering the final calculation of risk.

10. Inspections of Orchards

10.1 Inspection of Orchards as a Risk Mitigation Method

Risk mitigation measures for a range of the pests and diseases considered in the RDIRA involve inspecting orchards, however no detail is given in the RDIRA as to the timing, frequency or method of orchard inspections so no response can be made to the RDIRA on these points.

10.2 Seeing Pests and Disease Symptoms in Orchards

Inspection of orchards will only be a real risk mitigation measure where the pest is readily visible. An unsolicited paper provided to the Australian apple and pear industry by Associate Professor Michael Coote MB. BS, FRANZCO, an ophthalmologist, concludes that it is unlikely that the process of visual examination (of trees) is sufficient to detect all potentially visible fire blight or European canker lesions. He bases that conclusion on several significant points. They are;

- Seeing small lesions on stems presents a visual challenge
- Eye disease and refractive error is common especially with increasing age. Eyesight is adversely affected by uncorrected refractive error, cataract, changes due to aging and glaucoma all of which can exist at levels that do not prohibit driving but do compromise visual function
- Colour discrimination problems (undetected or ignored) will adversely impact the viewers ability to see lesions
- The quality of the abient light is a major factor in ability to see insect and disease symptoms.
- Around 30% of the biomass to be inspected will be invisible to the observer.

To ensure that visual inspections are effective, a person known to have visual abilities equal to the task must look at the trees directly, and in good light. All the stems of each tree must be systematically scanned using the central (foveal) vision.

Even if this is done, any inspection taking place when the trees are in full leaf will mean that leaves will obscure a significant percentage of the stems. Finally, in inspecting a mature tree, it is impossible to view all the stems from all angles from the floor of the orchard and even the use of ladder cannot guarantee that all stems will be viewed.

10.3 Procedures for Inspecting Orchards

Visual inspection of orchards that may have small-sized symptoms of disease or pest infestation needs to be conducted with great care. Each tree must be systematically scanned from all angles including above by a person who has the confirmed visual capacity to see the symptoms. Such inspections can take up to ten minutes for each tree.

The inspection processes would need to be carried out at least three times in a season – at blossom, at fruitlet stage and just prior to harvest. Further inspection would be needed should any adverse weather event such as severe rainstorm, hailstorm or unseasonable frost occur. All inspection processes, including eye checks for inspectors, would need to be documented and available for audit by AQIS officers and AQIS officers would need to carry out or, at least, supervise the pre-harvest inspections.

Even if this level of visual inspection is carried out there will still be a significant proportion of each tree that is not checked because it is not visible. This is important because if the grower has removed all **visible** symptoms from the orchard before the inspection takes place a visual inspection cannot provide assurance that the block is, indeed, disease or pest free.

10.4 Multi-Variety Blocks

If orchard inspections are to be carried out at specific times in relation to fruit development, then the presence of a number of apple varieties in a block must be taken into account.

Full bloom, fruitlet stage, immediately prior to harvest etcetera occur at different times for different varieties. The implication of this is that a single REB may need to be inspected over and over as each variety reaches the appropriate stage for inspection.

10.5 RDIRA Shortcomings

The above section (10) indicates quite clearly why the RDIRA cannot be regarded as a complete document ready for industry response without some specific discussion of the implementation of the risk mitigation measures that it proposes.

11. Inspections of Fruit

Another risk mitigation method suggested for use across a range of pests and diseases is inspection of fruit before entry into Australia. The standard procedure requires that 600 pieces of fruit be inspected per "lot" of fruit to provide a 95% confidence that not more than 0.5% of units in the consignment are infected/infested.

This level of confidence is really not good enough for quarantine inspection and is not the norm used by other countries. The USDA inspection regime, for example, use a sliding scale of inspection levels based on the size of the lot. Whereas Australian trading partners such as Japan and Korea have inspection regimes that involve 2% of the fruit being shipped and at least one carton per pallet.

Notwithstanding the above objection to the blanket use of 600 pieces of fruit, the following section deals with the inspection regime as mentioned in the RDIRA.

11.1 A Pest or Disease that Infests/Infects Individual Apples.

This section concerns itself with a pest or disease that infests/infects individual apples. An example of this may be an insect that is usually found in the calyx of apples and so requires that individual apples be inspected to try to detect the pest.

11.1.1 Inspection Regime

BA maintains that the inspection of 600 randomly selected pieces of fruit per "lot" is sufficient to provide 95% certainty that the fruit is substantially free of the pest for which the inspection is being carried out. Statistically this may be true (see objections above) but there are a number of considerations that need to be taken into account.

11.1.2 Random Selection

For the sake of this example, and simplicity, let us consider that a lot of fruit is equal to a 40-foot container consisting of 1100 cartons each of which contains 100 apples.

Selecting the fruit for inspection can be done in one of several ways. They are;

- Select 6 cartons of apples from near the door of the container, inspect them and pass judgement on the entire lot based on the results.
- Assign a number to each carton in the lot say 1 to 1100, then randomly select 6 numbers, inspect the cartons that correspond with those numbers and pass judgement on the entire lot based on the results.
- Assign a number to each individual apple within the lot say 1 to 120,000, then randomly select 600 numbers, inspect each piece of fruit that corresponds with those numbers and pass judgement on the entire lot based on the results.

The first option is the easiest and will be used by inspectors who are bored, blasé, inappropriately supervised or who just don't care. It is the least likely to find the pest for which the inspection is being carried out and the easiest to overcome once the dispatchers of the fruit learn what is going on.

The second option may be deemed to be effective. It is a random selection of cartons and 600 pieces of fruit will be inspected. However, pests that can be found by inspecting individual apples are likely to be clustered together. They have come from a part of the source orchard that is infested with the insects (a hot spot), they have been picked into the same bin, they have gone through the packing facility at the same time and have been packed into a small number of cartons that are likely to be on the same or neighbouring pallets or packed close together within the container. This means that opening only 6 cartons will not be likely to find the pest and the confidence level of 95% cannot be maintained.

Clearly, the only way to be sure that the 95% confidence level is maintained for a pest that infests individual apples is to use the third method of inspection described above.

11.2 Pests That Infest Cartons

Not all pests infest single pieces of fruit – some are much more likely to infest cartons of fruit. This is also true for trash which is much more likely to be an issue with cartons of fruit than for individual pieces of fruit. (Also see discussion of trash in Section 5 above.)

For carton-based pests an inspection regime that gives a 95% confidence that a lot is substantially free of these pests needs to be developed. This regime will involve opening and thoroughly inspecting a number of cartons rather than a number of pieces of fruit.

Clearly the number of cartons to be opened and inspected will need to be calculated using the appropriate statistical methods but for the sake of this example, let us assume that the appropriate number is, say, 6.

The method of selecting the six may be;

- Select the first six cartons that come to hand when the container is opened, inspect the cartons and pass judgement on the lost based on the results.
- Assign a number to each carton in the lot say 1 to 1100, then randomly select (say) 6 numbers, inspect the cartons that correspond with those numbers and pass judgement on the entire lot based on the results.

The first of these methods is absolutely unacceptable and will not provide the level of confidence required.

The second method is acceptable and can be combined with the method used for inspecting for pests that infest individual pieces of fruit. Since the method of inspecting individual fruit will already be in place and could require opening up to 600 cartons of fruit, it would be acceptable for inspectors to thoroughly inspect (say) 6 of the cartons more thoroughly for carton based pests, but the cartons need to be selected on a random basis.

11.3 Inspecting Bulk Bins

There is a strong belief that within a short time of imports commencing from New Zealand, apples will be generally imported in bulk bins rather than in pre-packed cartons (see Section 8 above). Inspecting apples in bulk bins poses a whole new set of problems.

The first issue is that the clustering of apples from pest or disease "hot spots" (see Section 11.1.2 above) will be far greater in bulk bins than in cartons meaning that the "randomness" of any inspection is absolutely critical to the maintenance of the 95% level of confidence.

The second issue is that trash is far more likely to be in bulk bins than it is to be in cartons and that trash will most likely be found in the bottom of the bin.

The third issue is that thoroughly inspecting apples shipped in bulk bins presents far greater logistical problems than apples shipped in cartons.

For the sake of simplicity and convenience, let us assume that a 40-foot container holds 40 by 400kg bins each of which holds 2000 apples and that a 40-foot container is designated as a "lot".

First, it is important to ensure that the 600 pieces of fruit per lot statistical formula is still appropriate to provide 95% confidence that the shipment is substantially free of the pests for which inspection is being carried out.

Second, it is required to select the 600 apples from the lot. For the same reasons as mentioned in 11.1 and 11.2 above, selecting 600 apples from the top of the bin nearest the door is not an appropriate inspection method.

In order to inspect bulk bins, some apples must be selected from every bin in the "lot" and those apples must be selected from various depths within the bins. Selecting apples only from the tops of bins will not provide the appropriate "randomness" required to maintain the confidence level.

Finally, the issue of trash and pests that infest bins rather than apples must also be addressed. When inspecting a "lot" of bulk bins it is imperative that the number of bins to be thoroughly inspected is decided using the appropriate statistical formulation but the number be at least one. The inspection process must include emptying at least one bin entirely so that the absence of trash and pests can be verified. This bin(s) may be among those from which a randomly selected apple of the 600 inspected is taken from the lower levels of the bin.

11.4 Absence of Visual Signs

However rigorous an inspection regime is imposed on any product, inspection can only be effective on pests that can be seen and diseases that express symptoms. Apples infested or infected with fire blight and apples that have latent European canker will **not** be detected in a visual inspection. For these diseases, visual inspection does not constitute risk mitigation.

11.5 Inspection Procedures

In order to maintain confidence that all inspections of fruit have been adequately conducted and that the risk mitigation inherent in properly conducted inspections is maximised, all inspections of apples should take place in New Zealand prior to shipment and all inspections should be carried out by AQIS inspectors or, at the very least, under the supervision of an AQIS inspector.

11.6 RDIRA Shortcomings

The above section (11) indicates quite clearly why the RDIRA cannot be regarded as a complete document ready for industry response without some specific discussion of the implementation of the risk mitigation measures that it proposes.

12. Fire Blight

12.1 New Science and Alternative Views

The Australian apple and pear industry's technical response to the RDIRA is a comprehensive document that canvasses all of the issues and looks at a range of references some 48 of which have **not** been used in the preparation of the RDIRA.

Of the references that have not been used by the RDIRA, many relate to the survival and behaviour of bacteria. It is the contention of the Australian apple and pear industry that the RDIRA has focussed too closely on the *Erwinia amylovora* bacteria when there is a wide range of information relating to plant bacteria behaviour that sheds some light on the unknowns of fire blight.

This is a major area of research that has been ignored by BA and needs to be investigated closely.

The RDIRA cannot be considered to be complete until the new research in the area of the behaviour of plant bacteria has been taken into account.

A list of the references not used by BA but used in the Australian apple and pear growers' technical response can be found at Appendix 1.

It is also worthwhile noting that the RDIRA refers to a 1992 paper by Hale and Clark that has not been published. Using this as a reference implies a questionable standard for using research. Why has the paper not been published after all it is more than 10 years old? Why would the RDIRA refer to an unpublished paper that is so old? Why is it that Australian stakeholders eager to respond to the RDIRA have not been able to obtain a copy of this paper from BA or HortReseach in New Zealand? The use of secret and unpublished research is not the standard of objectivity that should be expected from any IRA and it must be clear that it is inappropriate to base any policy decision on such a paper.

12.2 International Standard Phytosanitary Measures (ISPMs)

The Australian apple and pear industry feels that the RDIRA has overridden the provisions of the ISPM in two important areas. These are;

- The definition of the Pest Risk Analysis area
- The use of symptom freedom as analogous to disease freedom

12.2.1 Definition of Entry

The definition of "Entry" in the ISPMs (11,14 and 5) is

> *"Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled"*

In the case of fire blight and other pests and diseases entering Australia, the entire country can be regarded as the area where the pest is not present. So the steps in the RDIRA comprising "entry" should end with the entry of apples into the country after the on-arrival inspection. The inclusion of steps in the distribution (p.97 of the RDIRA) of the imported apples should not be included as a component of "entry". The RDIRA includes a host of steps regarding the distribution of the infected/infested apples and the transfer of the pathogen to a susceptible host as part of assessing the risk of entry. The RDIRA also extends the meaning of "entry" to include entry into an "endangered area" (RDIRA p. 45) for example the Goulburn Valley in Victoria. This extends the meaning of "entry" well beyond the definition of the ISPMs and serves to artificially reduce the risk of entry as a component in the "entry, establishment and spread" scenarios.

12.2.2 Pest Free Places of Production

Page 469 of the RDIRA, under the heading "Areas free from disease symptoms" states:

> *Areas free from disease symptoms as distinct from pest free areas could be established and maintained following the guidelines described in ISPM 4 and 10. An area free from disease symptoms could be a place of production (an orchard managed as a single unit) or a production site (a designated block within a an orchard) for which freedom from fire blight symptoms is established, maintained and verified by MAFNZ.*

A reading of ISPM 10 indicates that nowhere in the document is there any mention of freedom from symptoms equating to freedom from disease. The 2000 DIRA states on p.76

> *While fire blight occurs throughout New Zealand, outbreaks are more common in … the North Island.*

indicating that disease freedom is unlikely to be established in any area, place or site of apple production in that country. Considering the state of freedom of symptoms to be equivalent to freedom from the disease is pushing the boundaries for fire blight. There is no place where the disease has been established that can be regarded as being free of the disease. Orchards and apple growing districts where the disease appears to have been under control for even significant periods of time can still experience severe outbreaks indicating that, despite symptom freedom and apparent control, the disease is still present in the orchard.

Under heading 2.1 ISPM 10 states that;

> *The possibility of ensuring that a place of production or a production site is pest free depends on:*
>
> *- characteristics of the pest*
>
> *- characteristics of the place of production and production site*
>
> *- operational capabilities of the producer*
>
> *- requirements and responsibilities of the NPPO.*

And under heading "2.1.1 Characteristics of the pest" ISPM 10 states

> *A place of production or a production site can be declared free from a given pest to an adequate degree of security if the characteristics of the pest are suitable for this. Suitable characteristics may include the following:*
>
> *- the natural spread of the pest (or its vectors, if appropriate) is slow and over short distances*
>
> *- the possibilities for artificial spread of the pest are limited*
>
> *- the pest has a limited host range*
>
> *- the pest has a relatively low probability of survival from previous seasons*
>
> *- the pest has a moderate or low rate of reproduction*
>
> *- sufficiently sensitive methods for detection of the pest are available, either by visual inspection or by tests applied in the field or in the laboratory, at the appropriate season*
>
> *- as far as possible, factors in the biology of the pest (e.g. latency) and in the management of the place of production do not interfere with detection.*
>
> *The availability of effective and practical measures for control and management of the pest is also an advantage in establishing and maintaining a pest free place of production or pest free production site.*

So, even though there should not be so, if there is an acceptance that symptom freedom and disease freedom are equivalent, the seven characteristics that make a disease suitable for this equivalence then need to be taken into account. Below each in turn is addressed. More information on these can be obtained from the Australian apple and pear industry's scientific response.

- The natural spread of fire blight is rapid and can be over large areas including entire growing regions and even entire countries for example New Zealand.

- The possibilities of artificial spread of fire blight are several including insects, wind and rain splash with general acceptance that birds can also be an agent of spread.
- Fire blight has a wide host range.
- Fire blight can survive in orchards for many seasons.
- Fire blight reproduces very rapidly.
- Laboratory tests are sufficiently sensitive to detect fire blight and, in moderate to major outbreaks, visual detection is possible, however visual detection is not sufficiently sensitive to detect the presence of the bacteria if it is controlled sufficiently so that only minor symptoms or no symptoms are expressed. Bacteria may well be present but not causing disease symptoms at the time of inspection. This is not an unusual situation for bacteria in either the plant or animal environment.
- General management for fire blight involves the routine removal of symptoms from the orchard.

In places where fire blight is endemic rigorous control is not always enough to prevent outbreaks. This recent entry from a US on-line bulletin board is of interest.

> *We haven't had the type of dieback you are all talking about here in the Southeast to my knowledge but man, we've got fire blight. The strep sprays didn't make much of a dint on my trees. Hardest hit, Scarlett O'Hara. Others hit hard: Pink Lady, Gala, Mutsu/M27, of course, Goldens....those safest.... Liberty, Priscilla, W. Pride, Goldrush, Enterprise...as expected...*
> *A year like this really let's you see the importance of breeding for Fire Blight resistance.*
> *BTW, everything looked fine well into bloom but we had 2 very late frosts that I think contributed to the injury.*
> *John Cummins*
> *Get your trees from Cummins*

The above shows very clearly that fire blight infested places or sites are not suitable for the application of the assumption that symptom freedom equates to freedom from *Erwinia amylovora* bacteria.

THIS MEANS THAT, ACCORDING TO ISPM 10, ORCHARDS FREE OF FIRE BLIGHT SYMPTOMS CANNOT BE CONSIDERED TO BE PEST FREE PLACES OF PRODUCTION NOR CAN SYMPTOM FREE ORCHARD BLOCKS BE REGARDED AS PEST FREE SITES OF PRODUCTION.

12.3 What Is Not known

Fire blight has been known for about 200 years and yet there is still no cure and still no reliable means of control. It is the only plant disease that has its own specific international workshop – an event held every two years or so. This conference attracts scientists from around the world, especially from countries where fire blight in endemic. What does this tell us? It is a clear message that this disease has defied the most persistent and concentrated efforts to discover its secrets and that, even after 200 years of trying, the best experts as yet do not have the answers.

Some interesting quotes about fire blight:

"Fire blight is one of the most erratic and unpredictable diseases of pear and apple. Our perplexity is due mainly to our lack of fundamental knowledge of the bacterium and its mode of infection, especially just before and during bloom" (van der Zwet, Zoller and Thomson, 1988).*

"Great progress has been made in the knowledge of the epidemiology of fire blight in the last 30 years but, despite the advances, fire blight still causes major losses of fruit and trees and creates economic losses amounting to millions of dollars" (Thomson, 2000).*

"Fire blight continues to be one of the most intensively studied bacterial diseases of plants. …. In spite of this effort, the disease is still not satisfactorily controlled; it continues to spread throughout continental Europe and remains a major concern in most countries where pome fruits are grown" (Schroth et al, 1974). " Twenty four-years later, this summation of the status of fire blight is unchanged" (Johnson and Stockwell, 1998*).*

These quotes express the frustration that is repeated over and over by the scientists who attend the international workshops.

It seems that the perplexity is due mainly to the lack of fundamental knowledge of the bacterium and its mode of infection (van der Zwet, Zoller and Thomson, 1988*). Despite this, the RDIRA assesses the risk of infection to be "negligible" then feeds that assessment into the pathways to bring the risk of the disease becoming established in Australia down to an acceptable level. The theory is correct but the actuality is unknown. It is worth remembering that bacteria are among the most successful organisms on earth. To survive - as survive they do – they must find some means to transfer to a host. Although this is, no doubt, difficult it cannot be impossible. The survival of the organism is a fundamental biological norm. In the RDIRA, BA does not accept this natural principle of survival.

(Full details of these references can be found in the Australian apple and pear industry technical response to the RDIRA)

Finally, a note of rationality from a New Zealand apple grower:

Hi,

I do hope this is the correct email address for Darral Ashton, chairman of APAL; if not, my apologies. News of the fire blight problem has finally reached the media in New Zealand, and I'd just like to express my support for the Australian A&P growers - although I'm sure being able to export the fruit to you would be financially beneficial to NZ, the potential of also exporting the aforementioned disease does not sit well with me.

I know a number of beekeepers who have had to deal with the Verona Bee Mite over the last few years, so I have a measure of understanding about how catastrophic imported diseases can be. The phrase "Do unto your neighbours as you would have them do unto you" springs to mind.

I don't have a lot of spare time, but if there's any pressure I can apply from this side, such as writing to my MP or the NZ Ministry of Agriculture & Fisheries, please let me know. Good luck. Regards, Nic.

(Note: Nic's full name and contact details have been withheld but are available from APAL on a confidential basis.)

12.4 Research That Is Needed

The deliberations of apple and pear growers lead to the conclusion that further research is needed before informed decisions can be made on the real risks of fire blight. Suggestions for further research are;

- A better determination of how many bacteria are required to initiate an infection. The current number is between one and ten thousand according to different pieces of research;
- The real level of inoculum that may be found on apples sourced from orchards with various levels of fire blight activity;
- The ability of bacteria to transfer from mature apples to other apples and other surfaces;
- Further work on the new findings that fire blight may be present on apples in a viable but non-culturable form;
- Further work on the implications of biofilms formed by bacteria on plant material;
- Further work on the sigma factor; and so on.

12.5 Real World Experience

Whatever the theories in the world of science may be, growers have a wide experience of pests and diseases and how they behave in the orchard.

Growers know, even though the authors of the RDIRA seem not to, that an outbreak near a healthy orchard or block will add significant pest or disease pressure to that healthy orchard or block. This is the difficulty that neglected and abandoned orchards cause in a fruit-growing region. The proposal that a healthy-looking block of apple trees located right next to a clearly diseased block can constitute a registered export block (REB) is, in the experience of all fruit growers, just ludicrous. The BA team seem to think that this is a highly unlikely occurrence, but the difference in susceptibility between apples of different varieties makes it a feasible situation (see e-mail message from John Cummins in 12.2.2 above). The suggestion that the symptom free block will have low levels of bacteria is, to the experienced fruit grower, a ridiculous suggestion.

In the same vein, it is the universal experience of fruit growers that the chances of an outbreak of a pest or disease in an orchard or block where that pest or disease was a problem the previous season are much greater than in cases where the orchard or block was free of the pest or disease the previous season.

These experiences should be taken into account in the protocols put forward by BA. Some distance between REBs and other fire blight host plants needs to be maintained. Some account of disease history in the REB needs to be taken into account. The RDIRA claims that the science does not lead to that conclusion but the practical experience of orchardists all around the world would certainly do so.

12.6 Removal of Symptoms

One of the points made in the RDIRA is that the presence of fire blight bacteria on fruit is dependent upon the fruit being located close to active cankers. The point being that if the fruit comes from symptom free REBs then the apple fruit is unlikely to be carrying any bacteria. The RDIRA also states that orchardists in New Zealand, as part of their regular cultural practices, will remove symptoms from REBs and this is acceptable. However, there is no discussion of the possibility that apples in an REB may have developed in close proximity to an active canker that has been removed prior to orchard inspection.

12.7 Double Discounting Chlorine

In the technical response, the industry argues that the chlorine dip proposal in the RDIRA would be ineffective in reducing bacteria of apples. Notwithstanding that discussion, here we suggest that the RDIRA involves a degree of "double counting" of the effect of chlorine.

On page 23 of the RDIRA describes the current practice in New Zealand packing establishments and indicates that those packing for export are likely to be using chlorine in either the further washing of fruit or in spray rinse applications. On page 92 of the RDIRA the discussion of unrestricted risk includes comments on the effectiveness of chlorine.

When restricted risk is discussed on pages 470 and 471 it is from the point of view that chlorine dipping is a new activity. If the effect of chlorine has been taken into account as part of the unrestricted risk, then the risk control effect of chlorine must be discounted and the assertion that the use of chlorine on all rather than some fruit will ensure that nearly two-thirds of contaminated fruit will be de-contaminated by chlorine must be regarded as overestimating the effect of additional chlorine dips.

12.8 "Duelling With Scientists"

The range of scientists quoted in the RDIRA and the Australian apple and pear industries are fundamentally different lists. The industry's response includes new information from scientists that are principally interested in bacteria in general rather fire blight specifically, but when one considers the fire blight specific papers the two documents appear to be a case of each set of authors finding research papers to support their case. The "unknowns" surrounding the disease mean that finding research papers to support the two views of the disease is not difficult.

Using quotations from research papers to support an argument, especially in this case, would seem to be an endless occupation that can, and has, led to this back and forth of quotes that could well be characterised as "duelling with scientists".

One of the issues with the back and forth research paper quoting is that each team can claim some difficulty with the papers quoted by the other. It may be that one set of results was actually obtained from immature fruit, which was the case in the Japan/USA WTO case. Or perhaps the results were obtained after a hailstorm or as a result of less than up-to-date inoculation processes.

Solving these "bones of contention" is beyond the scope of this paper, however, it seems more than clear that the current processes being undertaken in Australia and internationally are far from ideal. (see also Section 15)

12.9 History of Fire Blight Spread

It is claimed by BA that long term trade in apples from fire blight countries to non-fire blight countries has not spread the disease, but fire blight has spread widely and, in some cases the initial source of infection is unknown.

Some examples are;

- In France it is believed that the disease was first introduced to orchards via roadside hawthorn hedges. The question then becomes, how did the hawthorn hedges become infected? Although it has not been proved, infection from discarded fruit must be a possibility.
- In Switzerland the outbreak source is unknown but is widely believed to have been spread to that country by birds.
- In the UK the most likely source for the initial outbreak is believed to have been packaging material.

Fire blight has spread across Europe and in some cases the source has been unknown – it may or may not be apples that have spread the disease.

12.9.1 The Outbreak in Australia

In 1997 fire blight bacteria was detected in the Royal Botanic Gardens in Melbourne. After a massive operation to eradicate the disease and national surveys of all apple and pear growing regions, Australia was declared to be free of the disease. The question remains, how did fire blight get to be in the gardens in the first place?

Australia was previously free of the disease and is now free of the disease. Despite the fact that many felt the circumstances surrounding the discovery of the outbreak were suspicious, no formal claim of "bio-terrorism" was ever made.

If the outbreak was not caused by deliberate action, what did cause it? No firm evidence is available but the circumstantial evidence is quite strong. The outbreak occurred in an area frequented by tourists but is hardly the place where illegally imported plant cuttings would be taken. It is very easy to imagine that a tourist, either through ignorance of the law or unintentional oversight, managed to bring one or more apples into Australia and then ate one of them during a visit to the gardens. The core was then discarded and the bacteria remaining in the fruit was transferred to a susceptible host.

The team at BA would tell us that this is a highly unlikely scenario but, in the face of no real proof as to where the bacteria came from, it is as likely an explanation as any other.

What does this tell us?

- With border controls as they are, it must be assumed that the number of apples coming into the country with tourists must be very low but even this very low level may have been the cause of at least one outbreak of fire blight in Australia.
- If such a low level of risk can cause an outbreak, the environment in Australia (climate and available hosts) must be particularly susceptible.
- If imports of apples are to be accepted from a country where fire blight is endemic, then risks must be managed very carefully.

12.10 The Case for Disease Parity

One of the regular arguments to arise in discussion of quarantine to prevent the spread of fire blight is that many countries with fire blight still have a thriving and competitive apple industry and if that is the case for them why should it not also be the case for Australia?

The issues that impact on this argument for Australian growers are;

- The industry in Australia has grown up in a fire blight free environment and so it has established and spread in areas where the weather patterns mean that fire blight would be a major problem should it become established.
- The industry in Australia has pinned its economic future to growing varieties of apple that are susceptible to fire blight – Pink Lady being the newest example.

- The cost structures, especially labour costs, in Australia are such that the extra costs of controlling fire blight would make apple growing a marginal (at best) to unviable industry in Australia for even the most efficient growers. Other fire blight affected countries all have access to low-cost labour.
- Even should the apple industry survive, the pear industry in Australia is established in an area where the weather conditions for fire blight are ideal. The combination of the extreme susceptibility of pears and the location of the pear orchards would mean that fire blight would virtually wipe out the Australian pear industry. The economics of establishing a pear orchard are such that, if fire blight did make pear growing the Goulburn Valley unviable, the industry would be most unlikely to establish elsewhere. Growing pears is a major underpinning of the economy of the Goulburn Valley.

All of this is reflected in the consequences assessment for fire blight entering Australia but the analysts who write these documents are not the people who stand to lose their jobs, businesses, homes and livelihoods as a result of an outbreak of this terrible disease.

13. Insects

The risk assessments for insects in the RDIRA include some fundamental flaws, which indicate that the assessments need to be completely redone with the inclusion of realistic scenarios.

13.1 What is the Risk?

In the rarefied world of theoretic risk analysis a high risk involves a 70% to 100% certainly that an insect will be present on a piece of fruit. When an apple grower is inspecting his/her orchard and finds insect pest populations, an infestation rate of 20% would be considered to be very high and an infestation rate of 70% to 100% would be a disaster. Yet the practical application of what would be considered a high infestation rate in any part of the world is disallowed by application of the risk analysis theories.

This is another example of "ivory tower" theorists imposing unrealistic processes on a real world scenario.

13.2 IFP and Pest Populations

13.2.1 IFP IN New Zealand

The IRA and the New Zealand apple industry place a great emphasis on the widespread adoption of Integrated Fruit Production (IFP) in New Zealand apple orchards and that only those growers implementing IFP would be registered to export to Australia.

Integrated Fruit Production aims to produce fruit in the most environmentally friendly manner and includes as a centrepiece Integrated Pest Management (IPM) principles for control of pests, diseases and weeds.

IFP has several important implications for quarantine. Compared with the traditional use of broad spectrum pesticides, orchards in which IFP is practised are likely to have higher and more variable population levels of key pests and include a higher diversity of pests.

13.2.2 Higher Key Pest Populations

There are several reasons why higher pest populations would occur in IFP orchards:

- For biological control to be effective, there must always be a host population to support the specific predator or parasite population.
- The economic threshold philosophy virtually ensures there are low (sub-threshold) populations of the pest in the orchard.
- Systems based on mating disruption are less effective for reducing pest population levels than broad spectrum sprays and usually result in higher levels of pest damage to apple crops.
- Similarly, specific chemicals such as insect growth regulators may be less effective than broad spectrum chemicals.

13.2.3 Higher Diversity of Pests

The use of pest control strategies targeted specifically to particular key pests, often leads to the emergence of new pests that were formerly suppressed, often unknowingly, by broad-spectrum chemicals. These insects were usually recognised only as occasional or minor pests when broad-spectrum sprays were in wide use. When these pests are released from broad-spectrum control and become significant under IFP programmes, new control strategies need to be developed specifically for them. Such strategies must be compatible with the IFP strategies for all other pests. The result is that IFP becomes increasingly complex and fragile, often with a range of measures that result in suboptimal control of one or more of the pests because of the constraints on the system. Such systems require intensive maintenance and are prone to collapse if one of the key control measures fails due to a perturbation such as the development of resistance to a key chemical in one of the main pests. Often, there are few, if any, alternatives available.

13.3 Host Range For Insects

Many of the insects covered in the RDIRA are capable of utilising many host plants, which is why these New Zealand natives are able to utilise apples as a host. This characteristic means that they are highly likely to find a suitable host plant when transferred to a new environment, such as Australia.

Many common garden plants and broad-leaf weeds are capable of hosting these pests and so allowing establishment to occur. The RDIRA does not seem to consider the ubiquitous nature of broad leaf weeds in Australia and the increased likelihood of establishment that they afford. The RDIRA considers garden plants and native species but does not properly consider weeds.

This situation requires that some of the likelihood ratings for the establishment of insects need to be re-appraised.

A further issue here is the impact of the insects in question on native Australian species. Most of the insects under consideration are native New Zealand species that have become a problem in apples because they are able to utilise many plants as hosts. The RDIRA includes no data on the possible impact that these insects may have on Australian native plants. BA has an obligation to gather such data and the RDIRA cannot be considered complete without it.

13.4 Why Only Waste?

On page 65 of the RDIRA it is made clear that the analysis in the document is based on the assumption that exposure to a host will occur almost entirely through the disposal of infected/infested apple waste. Some insect pests may emerge and disperse from fruit that has not yet reached the waste stage. As noted in 4.3.3 above, the cool chain may be discontinuous, which will allow insects to develop and emerge from fruit and this can happen during transport, in the retail outlet, in the home fruit bowl or at any other point.

Despite this possibility the RDIRA considers only what happens to apple waste and this is another reason to re-work the risk analysis for pests.

13.5 Regional Variation

There are some insect pests that occur only in certain regions of New Zealand or occur in far greater density in some regions of New Zealand than in others. In these cases the RDIRA still considers the likelihood of the pest being present in export fruit in terms of the exports from New Zealand as whole.

An example of this is Oyster Shell Scale (OSS). This pest does not occur north of Canterbury, which means that in shipments from the northern areas there will be no OSS present. However in shipments from places where OSS is a problem the presence of OSS could be quite high. Despite these differences, the RDIRA has insisted on always maintaining the statistical model of the likelihood of a single apple being infested with OSS. The result is a risk assessment that is too high for apples sourced north of Canterbury and far too low for apples from further south.

To be a good model of risk, the RDIRA must take regional differences into account.

13.6 Movement of Insects

Whatever the risks of insects moving from contaminated fruit to clean fruit may be deemed to be in the RDIRA, it is important to remember that insects have wings and/or legs or other means of propulsion – they move around! All cool store operators and fruit growers have observed this phenomenon. In order to prevent the movement of insects either all fruit must be fumigated so all insects are killed or the fruit that is known to be clean must be kept in such a way as to ensure that insects do not move in. This involves covering all carton openings with fine, insect-proof gauze.

These processes must be considered in the RDIRA before it can be considered a complete document.

13.7 The Real World

The amount of effort that BA has gone to in order to decide on the probability of insect pests entering Australia on New Zealand fruit is extraordinary when the real chances can be obtained from existing data.

New Zealand exports fruit to a number of countries, some of which also consider the New Zealand native insects to be quarantine pests. An excellent example of this is apple leaf curling midge (ALCM) infestations of apples from New Zealand arriving in the USA.

The available data shows that some sixty percent (60%) of inspections of New Zealand export apples for the US market have revealed the presence of ALCM. This level of infestation prompted the immediate implementation of a Special Procedure for ALCM by the United States Department of Agriculture in 2002

It is more than likely that this kind of data is available from several sources and should have been a major input into the RDIRA.

The RDIRA cannot be considered a complete document until the data regarding insect infestations of New Zealand export fruit are included in the risk assessments.

14. Fungi

European canker (Ec) is one of the most economically damaging diseases of apple and yet there is a pronounced lack of precise information about European canker in New Zealand.

14.1 An Insidious Problem

European canker shares many characteristics with fire blight and the attitude towards keeping it out of Australia should be the same. Consider the following:

- Except for one outbreak in Tasmania, it has never been successfully eradicated anywhere in the world.
- Cankers on trees can be very small and difficult to see with visual inspections.
- Symptoms of the disease can be removed from orchards and rotting apples can be removed from the rest during grading making inspections an ineffective form of risk mitigation.
- Apples with latent infection cannot be identified by any kind of inspection.

14.2 Spread of European Canker

At any time on its journey from the arrival inspection in Australia to purchase and storing by a consumer, the Ec infected apple may begin to break down and rot. This process is most likely to commence when the cool chain is broken, which it may be at a number of stages (see 4.2.3 above). Once the rot is discovered, the apple will be disposed of and will continue to rot in whatever location it has been placed. At the critical stage in the process the fungus will develop spores (millions of them) that will be dispersed by the slightest breeze.

14.3 Carriers of European Canker

Of major concern is that woolly aphids are carriers of European canker but are not quarantine pests. The RDIRA dismisses the possibility that woolly aphids already in Australia would pick up European canker conidia from rotting fruit but does not canvass the possibility of introducing European canker to Australia via woolly aphid arriving on New Zealand apples. The most recent research cited in the RDIRA on this issue is 1965.

The RDIRA cannot be considered complete until this risk pathway has been fully assessed.

15. Solving the Dilemma of IRAs

15.1 The Problem

The recently released batch of IRAs has been very controversial and raised a number of contentious issues despite the fact that BA has spent huge efforts and resources to do a thorough job.

Each contentious IRA gives rise to a huge effort on the part of each involved industry to analyse and respond to the document. Each industry seeks to involve the power of public opinion and exert political pressure to add weight to their case.

This gives rise to an unseemly battle on the public stage with professional and personal comments being made about all the parties involved.

What must the Australian quarantine scene look like to viewers from outside our borders? In must look like an all-in brawl! Each party is determined to hold its ground and demonstrate the rightness of its own case and the wrongness of the other case; the producers going so far as to mount legal challenges against the final outcomes. There must be an answer that does not lead to an environment of confrontation.

15.2 The Current Situation

The current situation, as seen by producers is;

- BA makes the rules and publishes them as the Handbook. When the rules prove to be inconvenient for BA, they change them by revising and re-releasing the Handbook.
- BA controls the process of researching and writing the IRA with the use of a team, the majority of which are BA staff and the appointment of which is controlled by BA.
- BA puts enormous amounts of effort and resource into producing IRAs. The result of making such an investment is that BA has a document that they think is "excellent" and "world class" and "highly transparent" and so on. It also means that their professional reputation is tied up in the quality of the document they have produced. No matter what BA may say to the contrary, the attitude they adopt to the IRA is that of defending their own document.
- The IRA is produced in secrecy. Industry had little input and what it did have was strictly controlled by BA. An industry person appointed by BA to the team is bound not to discuss the deliberations of the team. BA provides the support for the team, the team chair is a staff member of BA, and the majority of the team is BA staff members. All members of the team do not necessarily approve the resulting document as they are not requested or required to "sign off" on the final document.
- The document is released to industry with no prior warning. BA gives no date for completion of the work at any time in the process. The document is released with no prior notification and the clock starts to tick on the allowed response time from the day of the previously unannounced release.
- The outcome of BA's work will be a long and complex document that is the result of input by a whole team of people over a long period – in the case of the NZ apple IRA more than two years. The only responses that will have real influence on the process will be thorough scientific responses and yet the responders are allowed only 60 days according to the rules devised by BA. This is clearly a cynical exercise. Mobilising and finding resources for a team of scientists to respond to the document and ensure that a response is completed in the time allowed is virtually an impossible task. So why is the time so short? It may be that BA is so convinced that it must be right that it sees no real need for in-depth responses. It may be that BA feels the need to ensure that, once the DIRA is released the process is hurried along. Whatever the reason, the stakeholders that feel a need to respond to the DIRA feel that they are being treated with contempt by the rules imposed by BA.
- The fact that the entire process is fully controlled by a government department and is conducted in complete secrecy leads stakeholders to suspect that other government agendas (for example the trade agenda) are exerting a strong influence on the outcome.

- Responding to IRAs imposes an enormous cost and resource burden on industries.

If the aim of an IRA is to represent a balanced view of the risks and open the issues of increased trade to a transparent and scientific process, this is the worst possible process by which to achieve those aims.

15.3 A Proposal

If the process is so wrong, how can it be made right? The following is a proposal that may lead to some major improvements.

Requests for trade access should be referred to an independent panel of experts across an appropriate range of expertise. The panel then engages its own team to assist it in completing the IRA document. Neither the panel nor the team would include DAFF personnel or stakeholders in the process.

The precise method of working has not been considered but it would seem reasonable that the panel should accept submissions from any stakeholders that wish to put forward information or a point of view. In this context the term "stakeholders" includes Australian government departments and representatives of the country seeking to send product.

Clearly this proposal needs some considerable working through, but such a system would go a long way to removing the suspicions of stakeholders that surround the current process.

The terms of reference of an independent panel could include;

- Allowing a forum for the science at issue to be debated
- Making qualitative and quantitative judgements
- The ability to commission new research
- A demonstrated absence of conflict of interest with any stakeholders including BA and DAFF.

There must be a better way and the Government of Australia needs to be spending some time and effort to find it.

16. Conclusion

This paper has pointed out some major shortcomings of the RDIRA. The paper raises a number of issues that must be addressed by BA and that should have been addressed in this RDIRA. The RDIRA cannot be considered complete with out a range of inclusions and reconsideration of a number of points. All these have been outlined in the document.

APPENDIX 1

References Used by Australian Apple and Pear Growers' Technical Response to the RDIRA But Not Used By BA

Balachinsky, D. and Shtienberg, D. (2003) The role of autumn infections in the progression of fire blight symptoms. *Plant disease* 87: 1077-1082.

Barlass, M., Tomkins, B. and Hickey, M. (1998) Fresh Safe Food Safety Guidelines for the Australian Fresh Cut Produce Industry. *Cooperative Research Centre for International Food Manufacture and Packaging Science* , Melbourne .

Beltrametti, F., Kresse, A. U. and Guzman, C. A. (1999) Transcriptional regulation of the *esp* genes of enterohemorrhagic *Escherischia coli J. Bacteriology* 181: 3409-3418.

Beuchat, L. R. (1996) Surface disinfection of raw produce *Dairy, Food and Environmental Sanitation* 12 (1) 6-9.

Beuchat, L. R. (2001) Infiltration of microorganisms into fresh produce. FRESH The future of food safety and processing technologies for value-added horticultural products. Werribee 2001.

Bogdanove, A. J., Kim, F. J., Wei, Z., Kolchinsky, P., Charkowski, A. O., Conlin A. K., Collmer, C. A., Beer S. V. (1998) Homology and functional similarity of an *hrp*-linked pathogenicity locus, *dspEF*, of *Erwinia amylovora* and the avirulence locus *avrE* of *Pseudomonas syringae* pathovar tomato. *Proceeding of the National Academy of Sciences of the United States of America.* Vol 95 (3) 1325-1330.

Bogs, J.; Richter, K.; Kim, W.-S.; Josck, S.; Geider, K. (2004) Alternative methods to describe virulence of *Erwinia amylovora* and host-plant resistance against fireblight. *Plant Pathology* 53: 80-89.

Brulez, W. and Zeller, W. (1981) Seasonal b changes of epiphytic *Erwinia amylovora* on ornamentals in relation to weather conditions and the course of infection. *Acta Horticulturae* 117, 37-42

Buchanan, R. L., Edelson, S. G., Miller, R. L. and Sapers, G. M. (1999) Contamination of intact apples after immersion in an aqueous environment containing *Escherichia coli* O157: H 7. *Journal of Food Protection* 62: 444-450.

Burnett S. L., Chen , J., Beuchat, L. R. (2000) Attachment of *Escherichia coli* O157: H7 to the surfaces and internal structures of apples as detected by confocal scanning laser microscopy . *Applied and Environmental Microbiology* 66 (11) 4679-4687

Carmichael, I, Harper, I. S., Coventry, M. J., Taylor, P. W. J., Wan, J. and Hickey. M. W. (1999) Bacterial colonization and biofilm development on minimally processed vegetables. *Journal of Applied Microbiology Symposium Supplement* 85: 45S-51S.

DGCCRF-CTIFL (1988) Good hygienic guidelines for modified atmosphere packaging of vegetables product. Published in English by CFDRA Map Club (1990).

Faqua, C., Winans, S. C. and Greenberg, E. P. (1996) Census and consensus in bacterial ecosystems: the LuxR-Lux I family of quorum-sensing transcriptional regulators. *Annual Review of Microbiology* 50, 727-751.

Ge, Q.; van der Zwet, T. (1996) Persistence and recovery of endophytic *Erwinia amylovora* in apparently health apple tissues. *Acta Horticulturae* 411: 29-33.

Gross, M., Geier, G., Rudolph, K. and Geider, K. (1992). Levan and levansucrase synthesized by the fire blight pathogen *Erwinia amylovora. Physiol. Mol. Plant Pathol.* **40,** 371-381.

Guo *et. al*.(2001) Applied and Environmental Microbiology 67(10)

Hengge-Aronis, R. 2000 The general stress response in *E. coli*. In "Bacterial stress responses" ed. G. Storz and R Hengge-Aronis. ASM Press, Washington DC

Hery, M., Gerber, J. M., Hecht, G., Subra, I., Possoz, C., Aubert, S., Dieudonne, M. and Andre, J. (1998) Exposure of chloramines in a green salad processing plant. *Annals of Occupational Hygiene*, 42 (7) 437-451.

Hickey, K.D., Orolaza-Halbrendt, N. and van der Zwet, T. (1999). The presence of endophytic *Erwinia amylovora* bacteria in symptomless apple tissue on orchard trees. *Acta Horticulturae*, Number 489, 453-458.

http://www.caf.wvu.edu/kearneysville/articles/SteinerHort1.html

Janisiewicz, W.J. and van der Zwet, T. (1988). Bactericidal treatment for the eradication of *Erwinia amylovora* from the surface of mature apple fruit. *Plant Disease* **72,** 715-718.

Janisiewicz, W.J., Conway, W.S., Sapers, G.M., Fratamico, P. and Buchanan, R.L. (1999). Fate of *Escherichia coli* 0157:H7 on fresh-cut apple tissue and its potential for transmission by fruit flies. *Applied and Environmental Microbiology* **65,** 1-5.

Johnson, K.B. and Stockwell, V.O. (1998). Management of fire blight: A case study in microbial ecology. *Annual Review of Phytopathology* **36**, 227-248.

Lindow, S. E. (1991) Determinants of epiphytic fitness in bacteria pp. 295-314. In Andrews, J. H. and Hirano S. S. (eds) *Microbial Ecology of Leaves*, New York: Springer-Verlag.

Lindow, S. E.; Brandl, M. T. (2003) Microbiology of the phyllosphere. *Applied and Environmental Microbiology* 69(4) 1875-1883.

Lisle, J. T., Broadway, S. C., Prescott, A. M., Pyle, B. H., Fricker, C., McFeters, G. A. (1998) Effects of starvation on physiological activity and chlorine disinfection resistance in *Escherichia coli* 0157: H7 *Applied and Environmental Microbiology* 64 (12) 4658-4662.

Mazzucchi, U.; Bazzi, C.; Coti, G., Calzolari, A. (1984) Quantitative evaluation of two techniques for the detection of epiphytic *Erwinia amylovora* during the dormant period *Acta Horticulturae* 151 145-154.

Miller, H. J. (1984) *Erwinia amylovora* detection and its significance in survival studies. *Acta Horticulturae* 151: 63-68.

Norelli, J.L., Jones, A.L. and Aldwinckle, H.S. (2003). Fire blight management in the twenty-first century. *Plant Disease* **87,** 756-765.

Özakman, M and Maden, S. (1999) A study of epiphytic population of *Erwinia amylovora* on pear trees. *Acta Horticulturae* 489: 465-469.

Paulin, J-P. (1997). Fire blight: Epidemiology and control (1921-1996). *Nachrichtenble. Deut. Pflanzenschutzd* **49,** 116-125.

Persson, P. (1999) Leaf surface bacterial population of five different fire blight hosts. *Acta Horticulturae* 489: 499-503.

Raymundo K. A. and Ries S. M. (1981) Motility of *Erwinia amylovora*. *Phytopathology* 70: 1062-1065.

Robbe-Saule, V. Schaeffer, F., Kowarz, L. and Norel, F. 1997 Relationships between H-NS, ss SpvR and growth phase in the control of spvR, the regulatory gene of the *Salmonella typhimurium* plasmid virulence operon. Mol Gen. Genet. 256:333-347

Romantschuk, M.; Roine E., Björklöf, K., Ojanen, T., Nurmiaho-Lassila, E-L., Haahtela, K. (1996) Microbial attachment to plant aerial surfaces *Aerial Plant Microbiology* edited by Morris *et. al* Plennum Press , New York

Sholberg, P.L., Bedford, K.E., Haag, P. and Randall, P. (2001). Survey of *Erwinia amylovora* isolates from British Columbia for resistance to bactericides and virulence on apples. *Canadian Journal of Plant Pathology* **23,** 60-67.

Simons, L. and Carmichael (2001) Washing systems designs, sanitiser performance and industry issues. Conference proceeding FRESH. The future of food safety and processing technologies for value-added horticultural products. Werribee 2001.

Steiner, P. W. (1990) Predicting canker, shoot and trauma blight phases of apple fire blight epidemic using the MARYBLYT model. *Acta Horticulturae* 273, 139-148.

Stewart, P. S., Murga, R., Srinivasan, R. and de Beer, D. (1995) Biofilm structural heterogeneity visualized by three microscopic methods. *WaterRes.* 29: 2006-2009.

Sutton, T. B. and Jones, A. L. (1975) Monitoring *Erwinia amylovora* populations on apple in relation to disease incidence 65: 1009-1012.

Thomson; S.V. and Gouk, S. C. (1999) Transient populations of *Erwinia amylovora* on leaves in orchards and nurseries. *Acta Horticulturae* 489: 515-518.

Van der Zwet, T. and Buskirk, P. D. (1984) Detection of endophytic and epiphytic *Erwinia amylovora* in various pear and apple tissues. *Acta Horticulturae* 151: 69-77.

Vandevivere, P. and Kirchman D. L. (1993) Attachment stimulates exopolyscacharide synthesis by a bacterium *Applied and Environmnetal Microbiology* 59 (10) 3280-3286.

Wei., Z., Kim J. F., Beer S. V. (2000) Regulation of *hrp* genes and type III protein secretion in *Erwinia amylovora* by HrpX/HrpY, a novel two-component system, and Hrp S *Molecular Plant –Microbe Interaction* 13(11) 1251-1261

Whittaker, R.H. and Feeny, P.P. (1971). Allelochemics: Chemical interactions between species. *Science* **171,** 757-770.

Wimalajeewa, D.L.S. (1976a). Studies on bacterial soft rot of celery in Victoria. *Australian Journal of Experimental Agriculture and Animal Husbandry* **16,** 915-920.

Wimalajeewa, D.L.S. (1976b). Control of bacterial soft rot of celery. *Vegetable Growers Digest* No. 40, 14-15.