# New Zealand Horticulture–Success of an Export-led Industry


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*A common theme across all of these export initiatives has been the underlying theme of representing produce from New Zealand as coming from a country that is pristine, free from major pollution, sparsely populated and credible with respect to producing safe, high-quality traceable produce through the use of sophisticated environmental management systems.*

Welcome to New Zealand and a special welcome to Hawke's Bay—the "Fruitbowl of New Zealand." It is a pleasure to host members of the IDFTA to our shores and to share our mutual interest in fruit growing with you. This is the first time the IDFTA has held its annual conference outside of North America and Professor Bob Carlson, "Mr. Dwarf Fruit Tree," would be very proud of this development if he were with us today. You have attracted over 350 registrants from 15 different countries which is in keeping with "Dr. Bob's" vision of ensuring a free and open exchange of information across national boundaries on the particular topic of size-controlling rootstocks for fruit trees and their use in high density orchards.

I have been invited to address you today on the topic of horticulture's success as an export-led industry in New Zealand. The New Zealand horticultural industry has an international reputation for competing successfully on world markets, for commanding premium prices and for being the center of innovation, especially through the introduction of new fruit varieties.

Much of the really significant growth in horticultural exports from New Zealand has occurred fairly recently, in the last 20 years, from a value of around $NZ100 million in 1980 to in excess of $NZ1.75 billion in 1999 (1$NZ equals approximately .5$US) (Fig. 1). By far the greatest proportion of these exports is fresh fruit with apples and kiwifruit dominating (each representing 28% of total horticultural exports). Crops such as avocados, wine, citrus and summerfruit are, however, rapidly growing in importance.

Fruit, vegetables and flowers were exported to 110 countries around the globe in 1999. The value of exports to 41 of those countries exceeded $NZ1 million and, of these, exports to 15 countries exceeded $NZ10 million. The largest primary markets, all of which have grown in the 1990s, include Japan ($NZ364 million), the European Union ($NZ379 million), USA ($NZ166 million) and Australia ($NZ156 million). Rapidly expanding markets include Taiwan, Germany, Hong Kong, the Netherlands, Singapore, Malaysia, Spain and Italy.

The European Union countries, the United Kingdom and USA are the biggest markets for New Zealand apples (Fig. 2) while the European Union countries and Japan are the biggest markets for kiwifruit (Fig. 3). Most of New Zealand's wine exports are sold in the United Kingdom where premium prices are achieved over wines from other countries of origin (Fig. 4) and exports to Australia and to the USA are growing steadily.

Exports of horticultural crops from New Zealand have been taking place for over 100 years. The advent of refrigeration over a century ago permitted the transport of perishable products to the other side of the world and the introduction of a regular steamship service meant that transport time to England could be kept down to about 40 days.

Earliest fruit shipments appear to have been made in the early 1890s when initially several Auckland and later a number of Whangarei fruit growers were exporting apples to London. Around 10 years later, in 1899, the government became involved (through a guarantee scheme where growers were to be paid one penny per pound—about two cents per kilogram) by providing support for a significant trial shipment from Lyttleton to London. The shipment, which comprised 1500 bushel cases of apples and 50 cases of pears (Table 1), left Canterbury on March 26, clearly at a time when the stage of maturation of the individual cultivars in the shipment was largely ignored or considered at the time to be irrelevant.

The official report from this rather unsuccessful venture stated that "the shipment should have proved to New Zealand growers that the colony is not in a position to export apples in quantity yet. . . . It should also prove the correctness of the assertion that a few special varieties only must be grown for export purposes" (Ward, 1995).

Fortunately, growers did learn subsequently how to export apples in quantity and, although it took almost another 100 years, the industry did develop special varieties for export.

First trial shipments of apples and pears from the Hawke's Bay to England took place in 1909 and, aside from a cessation during World War I, have continued to grow ever since.

The main drivers underlying the New Zealand fruit industry's commitment to exporting have not changed in the last 100 years. These were and are:

- the very limited marketing options provided by having only a small domestic population.
- the intensification of land use as a means of generating employment in a country with few other natural resources and a very small industrial sector.
- the counter-cyclical options provided through being located in the Southern Hemisphere (originally with regard to supplying the "mother country," England).
- the maintenance of a strong production base that can compete effectively against imports.

The success of the horticulture industry in New Zealand and, in particular, the success of the fruit sector can be attributed to a number of factors including

- the constraints of a small domestic market and the absolute imperative to export if the industry is to achieve economies of scale that allow it to survive and prosper.
- a strong focus on innovation that has led to the development of new crops, new cultivars, new production methods and new products.

TABLE 1

**Cultivars included over 100 years ago in an 1899 shipment of apples and pears from Lyttleton, New Zealand, to London, England (adapted from Ward, 1995).**

| Apples | Pears |
|---|---|
| Adams Pearmain | Beurre Bosc |
| Boston Russet | Beurre Clairgeau |
| Claygate Pearmain | Beurre Easter |
| Cockle Pippin | Beurre Superb |
| Cox's Orange Pippin | Passe Colmar |
| Golden Russet | Vicar of Winkfield |
| Lord Wolseley | Winter Nelis |
| Margill | |
| Russet Nonpariel | |
| Sturmer | |
| Wilson's Royal | |

FIGURE 1

**Growth of horticultural exports from New Zealand from 1965 to 1999. Receipts are projected to exceed $NZ 2 billion in 2000 (Source: Statistics NZ).**

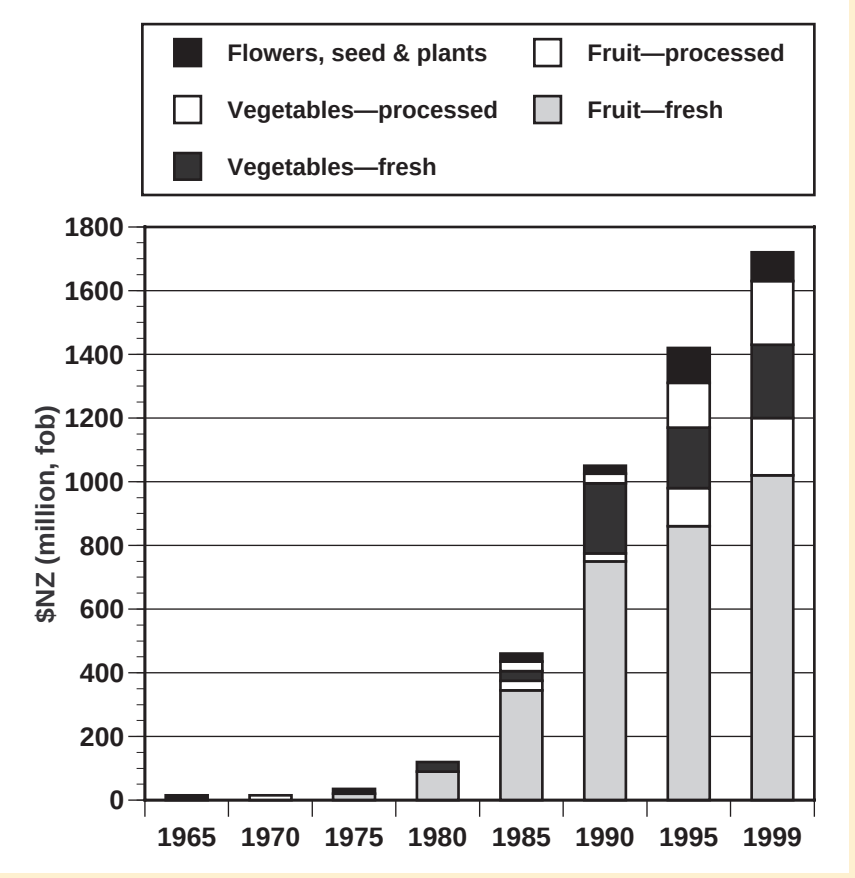
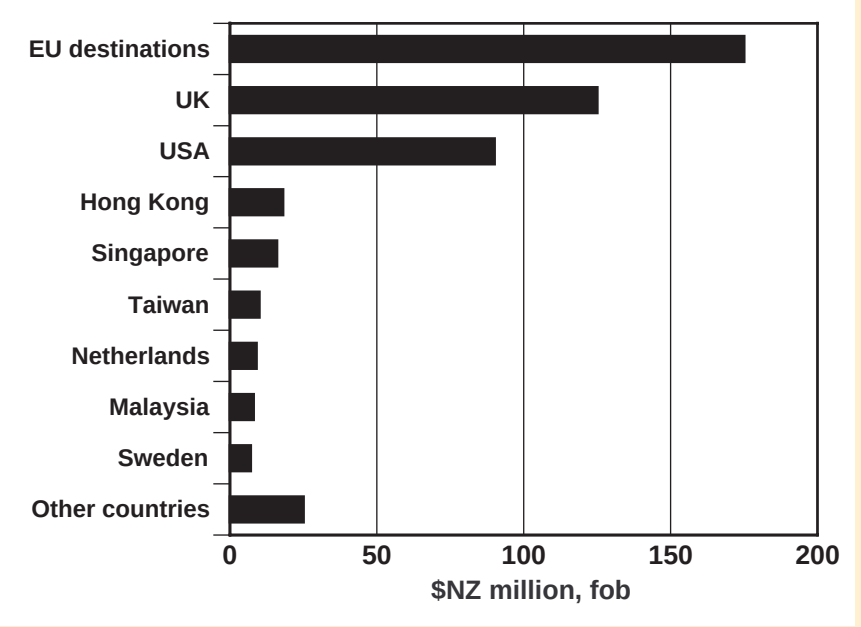



FIGURE 2

**Destinations of apple exports from New Zealand to world markets (1998/99 season) (Source : Statistics NZ).**



- a competent fruit-growing community.
- sound underpinning Research and Development (R&D) and effective technology transfer.
- several significant comparative advantages.
- strong brands that have themselves been used in innovative and effective ways to promote the New Zealand image and quality to world markets.

No single one of these factors is particularly unique when considered in isolation, but all of them in combination have provided an industry with the means to compete successfully on an international scale.

## NEW VARIETIES

Plant breeders in both the private and public sectors in New Zealand have had a major impact on the success of the fruit industry in New Zealand.

New Zealand's involvement with apple breeding—which has generated a number of other significant fruit breeding initiatives—arose from necessity, inspiration and vision driven from knowledge of the marketplace and an awareness of consumer preferences. It is not a recent development; it certainly stretches back for at least 80 years.

The first most significant contribution was the introduction of Gala and subsequently the red sport Royal Gala to international markets. Gala was selected from work originally undertaken by J. H. Kidd from Greytown. In the 1950s Mr. Kidd's contributions to apple breeding in New Zealand were best known from his development of the popular variety Kidd's Orange, which he produced in 1924 from a cross between Red Delicious and Cox's Orange Pippin.

Mr. Kidd's breeding efforts using hand pollination of selected parents continued and in 1942, following his death, 200 2-year-old seedlings were secured by the Department of Scientific and Industrial Research (DSIR) for evaluation. These seedlings matured to produce fruit by 1950 and from those one, a cross between Kidd's Orange and Golden Delicious (coded as D8), was shown to have flawless skin and excellent eating quality. This was further trialed and was named as Gala and released in 1962. The initial red sport Royal Gala was discovered by Matamata orchardist Bill Ten Hove in 1969, and significant numbers of trees were planted in both New Zealand (40,000 by 1979) and overseas within the following decade.

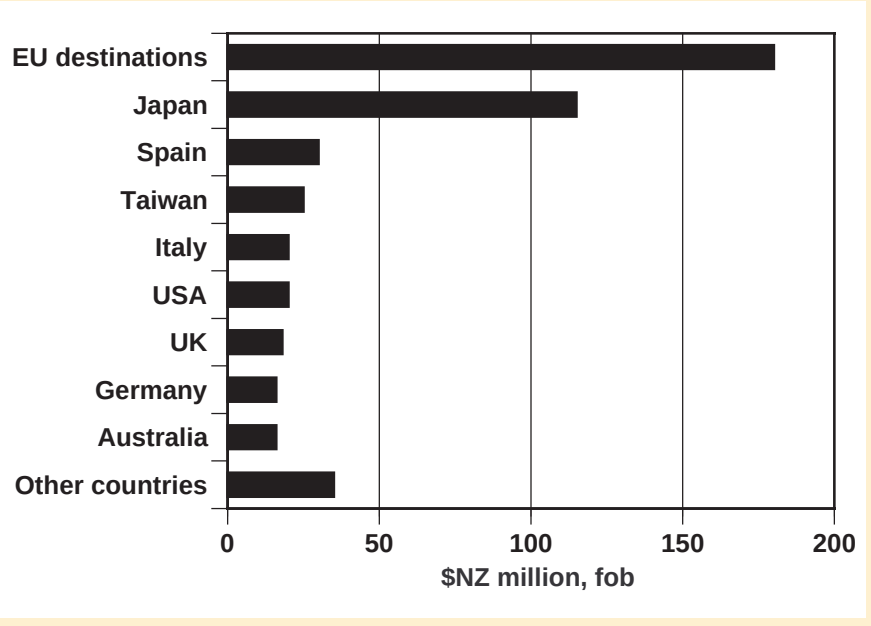
Braeburn, a chance seedling which was nurtured and developed by private growers, emerged over much the same period of time.

The early achievements of these varieties provided clear evidence that a structured breeding program was highly likely to produce cultivars that would be commercially successful. Furthermore, it was very likely that consumers would be prepared to pay premium prices for varieties that were distinctly new and different and were rewarding as an eating experience.

Spurred on by this realization, Dr. Don McKenzie initiated a controlled breeding program in the early 1960s that, although not officially sanctioned by the management of DSIR at the time, did receive early support from fruit growers via financial contributions from the New Zealand Apple and Pear Marketing Board. However, significant investment in apple breeding did not occur until the 1980s.

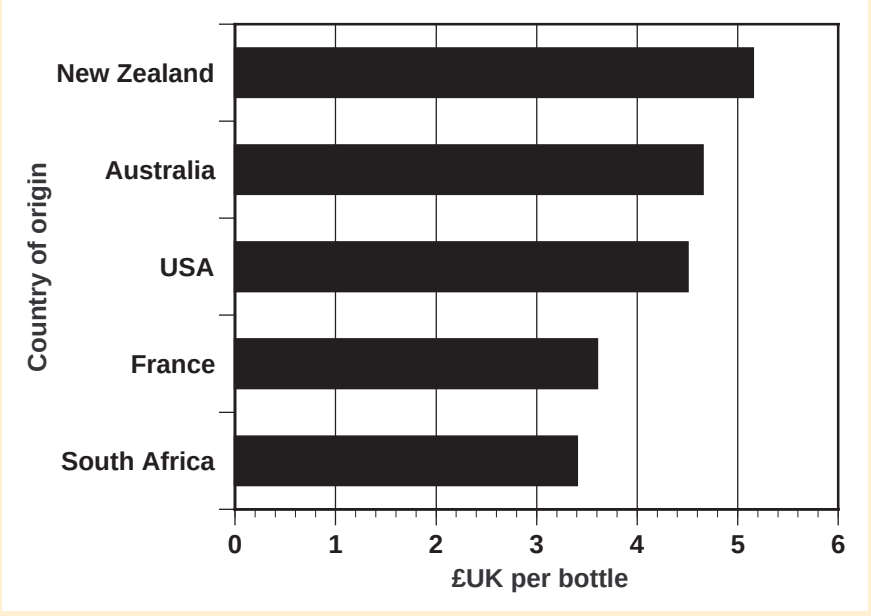
### FIGURE 3

**Destination of kiwifruit exports from New Zealand to world markets (1998/99 season) (Source: Statistics NZ).**




### FIGURE 4

**Returns received for white wine on the United Kingdom market (£UK per bottle) for supplies from different countries of origin (Source : Wine Institute of New Zealand, Annual Report, June 1998).**



Although some parts of that pioneering program were not successful, such as the selection of late maturing red-skinned varieties, other selections such as those from crosses between Gala and Splendour (the GS Series) including Pacific Rose and Southern Snap are now beginning to make an impact internationally.

Subsequent work by Allan White and his team within HortResearch, which is now incorporating recently developed methods such as marker-assisted breeding, is leading to the development of selections that will not only have obvious characteristics such as a distinctive external appearance, superb eating quality and excellent storability, but will also have multiple resistances to diseases such as black spot (apple scab), fire blight and powdery mildew. The focus has clearly shifted, therefore, to not simply meeting the expectations of consumers but to advancing the objective of achieving greater sustainability in fruit growing methods used in this country.

The successful introductions of Gala and Braeburn in the 1960s and 1970s were borne not solely from the special and subsequently successful characteristics of these varieties but from the critical need for the New Zealand industry to seek higher market returns in order to remain financially viable. The evaluation and commercial development of these varieties coincided with the culmination of research work, originally done by Dr. Don McKenzie during the 1950s and 1960s, which investigated options for the selection of new rootstocks and new tree training methods that would best suit apple production under New Zealand conditions.

This led to the selection of MM.106, particularly for adoption in Hawke's Bay, and to M.793 for use in heavier soils and in replant sites. These rootstocks provided excellent resistance to woolly apple aphid, appropriate vigor control, good precocity and acceptable resistance to soilborne diseases.

The combined use of the McKenzie central leader system with vigor-controlling rootstocks provided new growing methods that altered the economies of apple growing in New Zealand through:

- increasing tree density from 280-300 trees/ha (113 to 121 trees/acre) to around 550 trees/ha (223 trees/acre).
- reducing the time to significant production from 7 to 10 years down to 4 to 6 years.
- increasing economic yields from around 50 to up to 90 tonnes per hectare.
- increasing export packouts by achieving better color grades and larger and more uniform fruit size (Table 2).

Subsequent changes such as the development of the slender pyramid system—which includes the adoption of elements from the French axis system—have seen an increase in the number of trees being planted (up to 1000 trees/ha; 405 trees/acre) and a modification of tree form to allow better light penetration through the tree canopy and a greater use of renewal pruning methods.

More recently, more dwarfing rootstocks such as Mark, M.9 and M.26 have been used but resistance to woolly apple aphid remains a limitation in such plantings.

From the mid-1960s and 1970s, therefore, there was a coincidence between the availability of new cultivars, the adoption of new rootstocks and the development of new tree training methods that together significantly changed the viability of the New Zealand apple industry. Rates of adoption were high (Fig. 5). In 1982, 33% of the crop submitted to the New Zealand Apple and Pear Marketing Board was Granny Smith (110,162 MT) but by 1995 this had dropped to only 10% (to 28,953 MT). Over the same period, the proportion of Royal Gala/Gala had increased from 10% (34,016 MT) to 25% (75,388 MT) and of Braeburn from 7% (24,070 MT) to 32% (96,552 MT).

Not only was there rapid turnover of varieties within orchards over this period but the total area (and therefore total production) also increased quite dramatically from

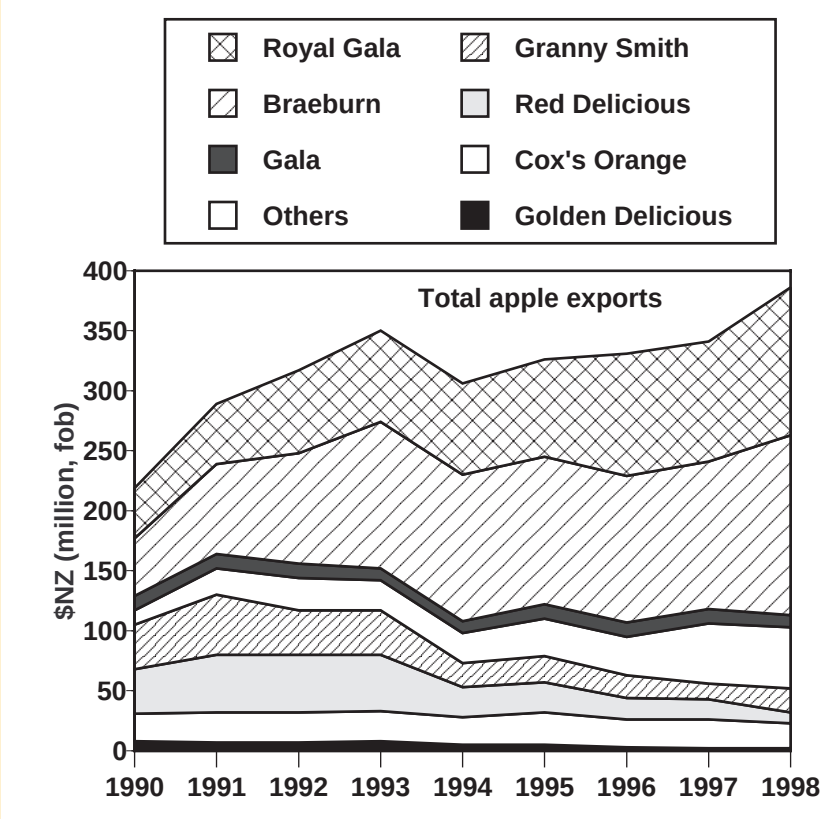
TABLE 2

**Proportion of fruit (%) in different size grades for Granny Smith apple grown on different orchard systems (adapted from Warrington et al., 1989).**

| Orchard system | Fruit size grade (count/carton) | | | | |
|---|---|---|---|---|---|
| | >175 | 150-163 | 125-138 | 100-113 | <88 |
| Multi-leader vase | 35 | 30 | 23 | 11 | 1 |
| Established central leader | 16 | 18 | 26 | 31 | 9 |
| Axis | 2 | 6 | 16 | 44 | 32 |

FIGURE 5

**Revenues from apple exports ($NZ million, fob), by variety from 1990 to 1998. The displacement of older varieties such as Granny Smith and Red Delicious by Royal Gala and Braeburn is clearly shown (Source: Statistics NZ).**



8,675 hectares (21,436 acres) in 1988 (up from 2,411 hectares [5,958 acres] in 1973) to 11,044 hectares (27,290 acres) in 1994.

The results for New Zealand growers over this period were dramatic. Fruit from this country consistently achieved prices in excess of other exporting nations, especially when compared with those competitors located in the Southern Hemisphere such as South Africa, Chile and Argentina (Fig. 6). In some instances, these differences have been up to three-fold in magnitude.

In spite of the successful returns achieved throughout the 1980s and 1990s (including 1999 when, although export prices were severely depressed, New Zealand fruit continued to attract premium returns on world markets), the lessons learned only 20 to 30 years earlier appear to have been readily forgotten by many. The industry's dependence on Granny Smith in the 1970s transferred to an even greater dependence on the two cultivars Royal Gala and Braeburn by 1995, when these comprised 57% of the total export crop.

Experience with both Royal Gala and Braeburn has demonstrated the significant lead time required for the development of a new apple cultivar. Although Royal Gala was selected in 1969, it was 20 years before crop volumes reached around 10% of the crop submitted for export and 35 years before it reached 25% of the volume exported.

It is appropriate to acknowledge the development of Pacific Rose and Southern Snap as new cultivars for the New Zealand industry. The crosses for these selections were made in the late 1960s and the cultivars were named in 1995. By 1999, however, the total amounts of Pacific Rose exported had reached only small volumes, equivalent to only a few percent of the current Braeburn exports. Rates of development of new cultivars will have to be far more rapid than this if returns from any premiums realized are to be maximized in the future.

A significant amount of the time required for development, especially during the first decade after the release of a new cultivar, is spent learning about it, developing appropriate tree management methods, setting and revising harvest maturity standards, resolving any production difficulties and defining appropriate postharvest handling and storage protocols. Even where an advanced selection may represent one progeny from 10,000 original hybrid seedlings, there is no guarantee and there should be no absolute expectation that the selection will be commercially successful. This is especially the case where a cultivar is commercially released with little prior testing and/or where diverse parentage (e.g., from wild progenitors) has been used.

Modern cultivar development will increasingly need to employ more rapid, fast-track methods of evaluation and fruit growers undoubtedly will have to accept greater risk of failure of advanced selections if new cultivars are to be released more rapidly and more frequently.

Recently developed methods of young tree management in the nursery and following establishment in the orchard can now markedly accelerate early production of a new cultivar and produce fruit of export quality. Such approaches will allow more rapid evaluation of new selections and more rapid generation of the volumes of fruit required for evaluation in overseas markets.

## TABLE 3

**Impact of fruit growing region on apple yield. Mean values for first three cropping seasons (Jonagold/M.9; modified from Tustin et al., 1997).**

| | Crop density (fruit no./cm$^2$ TCA) | Mean fruit weight (g) | |
|---|---|---|---|
| Hawke's Bay/NZ | 4.1 | 375 | (100%) |
| Kent /UK | 3.3 | 196 | (52%) |
| New York/USA | 3.0 | 197 | (53%) |
| Cadriano/Italy | 1.5 | 302 | (81%) |
| Washington/USA | 1.5 | 277 | (74%) |
| Georgia/USA | 1.0 | 262 | (70%) |

## TABLE 4

**Impact of timing of leaf fall on following season fruit size (5-yr-old Royal Gala/M.9; after Tustin, Stanley and Adams, 1997).**

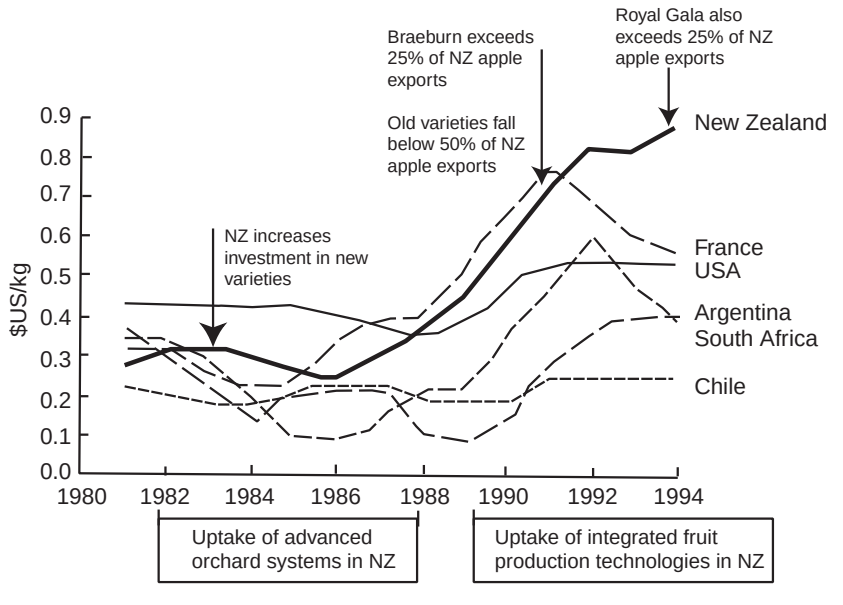
| Timing of leaf fall | Mean fruit weight (g) | Fruit number per tree | Fruit density (no./cm$^2$ TCA)** |
|---|---|---|---|
| Untreated* (natural leaf fall) | 147 | 159 | 10.0 |
| Harvest + removal at 10 days | 138 | 156 | 9.7 |
| Harvest + removal at 31 days | 134 | 153 | 9.5 |

*Harvest + 84 days.

**Trees thinned to common fruit density in December.

## FIGURE 6

**Prices obtained for export apples ($US/kg) between 1982 and 1996 from six apple exporting nations (Source: Heijbroek et al., 1997).**



## A COMPARATIVE ADVANTAGE

There are a number of factors which provide a comparative advantage to New Zealand fruit growers in contrast to those producing fruit in other regions around the world (Fig. 7). These factors, which have received only limited study, lessen the vulnerability of those engaged in commercial fruit production as yields tend to be higher and more consistent from trees that have higher growth rates and higher levels of carbohydrate reserves (Table 3).

### Temperature

New Zealand, being surrounded by ocean, has a mild maritime climate year-round. Daytime temperature maxima in summer rarely exceed 30˚C (86˚F) minimizing tree stress and, significantly, night temperatures during the growing season are always cool (typically 5 to 15˚C; 41 to 59˚F). Cool nighttime temperatures lessen losses of carbohydrate reserves through respiration, leaving more available for fruit growth, flower bud development, continuing vegetative growth and reserve carbohydrate accumulation.

Winter conditions are also moderate and the short, mild winters, while providing adequate conditions to satisfy winter chilling requirements, are such that trees are never subjected to winter injury.

The lack of temperature extremes between summer and winter does mean, however, that the onset of spring can be prolonged, greatly extending the flowering season and enhancing potential exposure to spring frosts. Many New Zealand orchards are, therefore, equipped with wind machines or they use helicopters to disrupt the inversion layers during radiation frost conditions and so minimize fruit losses through frost injury.

The extended flowering season in spring does, however, provide other challenges. Chemical thinning, which usually can be successful in continental climates where bloom is concentrated, can fail to work in New Zealand because bloom is more prolonged and temperatures more variable. A long flowering season, which for Royal Gala may last for 2 or even 3 weeks, also leads to a prolonged harvest period and, as a consequence, selective picking is required to ensure that fruit is harvested at optimum maturity.

The main environmental threat to apple growing in New Zealand is the incidence of hail. Very few growers install hail netting and major losses can be sustained as occurred, for example, in Hawke's Bay in 1994 and again in 1996.

The transition from summer to winter is also very prolonged, resulting in a considerable time interval between fruit harvest and leaf fall, during which time photosynthesis and accumulation of reserve carbohydrates can continue. This is most likely to be a significant factor in allowing strong return bloom annually following regular heavy cropping (Tables 4, 5, 6).

### Solar Radiation

Both of the principal growing districts, Hawke's Bay and Nelson, are located in the rain shadow of nearby mountain ranges and are remote from major urban centers and industrial regions. Consequently, sky conditions in both regions are consistently clear, leading to high levels of incoming solar radiation, particularly late in the season. These high light levels coupled with the extended growing season contribute strongly to high crop yields, large fruit sizes and the strong return bloom pattern that characterize the performance of most varieties under New Zealand conditions.

### Soil Types

The alluvial soils in Hawke's Bay are typically deep and naturally fertile, providing few challenges with regard to managing the mineral nutrition requirements of trees growing in this region. Similarly, water holding capacity within the root zone in

TABLE 5

**Impact of timing of leaf fall on following season fruit set (5-yr-old Royal Gala/M.9; after Tustin, Stanley and Adams, 1977).**

| Timing of leaf fall | Spurs final set (%) | Laterals final set (%) |
|---|---|---|
| Untreated* (natural leaf fall) | 131 | 49 |
| Harvest + removal at 10 days | 85 | 33 |
| Harvest + removal at 31 days | 99 | 28 |

*Harvest + 84 days.

TABLE 6

**Impact of timing of leaf fall on following season trunk growth rate (5-yr-old Royal Gala/M.9; after Tustin, Stanley and Adams, 1997).**

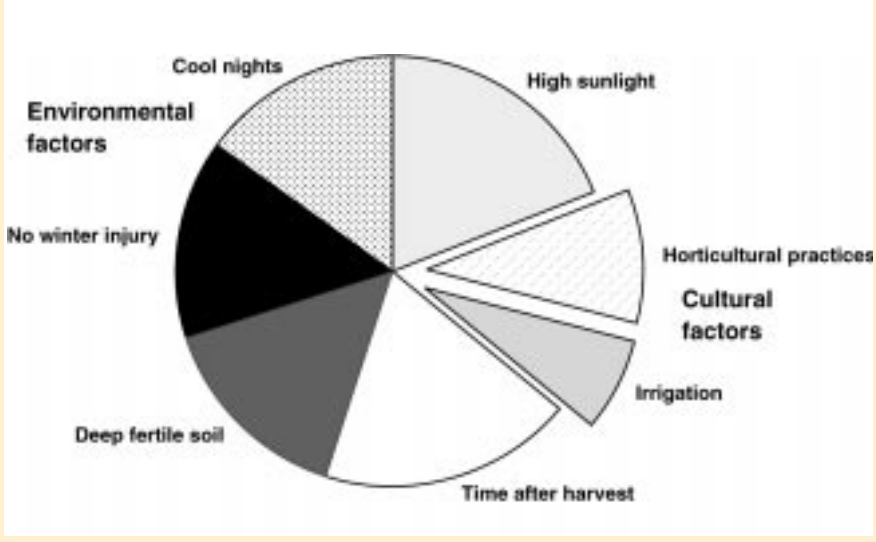
| Timing of leaf fall | Change in TCA ($mm^2$/day)** |
|---|---|
| Untreated* (natural leaf fall) | 1.75 |
| Harvest + removal at 10 days | 1.50 |
| Harvest + removal at 31 days | 1.28 |

*Harvest + 84 days.

**Rate for period 200 to 400 days after harvest + 10 days.

FIGURE 7

**Factors contributing to the comparative advantage of the New Zealand apple industry (adapted from Schupp et al., 1999).**



these soils is substantial, providing fewer demands with respect to the precision of irrigation management.

Alluvial soils in the Nelson region confer similar advantages, but the clay soils on the rolling hill sites do require greater management intervention.

## OTHER SECTORS

The primary content of this paper is largely about apples as that crop is a main focus of the IDFTA. A focus on New Zealand fruit exports, however, would be incomplete without some attention being given to kiwifruit and the other fruit sectors showing strong growth within the horticulture industry in this country.

### Kiwifruit

Kiwifruit, like the apple varieties Royal Gala and Braeburn, is a success story unique to New Zealand. In the 1998/99 season over 60 million trays valued at $NZ473 million were exported to 42 different countries. This represents approximately 23% of world production (in contrast, apples represent only about 1.4%).

Following poor returns in the early 1990s, the industry has since gone through considerable rationalization with a reduction in the total area planted and, through aggregation, a reduction in the number of orchards, the number of packhouses and the number of coolstore operations, all of which have improved the industry's viability. Throughout that period, however, both the volume of fruit sold and production efficiency have increased significantly (Table 7).

Until recently the industry worldwide was based almost entirely on the cultivar Hayward which had originally been selected in the late 1920s and named in the 1950s. More recently the HortResearch breeding program has been successful in developing the early maturing cultivar Tomua and particularly the new gold-fleshed cultivar Hort16A which is being marketed as Zespri™ Gold Kiwifruit. This latter cultivar is currently providing returns to growers that are two to three times greater than those for Hayward.

There remains considerable scope, from within the over 50 species of Actinidia available, to produce many more exciting new commercial selections with different shapes and sizes, different skin and flesh colors and different ranges of maturity.

The kiwifruit industry has not focused on the use of specialty rootstocks, preferring instead to use seedlings rootstocks of A. deliciosa or, more recently, to top-work Hort16A onto vines of Hayward that have been headed back. One specialist rootstock, Kaimai, has been bred and selected and this confers enhanced precocity in the scion variety.

Rootstocks for kiwifruit that were able to control scion vigor (thereby reducing the need to summer prune and enhance the options for "spur" bearing), to alter fruit quality (particularly to increase carbohydrate content) or to provide resistance to soilborne diseases (especially *Armallaria* spp.) would be of considerable value to the industry.

### Winegrapes

The most rapidly expanding horticulture sector in New Zealand currently is the wine grape industry. Planted areas have more than doubled in the last decade from 4,880 ha (12,058 acres) in 1990 to 9,380 ha (23,178 acres) in 1999. Exports have risen to $NZ123.3 million in 1999, up from only $NZ18.4 million 10 years earlier. They are projected to grow to $NZ275 million within 3 years and to $NZ500 million or more within the decade.

Largest increases in planted area have occurred for Chardonnay (235%), Sauvignon blanc (306%) and Pinot noir (316%). A range of rootstocks is used.

### Avocados

Avocado exports have also been increasing dramatically being worth only $NZ1.05 million in 1985 but growing to $NZ9.203 million within a decade and exceeding $NZ19.5 million in 1999. Previously exports have been mainly to Australia but North America is now importing increasing volumes of the New Zealand crop. Annual yields from mature plantings are typically 20 to 30 tonnes per hectare of high quality fruit.

The New Zealand industry, like the avocado industry elsewhere in the world, urgently requires an effective, easy-to-propagate, vigor-controlling rootstock that will provide options for markedly reducing the size of mature trees and provide the means to increase tree density per hectare, to increase yields and to reduce labor costs.

The rich diversity of different fruit crops grown throughout New Zealand provides a depth of professional services that support this export sector. Specialist suppliers of spray chemicals and spraying equipment, orchard machinery, packaging materials, fruit grading equipment, cool and controlled atmosphere technologies, and air and sea-freight services are available, and they readily transfer their knowledge and skills effectively from one sector to another, especially in such a small country. Small emerging sectors can also benefit from advances made in the larger, more established sectors.

## CONTRIBUTIONS OF RESEARCH

New Zealand horticulture has been supported by very strong government-funded research and development programs for over 50 years. For much of that time, the private sector has also invested strongly and their contributions currently represent around 40% of the total R&D spent in the fruit industry. Until a decade ago the government also supported a strong horticultural extension service, which has since been replaced by private consultancy companies that are staffed largely by those from the previous government service.

There has always been a good integration in New Zealand of the fundamental and more applied research being carried out by scientists, with the technology transfer initiatives of consultants and the application of new developments by innovative fruit growers within their commercial operations.

TABLE 7

**Changes in the productivity and structure of the kiwifruit industry in New Zealand from 1992 to 1998 (Source: Annual Report 1998 & 1999 Kiwifruit New Zealand).**

| Season | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|
| **Crop volumes Trays submitted (million)** | **67.7** | **55.3** | **55.8** | **58.7** | **63.1** | **60.6** | **63.1** |
| General Statistics | | | | | | | |
| Yield (trays/ha) | 4,636 | 4,516 | 5,492 | 5,756 | 6,110 | 5,919 | 6,305 |
| Area planted (ha) | 14,594 | 12,256 | 10,161 | 10,210 | 10,329 | 10,243 | 10,015 |
| Growers (no.) | 3,327 | 2,748 | 2,335 | 2,205 | 1,596 | 1,766 | 1,657 |
| Packhouses (no.) | 349 | 252 | 190 | 148 | 137 | 126 | 118 |
| Coolstores (no.) | 180 | 146 | 125 | 119 | 108 | 111 | 106 |

Field days, grower seminars, industry conferences and popular and technical research publications are routine in all sectors of the fruit growing industry. There is no doubt that these activities have readily enabled growers in this country to remain up-to-date with new discoveries both in New Zealand and overseas and to have the capacity to rapidly adopt new cultivars, new cultural and management techniques and emerging postharvest technologies to achieve competitive advantage.

R&D has made many significant contributions to the New Zealand fruit growing industry through:

- breeding and selection of new, often innovative cultivars.
- development of new tree training and management methods to optimize both yield and fruit quality, including the use of appropriate rootstocks.
- development of integrated fruit production methods.
- determination of appropriate maturity and related grade standards.
- development of protocols for the effective postharvest management of fruit from the tree to the marketplace to ensure that consumers are provided with premium condition, ready-to-eat product.

Several of these contributions have been mentioned elsewhere in this paper, but it is important to relate briefly to the major changes that have occurred within the last 5 years with respect to the urgent need to reduce dependence on the use of chemical intervention for the control of weeds, pests and diseases in fruit crops exported from New Zealand.

Internationally consumers are demanding access to safe, healthy foods that are free of detectable pesticide residues. Buyers from multi-national food chains, therefore, have been quick to set stringent standards on suppliers in order to provide consumers with produce that meets the preferred standards. In an abundantly supplied marketplace, compliance with such standards is obligatory if continued access is to be assured.

In both the kiwifruit and apple industries, strong underpinning R&D programs provided the knowledge and expertise needed to rapidly introduce integrated fruit production (IFP) methods into the New Zealand fruit industry and so ensure continued access to international markets.

The R&D programs provided detailed information about:

- the phenology and ecology of the key pests.
- the interactions between environment and infection for key diseases.
- the computer-based expert systems required to define disease infection events.
- the protocols and methods needed for pest monitoring including the development of pheromone-based traps and the use of mating disruption.
- the effectiveness, abundance management of effective predators.
- options for the application of alternative and softer pesticides.

Adoption of the new technologies available has been dramatic with both apples (Fig. 8) and kiwifruit:

1990 Trial programs on 20 orchards, 250,000 trays produced.
1991 3 million trays produced (for the Italian market) using the "Kiwigreen" program.
1992 6.4 million trays produced.
1993 Approximately 50 million trays produced (80% of the total crop).
1994 The entire crop of 61 million trays grown under either "Kiwigreen" or organic production methods.

## STRONG BRANDS

By world standards, the size of any sector within the New Zealand fruit industry is small, for example, only 273,000 tonnes of apples, 220,000 tonnes of kiwifruit and 21,000 tonnes of wine were exported in 1999. Being noticed in the international marketplace is, therefore, a challenge for any marketer selling produce sourced from this country.

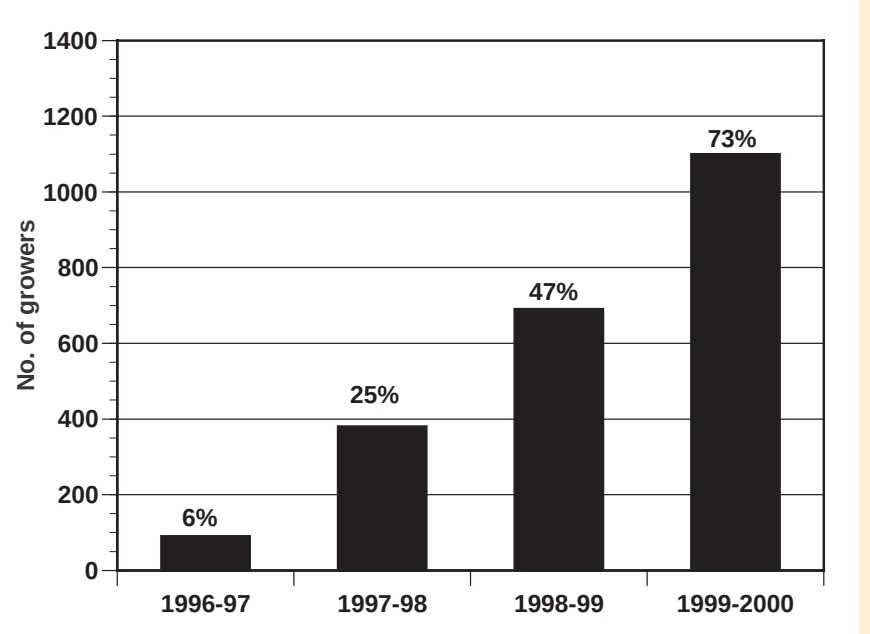
Up until now, exports of apples from New Zealand have been coordinated under statutory provisions, by the New Zealand Apple and Pear Marketing Board (through its marketing arm ENZA FRUIT New Zealand [International]) and similarly kiwifruit has been exported under similar provisions by the New Zealand Kiwifruit Marketing Board through its marketing arm Zespri (International) for the past decade. The provisions under which these boards operate have been under review recently by the government with an original intention to completely deregulate both of the sectors. The outcome of that review remains somewhat uncertain at this time but it is clear that a greater proportion of the apple crop, and probably the kiwifruit crop, will be exported by independent entities from now on.

It is not the intention of this paper to summarize the single desk/deregulation debate, a debate which has been prolonged and certainly, at times, acrimonious. It is clear, however, that the marketing boards have in the past made substantial contributions to the success of fruit exports from New Zealand, amongst which include the ability to:

- provide product in volume to large multi-national buyers to specification and, increasingly, continuously throughout the year.

FIGURE 8

**Uptake of integrated fruit production (IFP) technologies by apple growers in New Zealand. Approximately 80% of the total apple crop was produced using IFP within 4 years of the methods being introduced to the industry. Within this period, the use of insecticides has been halved and the use of organophosphate insecticides reduced by 75%.**



- promote the New Zealand brand in major publicity campaigns.
- work in a coordinated manner with regard to securing market access, for example, into countries such as Japan.
- negotiate shipping, cool storage, packaging, and transport arrangements to secure significant discounts on large volumes.
- maintain a global network of marketing agents.
- undertake a range of "industry good" activities, including support for significant research and development programs.

There is no doubt that the ENZA and ZESPRI brands have become well recognized and respected internationally and that fruit marketed under those brands has been able to command premium returns in a wide range of international markets.

Other sectors, such as avocados, persimmons and summerfruit, have developed coordinated export marketing strategies which involve a disciplined approach to export market development by both growers and exporters. These strategies define the requirements for factors such as quality management and the setting of grade standards. Coordination is achieved via the sector's own association as through the New Zealand Horticultural Export Authority.

In the New Zealand wine industry, considerable success has been achieved with market development in the United Kingdom and in other markets via the generic export activities coordinated by the Wine Institute of New Zealand. These include the coordination of various tastings, attendance at wine fairs, advertising and interactions with the media.

A common theme across all of these export initiatives has been the underlying theme of representing produce from New Zealand as coming from a country that is pristine, free from major pollution, sparsely populated and credible with respect to producing safe, high-quality traceable produce through the use of sophisticated environmental management systems.

These systems include kiwifruit's "KiwiGreen" program, "Green Gold" for persimmons, "Avo Green" for avocados and the Integrated Fruit Production (IFP) program for apples. The systems include strong elements of sustainability and are especially focused on eliminating pesticide residues from the crops produced.

This image has sometimes been captured in the wording of the product brand as evidenced by "the riches of a clean green land" positioning line used by the Wine Institute of New Zealand.

## THE FUTURE

Predicting the future fortunes of exports from the New Zealand horticulture sector is not easy in the face of the recent oversupply of fresh and processed fruit products onto many of the world's affluent markets. Nonetheless, forecasts estimated for the sectors by the New Zealand Institute of Economic Research in 1995 and the New Zealand Trade Development Board in 1994 for the years 2000 and 2001, respectively, have largely been met or exceeded, confirming that previous confidence in future performance was well justified.

There are many factors that are likely to contribute to continuing success in the fruit industry in New Zealand including:

- the recovery of economies in the Asian region.
- re-entry to the USA for kiwifruit exports from New Zealand.
- the development of markets other than the UK in the European Union.
- the emergence of innovative cultivars for New Zealand producers.
- the globalization of marketing networks.

In contrast, challenges remain with:

- the aggregation of multinational supermarkets and the strengthening of their buying power.
- the continuing maintenance of production subsidies and tariff mechanisms in many importing countries.
- the emergence of China as a major fruit-producing and exporting nation.
- the disruptions due to Producer Board reviews within New Zealand.
- the shift in emphasis by the New Zealand government away from supporting research associated with the traditional primary production sector to high technology sectors and the likely implications of that change in policy on the ability of the industry to sustain continuous innovation.

The fruit industries in this country have faced similar challenges in the past and they have the experience, infrastructures, diversity and leadership to continue to succeed and be major suppliers to international markets into the future.

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