Financial impact of a fruit fly incursion to New Zealand's kiwifruit industry

March 2014

Purpose
To provide the KVH Board with an estimate of what a fruit fly incursion could cost the kiwifruit industry.

Executive Summary
The financial impact of a fruit fly incursion to New Zealand's kiwifruit industry is estimated to cost between $2 million and $430 million per year. The former represents the best case scenario, which is the discovery of a single non-breeding individual with no market access implications, such as the 2014 Queensland fruit fly find in Whangarei. In this scenario, $2 million is for the operational costs alone and under GIA would be cost-shared between government and other beneficiary industries. The latter figure of $430 million, represents the worst case scenario for the kiwifruit industry as modelled by Underwood (2007), which is the discovery of a breeding population in Te Puke triggering severe market reactions. This figure of $430 million is the direct impact to horticulture and includes only the quarantine export costs, which would be largely borne by the kiwifruit industry.

This paper provides estimates of the market impacts of a fruit fly incursion in Te Puke by referencing the findings of Underwood (2007), who modelled an incursion based on the 1996 Medfly market response. A comparison of these findings is made with international studies where the impact of fruit fly incursions has been quantified.

Background
Fruit flies have been identified as the biosecurity threat of greatest concern to kiwifruit and other New Zealand horticultural industries. Of the numerous fruit flies that pose a potential threat, the three species with the greatest potential impact are the Mediterranean fruit fly or Medfly (*Ceratitis capitata),* Queensland fruit fly (*Bactrocera tryoni*), and Oriental fruit fly (*Bactrocera dorsalis*). New Zealand has had seven separate fruit fly finds in the past 25 years, of which the two most recent (2012 & 2014), cost the Ministry for Primary Industries $2 million in increased trapping and surveillance costs alone. A fruit fly incursion (that is the presence of a breeding population), can have far more significant economic impacts resulting from loss of market access and costs associated with quarantine and monitoring. The significance of these market access restrictions to New Zealand growers was felt in 1996 when a Medfly incursion occurred, which despite being contained in an urban area of Auckland and having no direct crop damage, resulted in significant market access restrictions for exports of New Zealand produce. Responses by export markets ranged from Europe which imposed no restrictions (as Medfly is established in a number of European countries), to China which imposed severe restrictions excluding fruit from the whole of the North Island for a period and restrictions were not removed until two years after the initial outbreak (Gilbertson, 2012).

Determining what a fruit fly incursion would cost the kiwifruit industry if it occurred today is a complex task influenced by many factors. Market access restrictions may prevent fruit harvested inside the incursion zone from being sold in premium markets, however, this fruit may be sold to other markets that do not impose restrictions. This reallocation of fruit between markets influences supply levels and prices and therefore the overall impact is a figure more complex than solely the net value of markets imposing

restrictions. Fortunately there are several recent New Zealand studies whose findings, along with international studies quantifying observed and potential fruit fly incursion impacts, can be used as the basis for this paper.

There have been two recent studies in New Zealand which have used the market access restrictions of the 1996 Medfly incursion in Auckland as a benchmark to provide an overview of the threat to New Zealand's horticultural industries posed by fruit flies (SriRamaratnam, 1996), and to model the impacts of similar market restrictions had the incursion occurred in one of three major fruit growing districts of the Bay of Plenty, Hawkes Bay or Nelson (Underwood 2007).

This paper will provide:

1. An estimate of the market impacts of a Bay of Plenty fruit fly incursion based on the findings of Underwood (2007)
2. A summary the market impacts of international fruit fly incursions
3. A summary of the operational cost of fruit fly incursions and eradication.

1. Methods

An estimate of the market impacts of a Bay of Plenty fruit fly incursion is taken from Underwood (2007), a study commissioned by Horticulture New Zealand. The Bay of Plenty component of this study is a kiwifruit centric model with the incursion scenario centred in Te Puke, the centre of New Zealand's kiwifruit industry. The study updates findings from a previous study in 1998 using the same methodology, and models three scenarios, each with a different market reaction for a fruit fly incursion in Te Puke;

- the "1996 Auckland " scenario based on the market reactions of the 1996 medfly incursion (which is summarised in Table 1); and
- two more severe market reactions with wider incursion zones of 15 km and 80 km.

Table 1. Market Reactions of the 1996 Auckland Medfly incursion

Market	Radius applied for restrictions	Date restrictions lifted	Duration of restrictions (lifecycle)	Duration of restrictions (months)
United States	7.2 km	2 April 1997	3 generations	10.5 months
Korea	15 km	23 April 1997	3 generations	11.5 months
Japan	15km	14 April 1997	3 generations	11 months
Australia (except Western Australia)	80km, reduced to 15 km on 5 June 1996	22 January 1997	1 generation plus 28 days	8.5 months
Western Australia	No restrictions	No restrictions	No restrictions	No restrictions
China	North Island	BOP kiwifruit exempted within 1 year, other restrictions remained		Final restrictions lifted more than 2 years after initial incursion
Europe	No restrictions	No restrictions	No restrictions	No restrictions
NZ Domestic	A zone 200m radius B zone 1.5 km C zone 15 km	23 Jan 1997 (With Australia)	1 generation plus 28 days	8.5 months

Underwood (2007) calculates only the quarantine impact on exports, not the costs of controlling a fruit fly should it become an established pest. Incursions are modelled to start in April, early in the kiwifruit harvest season, and to last for 12 months. Scenarios take into account many factors such as the cost of transporting fruit through incursion regions and the ability to mitigate incursion effects by supplying fruit from regions outside the incursion zone to markets applying restrictions.

2. Market impacts of a Bay of Plenty fruit fly incursion

Scenario 1: Base "1996 Auckland" market reaction of a fruit fly incursion in Te Puke

This scenario models a fruit fly incursion in Te Puke based on the market reaction the 1996 medfly incursion.

Assumptions of this scenario:

- All market restrictions are applied for 12 months from 1 April and simplified to a 15km radius incursion zone for countries restricting produce imports due to the incursion. This assumption has been used to simplify calculations. Comparison with the actual market restrictions (Table 1), show that 15 km and a one year duration is a fair approximation for all markets except China, which included the whole North Island so the true figure would be larger.
- No market restrictions are applied to produce exported to Europe or directly to Western Australia. Produce grown in the incursion zone that could host fruit fly may not be exported except to Europe or Western Australia. Produce grown outside the incursion zone may be exported as long as it is also packed outside the zone and not transported through the zone unless in insect-proof packaging or transport.
- Production and markets are "back to normal" after the 12 month period, that is, no long term changes in market characteristics or production occur due to an incursion.

Impacts of this scenario:

Market impact to horticultural industries would be $71.4 M
Total impact including follow-on effects would exceed $100M

Kiwifruit from the incursion zone would not be available for premium markets in Japan and other Asian countries. This would mean these markets would be undersupplied with fruit, particularly of the gold type. Prices would be reduced due to lower fruit quality arising from less inventory from which to select premium fruit for these markets. Reallocation of fruit from the incursion zone to available markets would depress prices. Incursion zone fruit would not be able to be exported to the eastern states of Australia, an important market for class II fruit. This would increase reject rates. Crops from orchards in the incursion zone would not qualify for incentives relating to sale in premium markets, as that fruit would be excluded from those markets due to quarantine restrictions.

There would be a significant logistical challenge and cost to re-locate fruit for packing. Fruit grown in the incursion zone would need to be packed in the incursion zone and fruit grown outside the zone also packed outside the zone. This would require a significant re-jig of packing plans including fruit flow plans, packaging types, transport, coolstore location, shipping schedules and so on. This would also cause packing and shipping delays so would reduce revenue and increase costs. Shipping costs would increase due to late changes to booked schedules. Some of the impact would affect other kiwifruit growing districts as revenue is pooled.

Impacts for Bay of Plenty horticulture are primarily kiwifruit, but also include avocados and citrus. Underwood (2007) does not provide a breakdown of these impacts by crop type we can estimate that at least 80% of this impact would be attributed to kiwifruit as in 2007, 79% of Bay of Plenty horticulture by hectare was planted in kiwifruit (Plant and Food Research, 2008). The true figure would be even higher as kiwifruit has a higher return per hectare than most other horticultural crops such as citrus and avocados.

Assuming 80% of horticulture impact, kiwifruit market impacts would be $57.12 million

Scenario 2 and 3 "Worst case" impact scenarios:

Underwood (2007) states that the market reaction to the "1996 Auckland" incursion was relatively mild, occurring in an urban area of a region not growing significant quantities of commercial horticulture produce for export. There are a number of factors that could trigger a more severe market reaction including; if the incursion occurred in a major fruit growing area, the fruit fly species was less well known or distributed internationally (such as Queensland fruit fly), if individual European countries free of medfly applied individual restrictions rather than a collective acceptance, or if the incursion became more widespread before detection or continued to spread after its detection. Therefore modelling the financial impact of fruit fly incursions should include more severe reactions and two "worst case scenarios" were included in the paper.

These "worst case" scenarios modelled a fruit fly incursion in Te Puke but considered a market reaction of no exports of fruit fly host produce allowed from within a 15km or 80km radius zone around the incursion site for one year. In the base "1996 Auckland" scenario, loss of export markets resulted in kiwifruit redirected to Europe which mitigated losses. This is not permitted in a no-export zone and greatly increases the lost revenue. The Australian experience from the Papaya fruit fly incursion (see Box 1) show these "worst case" scenarios are not unrealistic and may even be conservative compared to true worst scenario may represent.

Box 1 –1995 Papaya fruit fly incursion in Australia
In North Queensland 1995, Australian experienced a large scale Papaya fruit fly incursion. An eradication programme began within 10 days of the pest being detected and lasted for almost four years.
The peak area over which the eradication programme operated was 78,000 km^2 which is the equivalent area of a circle of radius approximately 157km. The Government cost to eradicate the Papaya fruit fly in Queensland was $A34 million over the four years of the eradication programme. It was a huge programme, with nearly 64,000 fruit samples collected, 3 million lure/insecticide blocks used and more than 3 million vehicles stopped at roadblocks.
The cost to growers would have been magnitudes larger but the purpose of this example is to illustrate that even the worst case scenarios in this paper may still be on the conservative side.

Scenario 2: 15km Radius No-export zone for one year

Around 40% of the New Zealand kiwifruit crop is produced in a 15km radius zone around Te Puke. Export markets would be undersupplied with fruit with consequently reduced revenue, despite higher prices. Costs would increase due to issues like excess shipping space having to be on-sold at a discount. Domestic and processing markets would be nowhere near able to absorb the volume of fruit potentially available or to provide returns to cover the handling costs, let alone be comparable to export market returns.

Market impact to horticultural industries is $235 million
Total impacts including follow-on effects to exceed $450 million

Scenario 3: 80km Radius No-export Zone for one year

An 80km radius zone around Te Puke would take in all the Bay of Plenty kiwifruit production area except for Opotiki, and would also include kiwifruit produced in Waihi and parts of the Waikato. Around 75% of New Zealand's kiwifruit is produced in this zone.

Market impact to horticultural industries is $430 million
Total impacts including follow-on effects would exceed $800 million and nearly 3,500 jobs would be at risk

Summary of market impacts of a Te Puke fruit fly incursion

Scale of incursion response:	Direct Impact on Horticultural sector (NZD millions)
Base "1996- Auckland" Scenario	$71.4
15 km no-export scenario	$235
80 km no-export scenario	$430

3. Market access impacts -International

The actual or potential production and trade losses as a result of fruit fly incursions have been quantified in some international studies. These figures provide consistency to the message that fruit fly incursions can have a huge financial impact to a country's horticultural production and trade with losses upwards of $100 million per year. These international studies are summarised in the table below (Source, FAO 2001).

Pest	Country/ region	Estimated losses from outbreaks or benefits from control	Type of impact analysed	Year of study referenced

Medfly	United States	Potential loss US$ 800 million / year if it became established	Production and trade	1992 (FAO 2001)
Fruit flies	Egypt	Losses: US$ 100 million / year	Production and trade	1999 (FAO 2001)
Fruit flies	Pakistan	Losses: US$ 200 million / year	Production and trade	1998 (FAO 2001)
Carambola fruit fly	Latin America and the Caribbean	Potential net benefit of control US$ 709 - 938 million over 12 years	Benefits and costs	1995 (FAO 2001)

4. Cost of eradicating flies

The following table provides figures on operational costs only, such as increased trapping, and exclude any market access implications. The New Zealand figures represent extra costs of increased trapping and surveillance but do not include MPI/MAF personnel costs. These costs have been previously covered by MPI but are likely to be cost-shared with beneficiary industries under GIA.

In Australia, managing fruit fly is a significant cost to industry and government. Over the five year period from 2003- 2008, Australian industry and government invested more than $128 million in the management of fruit flies. This estimate excludes costs to growers in fruit fly endemic areas of Australia for managing crops to prevent infestation and generate a product fit for both sale and consumption (National Fruit Fly Strategy, 2009). The current national, annual cost of Queensland fruit fly is estimated to be $AU 28.5 million / year ($25.7 – 49.9 million) with 60% of the cost borne by commercial growers (Sutherst et al, 2000).

Year	Species	Location	Cost of Operation	Outbreak Details
New Zealand				
1996	Medfly	Auckland	NZ$5 million	Breeding population (Gilbertson, 2012)
2012	Queensland Fruit fly	Auckland	NZ$2 million	Single male fly
2014	Queensland Fruit fly	Whangarei	NZ$2 million	Single male fly
Australia				
1989-1991	Queensland fruit fly	Perth	AU$8.5 million	300 km^2 Baiting, Sterile Insect Technique and Cue lure used (DPI, 2011)
1995	Queensland fruit fly	Victoria Park	AU$250,000	4 flies only in less than 25km^2 (DPI, 2011)
2003-2008	Queensland fruit fly	NSW (Fruit fly exclusion zone, FFEZ)	AU$10 million	Cost of control program for several outbreaks (DPI, 2011)
2003 – 2008	Queensland fruit fly	Vic (FFEZ)	~AU$7.3 million	Cost of control program for several outbreaks (DPI, 2011)
2003 – 2008	Queensland fruit fly & Mediterranean fruit fly	SA (FFEZ)	~AU$2.1 million	Cost of control program for several outbreaks (DPI, 2011)

5. Conclusion and Recommendations

The discovery of a fruit fly in New Zealand can cost between $2 million for a single non breeding individual with no market implications, to between $70 and $430 million for a Te Puke based incursion depending on market reactions.

1. **Note**. These figures are a rough estimate based on a 2007 study and the following points should be considered;
   - In Scenario 1 all market sanctions were rounded to a 15 km incursion radius for simplicity, China excluded fruit from the entire North Island and therefore the true figure would be much larger, especially in today's market
   - Production volumes to specific markets are different in 2014 to 2007
   - Markets in 2014 may not react the same as they did in 1996
   - The scenarios modelled by Underwood (2007) are based on Bay of Plenty horticulture figures and although are focused on kiwifruit do include citrus and avocados. A breakdown by crop is not provided in the study and can only be estimated.
2. **Discuss** whether a more up-to-date estimate given the points noted above is required.

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