Excerpts from final inventory of issues from New Zealand apple IRA, indicating changes from the draft

Part 1 - General

AQIS performance

- "34% of new incursions of pathogens were ~~illegally~~ in legally imported Fruit & Vegetable Trade" (Nairn Report. Chapter 8.)

Part 3 - Methodology

Estimation of consequences

- AFFA has introduced into pest risk assessment concepts that go beyond the internationally accepted guidelines for assessing the economic impact of a pest (eg. 'recognition', 'concern', 'values', 'wellbeing'). AFFA should provide a clear explanation.

General

- The matrix contained in the draft IRA overestimates risk unless it is used for combining only two probabilities.
- AFFA has not assessed separately the four key risks that they seek to manage (ie bacterial infection of mature fruit in orchard or after harvest; infestation of the calyx-end of the fruit; epiphytic contamination of fruit surfaces; and the presence of trash with imported fruit.) A separate assessment of these risks will, stakeholder believes, demonstrate that the measures proposed by AFFA are not justified.
- AFFA should explain the way in which each measure reduces risk (ie., the scientific basis of the measure), and also the extent to which the measure is believed to reduce risk.
- Each matrix is based on discrete steps of what are admitted to be continuous quantities which causes discrepancies. The errors introduced by this model should be admitted and some flexibility in interpretation of results should be allowed based on sound scientific rationale.

Part 4 - Risk assessment

Fire blight; *Consequences*

- AFFA has not clearly assessed the effect of fire blight on the economic stability, or specified the meaning of 'significance at the national level'.
- In assessing the economic impact of fire blight in Australia, AFFA has not followed the international guideline which states "In order to estimate the potential economic importance of the pest, information should be obtained from areas where the pest currently occurs. For each of those areas, note whether the pest causes major, minor, or no damage."
- None of Australia's major pome fruit markets impose restrictions on apples from countries where fire blight occurs.
- BA must give due consideration to the developing organic industry, advantages that the current 'clean green' environment has for the further expansion of the organic industry and economic consequence to that industry from an outbreak of fire blight or any other pest/disease coming from NZ.

Fire blight; *Risk level*

- Due to the uncertainty and the lack of this information, if the probability of entry for fire blight moves from negligible to low, the restricted risk for fire blight changes to low, which is above the ALOP.
- Section 6.1 (*Erwinia amylovora*) from the Draft Review of Post Entry Quarantine for the Importation of Apple and Pear Budwood should be incorporated into the issues paper.

Fire blight; *Probability of ~~Introduction~~ Entry*

- There does not appear to be a rational relationship between the scientific evidence and the determined risk when addressing the probability of entry.

- The literature supports the position that commercial cold storage acts to reduce the risk (sic) that calyxes of mature the fruit are infested with *Erwinia amylovora*.

- The probability of entry is negligible based on a very low importation potential and a negligible distribution potential.

Importation

- Importation potential is overestimation of probability due to the misinterpretation of the literature, and failure by BA to consistently apply its methodology each step along the importation pathway. An objective review of data strongly suggest calyx infestation is a rare phenomenon. The importation potential should be rated as 'very low' rather than 'high'.

- In assessing the risk that fruit may carry *Erwinia amylovora*, it is important that the relative risks of fruit infection, calyx infestation, fruit surface infestation, and trash are considered separately. Not doing so makes the application of phytosanitary measures non-transparent.

- AFFA should review the risk of bacterial infection of mature fruit, infestation of the calyx-end of the fruit, epiphytic contamination of fruit surfaces and the presence of trash separately. If this is done, the probability of fruit being infected or infested on the surface is negligible and the probability of epiphytic infestation of the calyx is very low.

- AFFA should assess the risk of cross contamination and provide justification for imposing the trade restrictive phytosanitary measures concerned (namely disinfestation of fruit and sanitation of the packing line).

- AFFA's allocation of a "high" probability to the likelihood of *Erwinia amylovora* surviving storage and transport is questionable.

- 'It is considered likely that the importation of apples from NZ would lead to the arrival in Australia of infected fruit'. This should be the first likelihood used in the matrix.

Distribution

- Many studies have shown that whilst the risk of transmission of Erwinia amylovora via mature fruit is low there can be significant transmission of the disease.

- It seems reasonable to conclude that bacteria present in the calyx of an apple, or on the surface, are very unlikely to survive exposure to the environment. If they do, the likelihood that *Erwinia amylovora* would survive in the environment for a sufficient period, and be able to either multiply or persist in sufficient numbers to be transferred to a host in a receptive state is very low, not low. Therefore, distribution potential of *Erwinia amylovora* is negligible.

- If a bacterium gets into the country it will always find a means of finding a host and producing an infection.

Fire blight; *Spread*

- In assessing the probability of spread, BA has not taken into account the activities that would be taken to prevent spread after the disease was first detected.
- An appropriate assessment of spread is moderate, not high.
- The draft IRA did not mention filaments as a mechanism of spread of fire blight and it should be further investigated.

Fire blight; *Competent epiphyte*

- Steiner (1998) has observed that *Erwinia amylovora* is competent epiphyte capable of colonising and multiplying on the surfaces of plants. Furthermore, it makes little difference whether the plants colonised are susceptible or resistant to fire blight. It has also been shown that *Erwinia amylovora* remained viable for periods of up to 10 months on wood (Nachtigall *et al*. (1985) and 4 months on plastic (Keck *et al*. (1996). Full consideration of the characteristics of *Erwinia amylovora* and its ability to survive in a range of environments is required.

Fire blight; *Infestation of immature fruit*

- Infestation of immature apples is irrelevant to the importation of mature, healthy fruit since immature apples are not shipped.
- The decline in infestation prior to maturity (ie from 50% immature fruit infested to 3% of mature fruit) should be taken into account.
- When the misquoting of Clark *et al*. 1993 (ie these authors found 8.7% infested immature fruit, not 87%) is taken into account it is clear that levels of infestation of calyxes of immature apples range from approximately 0-9% in orchards without fire blight symptoms (but in close proximity to blighted trees) to 50% in orchards with severe fire blight.

Fire blight; *Fruit infestation*

- It is obvious that fire blight can be present in the calyx. Moreover, the bacterium can survive on plastic for four months and on timber for 10 months. Therefore apple fruit can harbour the disease.
- AFFA incorrectly reports from van der Zwet *et al*. (1990) that "bacterial numbers exceeded 10^3 cfu/fruit in the calyxes of fruit harvested from blight free orchards". The level of infestation was <50cfu.
- Regarding van der Zwet *et al*. (1990) (which reports mature apples from disease free orchards with infested calyxes) stakeholder has been advised that a blighted orchard was located <10m from the fire blight free orchard in West Virginia (Roberts, pers. comm., 2000). The level of infestation reported by van der Zwet *et al*. (1990) is 2 infested fruit out of 40 sampled, or 5% of fruit.
- Taking the reported 6.7-8.7% infestation of fruitlets in orchards free from fire blight symptoms (Hale *et al*., 1987) and allowing for the decline in infestation prior to maturity, only 0.05% (sic)of the fruit would have been infested at harvest.
- Roberts *et al*. (1989) believe that biotic factors such as naturally occurring biological control may explain the lack of recovery of *Erwinia amylovora* from mature fruit.

- If assessed separately, the probability of *Erwinia amylovora* occurring on the surface of fruit would be negligible, ie., the event would almost certainly not occur.

- The research work carried out by the NZ indicated that only 3% apple are found positive, this was suggested by McManus and Jones (1996), who found an infection of 27%, that the NZ's work may be an underestimate of the level of Erwinia amylovora infection [sic] on fruit.

Fire blight; *Fruit infection*

- If bacteria could move into growing shoot tips there is no reason why they cannot move into developing fruit.

- Van der Zwet *et al.* (1990) recovered *Erwinia amylovora* from the cores of 2-5% of mature fruit (harvested in August) collected within 15 cm of blighted shoots. It was unclear whether the isolation of *Erwinia amylovora* was associated with symptoms, as the authors reported that "symptoms were difficult to distinguish from other fruit rots". Given that all fruit sections were routinely tested (regardless of the presence of symptoms of infection) it is likely that the isolations of endophytic *Erwinia amylovora* were not instances of infection (disease).

- It is stated by van der Zwet *et al.* (1990) that *Erwinia amylovora* was recovered from up to 21% of the core sections of fruit harvested from within 15 cm of visibly blighted shoots. What is not clear is the stage of maturity of these fruit. Fruit was harvested in July and August. Given that the normal fruit harvest period is between late August and early October it is highly likely that the fruit collected in July were immature fruit. This is borne out by the decline in infection between July and August (Table 3 of van der Zwet *et al.* (1990)), indicating a maximum recovery of 5% of tissue samples in mature fruit collected within 15 cm of visibly blighted shoots.

- Van der Zwet *et al.* (1990) also found *Erwinia amylovora* in the internal tissues (core) of fruit sampled from blighted orchards in a number of regions of the USA. It is difficult to determine the percentage of fruit with *Erwinia amylovora* as the data are presented as numbers of isolations from the upper core, core, and lower core and it is not stated whether these were the same, or different, fruit. The percentage of fruit with *Erwinia amylovora* present was therefore between 1.5% (5/320) and 4.4% (14/320).

- The overall risk of fruit infection (or the presence of endophytic *Erwinia amylovora*) is therefore considerably less than 5% unless every fruit was harvested from within 15 cm of blighted shoots.

- On the basis of the available scientific evidence an appropriate assessment is that the probability of fruit infection is negligible. AFFA should review the assessment of risk of fruit infection.

- No discussion as to how blighted orchards nearby could be accounted for when assessing the likelihood of orchard infection.

Fire blight; *Vectors of*

- Honey bees are a major vector, especially at flowering time when trees are most vulnerable to Erwinia amylovora.
- The assumption or suggestion that browsing insects, or mites may be able to transfer bacteria to a receptive flower or wounded twig was not supported by any published data.
- Because of the lack of vectors or means of transfer, the risk posed by imported apple fruit is negligible.

Fire blight; *Experts opinions*

- The names, qualifications and comments of the fire blight experts from whom AQIS sought the opinion should be given in the appendix.
- AFFA did not ask these experts to express their answers in the same terms as those used to assess risk (Table 6 of the draft IRA).
- JP Paulin, when asked to describe the risk, said that the risk should not be taken by a country free of the disease.

Fire blight; *Misquotes*

- AFFA has perpetuated a typographical error in Clark et al. (1993). The 87% reported is actually 8.7%.
- Two papers were cited by AFFA as evidence of fruit infection, van der Zwet *et al*. (1990) and Clark *et al*. (1993). This work was reporting epiphytic infestation, not internal fruit infection. AFFA has mis-reported Clark *et al*. (1993). The authors did not detect *Erwinia amylovora* in the calyxes of any fruit samples, even within 20 cm of the inoculation site.

Pathogens; *European canker~~; Consequences~~*

- The argument that Nectria galligena is unlikely to be spread to pome fruit trees or forest trees from core infections or storage rots is unconvincing. Long distance dispersal of conidia and ascospores has been demonstrated. The probability of entry should be 'high' (or at least 'moderate') and consequently overall unrestricted risk should be 'high'.
- AFFA suggests that most nursery stock in New Zealand comes from areas where the disease is prevalent (ie., Waikato) and this would mean that newly established orchards were a source of inoculum, raising the probability of fruit infection. However, if the nursery stock is planted to regions with less than 1000 mm rainfall (New Zealand production areas) the disease will not be expressed and there is no danger of fruit infection.

Arthropods; *Leafrollers*

- Larvae readily invade calycine sinuses on apples and can be difficult to detect by inspection of fruits. Establishment of these leafrollers in Australian orchards will have high rather than moderate economic consequences because they not only affect a wide range of crops but also will adversely affect IPM management programs.
- The level of fruit infestation by green- and brown-headed leafrollers at harvest will be low; visual inspection techniques will detect the pest; and storage and transport will reduce the likelihood of survival of the pest. The overall estimation of risk is very low.

	overall estimation of risk is very low.
	◆ Pygotis plagiatana: The conclusion reached for this species is erroneous and requires consideration in more detail, in particular in relation to the impact it may have on Australian flora.
	◆ AFFA should only considers those species it considers to be above the ALOP, therefore, Tortricinae spp. should be removed from the draft IRA.
Arthropods; *Apple blister mite*	◆ Agreement with BA about the pest having a low overall probability of entry. However a conclusion that the pest will be of high, not moderate, economic significance if it were to establish in Australia. This is because it is likely to be difficult to control and may disrupt IPM programs in orchards.
	◆ AFFA needs to provide documentation that taxonomists have examined specimens of *Eriophyes pyri* from apple and pear trees in order to confirm whether or not Australia has both *Eriophyes mali* and *Eriophyes pyri*.
	◆ The unrestricted importation of New Zealand apples presents a very low risk of the introduction of *Eriophyes mali.*
Arthropods; *Apple leaf-curling midge; likelihood of entry and establishment*	◆ The United States' Department of Agriculture (USDA) has intercepted apple leaf-curling midge in NZ apple consignments exported to the USA.
	◆ The risk of entry, establishment and spread of *Dasineura* mali would be more accurately described as very low and the economic consequences as low giving an unrestricted risk estimate of negligible. Therefore, no risk management measures should be required for this pest.
Arthropods; *NZ flower thrips*	◆ The risk of entry under the proposed BA protocol would be moderate since thrips eggs and insects are very small and difficult to detect in apple calyces.
	◆ *Thrips obscuratus* presents an unrestricted risk estimate of negligible.
General issues; *Assessing data*	◆ "Roberts et al. (1989): Mature healthy apple fruit do not appear to be an economically suitable substrate for the survival of epiphytic Erwinia amylovora…" How can this quote be included in the draft IRA as it is shown to contradict other publications?
	◆ AFFA has previously expressed concern that the number of fruit used by Hale and Taylor (1999) was insufficient. Stakeholder wishes to point out that the numbers of fruit used by van der Zwet *et al*. (1990) were less than those used by Hale and Taylor (1999) and believes that AFFA should consider all available literature using common criteria for assessing the validity of conclusions reached by authors.
	◆ Evidence in Hale et al. (1996) paper on the inoculum dose required for infection of blossoms should be treated with caution.

Excerpts from final inventory of issues from New Zealand apple IRA

Part 4 - Risk management

Fire blight; *Detection zone*

- Given that Erwinia amylovora has not been recovered from fruit located more than 15 cm from infection sites, we cannot establish any rational link between the establishment of a buffer zone and the assessed risk posed by either fruit infections or epiphytic infestation of the calyx of mature fruit. A distance no greater than 10 m would ensure an area is free of fire blight.
- Detection zones unlikely to be of any value as an "early detection mechanism", as fire blight does not infect the edges of an orchard before any other part of the orchard.
- There is no justification for a detection zone to manage the risks posed by infected fruit. AFFA needs to document the rationale for a 50 m detection zone to prevent fruit surfaces being contaminated.
- The requirement should include thorough inspections including laboratory testing as a requirement for export accreditation.

Fire blight; *Harvest bins*

- 'For Australia' bins should be stored in an area physically separated from that used for the storage of other bins.
- Disinfestation of harvesting bins is of no value in reducing the risk of surface infestation.
- The imposition of phytosanitary measures must be based on the probability of risk, not the mere possibility of risk. Therefore, Biosecurity Australia should explain the need for disinfestation of harvesting bins with data.

Fire blight; *Chlorine dip*

- Fruit from REBs will be transported in open bins by tractor through detection area trees and other blocks, risking contamination.
- The chlorine dip is a one-off treatment for surface contamination and needs no other measures to support it.
- The recommendation strength of the chlorine should be 200 ppm instead of 100 ppm.
- What if, through poorly managed wash-water, new bacterial cells can be forced into the calyx-end of the fruit?
- One issue that AFFA may wish to consider before requiring compulsory surface disinfestation of fruit is the possibility that this treatment may in fact increase the risk of the development of endophytic infections, by killing *Erwinia amylovora*'s competitors.

Fire blight; *Cross contamination or substitution*

- Will inspectors ensure that the fruit from each orchard is segregated at the packing shed? If so, how will this be done?
- The requirement to pack fruit into cartons before storage is more trade restrictive than necessary.
- There is no technical justification for a 1 m separation of fruit in cold storage.

Excerpts from final inventory of issues from New Zealand apple IRA

Fire blight; *General management issues*	◆ A candidate block should be no less than 500 m from the boundary of a surveyed district; as justification, this distance is supported by New Zealand data. ◆ Notification of every change in registration is onerous and costly, and adds no security to the system. AFFA should allow MAF to maintain a register available to AQIS on request. ◆ Adopt a block registration scheme similar to that required by Japan for apple fruit from New Zealand and USA.
European canker; *Latent infection*	◆ The only way to reduce the incidence of storage infection by latent inoculum of Nectria galligena in the fruit is an application of postharvest fungicidal dips. ◆ The literature states that if an orchard is free from European canker, then latent infections never occur. It is therefore difficult to see how a phytosanitary inspection (and associated testing) for the disease can be justified.
Arthropods; *Apple blister mite*	◆ The only way to guarantee the reduction of the risk of apple blister mite from 'low' to 'very low' is to fumigate with methyl bromide, or an equivalent treatment as the mites have proven notoriously difficult to detect. ◆ The risk posed by this pest falls below the ALOP and no measures are required.
Arthropods; *New Zealand flower thrips*	◆ Additional risk mitigation steps for New Zealand flower thrips are necessary to reduce the moderate entry risk to low. ◆ On that basis of a reassessment of risk to very low, further risk management measures are not necessary or justified. ◆ AFFA should apply equivalent measures for this pest on apples as it does on other crops from New Zealand.