

## **SUMMARY OF ASSESSMENTS OF THE ECONOMIC IMPACT OF VARROA IN THE SOUTH ISLAND OF NEW ZEALAND.**

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This summary of the economic impact of Varroa establishment in the South Island of New Zealand is based on assessments by Dr Johannah Branson of the Ministry of Agriculture and Forestry. An initial assessment of the national economic impact of Varroa was carried out in 2000. In 2002 that assessment was reviewed based on experience in NZ since the establishment of Varroa in the North Island and focussing on the potential impact in the South Island. This summary presents data from the “middle case” scenario considered in the latter economic impact assessment. Full reports are available from the MAF website ([www.maf.govt.nz/varroa](http://www.maf.govt.nz/varroa)).

### **Summary**

Assessments of the economic impact of Varroa on South Island agriculture have included “best”, “middle” and “worst” case scenarios. These have shown the potential economic impact of establishment of Varroa in the South Island to be between \$198 and \$433 million, with the “middle” case scenario showing an impact in present value terms of \$314 million, over the next 35 years. Ninety percent of this impact will fall on the pastoral industries, with lesser, but still significant effects on the beekeeping, horticultural and arable industries. This summary focuses on the “middle” case scenario.

Impacts on different industries develop at different rates but once stabilised, the annual impacts on the different industries are

Pastoral industries	- \$234.22 million,
Beekeeping industry	- \$1.07 million,
Horticultural industries	- \$0.96 million and
Arable industries	- \$1.57 million.

### **Introduction**

The varroa mite (*Varroa destructor*) is an external parasite of adult and developing stages of the honey bee (*Apis mellifera*). Infested colonies are weakened by a decline in the number of adult bees produced and emerging bees may be less active. Varroa may also act as a vector for a number of bee viruses.

Varroa may impact upon New Zealand agriculture in two ways:

- directly, on the beekeeping sector; and
- indirectly, on sectors that benefit from honey bee pollination.

Varroa may reduce both the pollination efficiency of honeybees and pollinator numbers through intermittent crashes of managed hives and the elimination of feral bees. The resulting reduction in pollination activity may affect the production of a number of crops.

Dependence on honeybees for pollination differs according to crop. Grasses and cereals are generally wind-pollinated. Floriculture has little requirement for honeybee pollination. Viticulture and some vegetables have a relatively minor reliance on honeybees. Glasshouse

crops, such as tomatoes, are usually pollinated by commercially reared bumble bees. Most dependent on honeybees for pollination are many major horticultural crops, pasture clovers and some small seed and vegetable seed crops.

For some of these crops, there may be minimal crop set without adequate pollination. For others, production may take place but crop yield, size, quality and/or seed development may be adversely affected and/or the season may be delayed.

Alternative pollinators are generally not available in New Zealand.

## **Source of impacts**

Assumptions as to the magnitudes of the effects of, and responses to, varroa were based on the consensus of opinion reached by a consultation group convened in 2000 with some modifications in 2003 based on new information following experience of the management of Varroa in New Zealand.

The impacts of varroa are assessed over a 35-year time period. A discount rate of 7 per cent, based on the five-year government bond rate, was used in expressing future impacts in present value terms.

### ***Impacts on the pastoral sector***

For the pastoral sector, the impacts modelled are increases in nitrogen fertiliser applications, clover reseeded and some production losses. Different effects in summer moist and summer dry areas are modelled, given that pasture in the latter, particularly in summer dry hill country, is more dependent on annual clovers and other trefoils that must set seed and regeminate each year. In South Island high country, the main pollinators of clover are feral bees, which are assumed to be eliminated by Varroa.

The impacts included are:

- in summer moist areas:
  - additional nitrogen fertiliser applications of 3.25 kilograms per hectare per annum on dairy farms and 1.1 kilograms per hectare per annum on sheep and beef farms (based on the assumption of a reduction in clover nitrogen fixation of 25 per cent of the reduction assumed for the worst case);
  - clover reseeded of one kilogram per hectare per five years; and
  - no production losses;
- in summer dry areas:
  - additional nitrogen fertiliser applications of 2.2 kilograms per hectare per annum (based on the assumption of a 5 per cent reduction in clover nitrogen fixation);
  - clover reseeded of two kilograms per hectare per annum; and
  - annual production losses of 3.5% reductions in sheepmeat, wool and beef production resulting from reductions in pasture growth and quality.

### ***Impacts on the beekeeping sector***

For the beekeeping sector, the impacts modelled are varroa management costs, increases in pollination charges to growers and non-pollinator hive industry exits. These impacts are modelled for registered hives only.

It is widely considered that varroa is likely to lead to the disappearance of most hobbyists, the majority of below average performance beekeepers and many honey producers, who are unlikely to have sufficient profit margins to be able to meet the additional costs of managing varroa. Industry exits are modelled, comprised of non-pollinator hives - hives not earning pollination revenue.

The impacts modelled are:

- a varroa management cost of \$40 per hive per annum;
- a \$40 increase in pollination charge per hive and exits from the industry of South Island non-pollinator hives, representing 12 per cent of all hives.

### ***Impacts on the horticultural sector***

For the horticultural sector, the impact modelled is increases in pollination costs. This is modelled for a range of important fruit and vegetable crops: pipfruit, kiwifruit, summerfruit (stonefruit), citrus, berryfruit (represented by strawberries), avocados, peas and squash. The current hive requirements of these crops are assumed to be the recommended numbers of pollinator hives per hectare.

The impact included is:

- a \$40 increase in pollination charge per hive.

### ***Impacts on the arable sector***

For the arable sector, the impacts modelled are increases in pollination charges. These impacts are modelled for: white clover (Huia and proprietary), brassica seeds, fodder radish, phacelia, borage, chicory, lotus, red clover, seed multiplication areas, yarrow, lucerne and hybrid vegetables. Crop areas vary annually. The model uses 1999/00 crop areas, which reflect a decline in traditional small seeds production and an expansion in production of higher value crops.

The impact modelled is:

- a \$40 increase in pollination charge per hive.

### ***Rate of spread of varroa and its effects***

This study assumes that varroa becomes established in the South Island in 2005. “Established” denotes a sufficient presence of varroa to begin to have significant effects on agriculture the following year, as distinct from initial, isolated incursions.

The impacts on agriculture are modelled as commencing the year following the year in which varroa becomes established and are phased in over time, reflecting the time taken for the sector impacts to come into full effect across the region. Sector impacts are phased in over six

years in the South Island.

## Results

The economic impact on the South Island in the “middle” case scenario over the period 2002 to 2035 is calculated at \$314 million (present value; 2002) (Range \$198 million to \$433 million in the best case and worst case scenarios).

Table 1 illustrates the economic impact of Varroa on agricultural industry sectors in the South Island. 90% of the impact falls on the pastoral sector.

**Table 1: Total South Island economic impacts 2003 to 2035 by sector**  
(\$ million; present value; 2002)

	Horticultural	Pastoral	Arable	Beekeeping	Total
<b>Middle case</b>					
Impacts	8.011	284.384	13.171	8.952	314.519
% of total	2.55	90	4.19	2.85	100

Figure 1 illustrates the annual economic impact on industry sectors over the 35 year period of the assessment. (Note that the scale on the left side of the graph is a log scale)

## Annual economic impact of Varroa in SI industry sectors

