KIWIFRUIT BOOM OR BUST: THE EFFECT OF CLIMATIC VARIATION ON KIWIFRUIT PRODUCTION

R. A. Martin

New Zealand Kiwifruit Marketing Board

The New Zealand kiwifruit industry has had a reputation of making millionaires in its early days and in making people bankrupt in its later years. However, as it is often the case, reality is somewhere between these extremes. Sure, there have been people who have made a lot of money in the early days of the kiwifruit industry in New Zealand and equally in the post 1987 crash, there are people who have lost money. They paid too much money for land, they had to borrow heavily to develop properties and were then hit by the very high interest rates of the mid to late 1980s - hard lessons in the economics of horticulture production.

The reality today is that there is a good solid kiwifruit industry in New Zealand, with 2,200 efficient growers who have reduced the cost of production and increased their productivity dramatically over the last five years. They are serviced by a very efficient post harvest sector that grades, packs and then stores the kiwifruit until required for export. There is great competition between these operators to secure throughput for their facilities. All operate to New Zealand Kiwifruit Marketing Board standards for fruit - shape, pest and disease status, packaging, checking the condition of fruit prior to export and for shipping conditions. It is a very sophisticated quality system that has given New Zealand kiwifruit a top world-class reputation for quality and consistency of both product and service in the face of competition, not only from the other kiwifruit producers such as Chile in our own season, but also at either end of our season from the northern hemisphere producers - California, France, Italy, Greece, Japan and to a lesser extent Korea and Iran. Since the 1989 season, the New Zealand kiwifruit industry has had a strong single desk marketing organisation which has brought discipline to the marketing of our kiwifruit internationally - the envy of other producing countries.

To give some idea of the industry size, Table 1 shows some statistics of the New Zealand industry and Table 2 shows other kiwifruit producing countries.

	1989	1994
Growers	4273 orchards 4154 owners	2791 orchards 2298 owners
Packhouses	532	188
Coolstores	193	125
Production (trays)	42.76m	55.81m
Hectares	15,895	10,161

Table 1: Kiwifruit statistics

	1989	1994
Italy	210	236
France	36	53
Greece	11	45
USA	32	36
Japan	39	52
Korea	3	9
Others	5	22
NORTHERN Total	336	453
NZ	188	217
Chile	14	83
Others	7	5
SOUTHERN Total	210	305
TOTAL	546	758

Table 2: World productin trends, thousands of tonnes

Kiwifruit is grown in New Zealand in areas ranging from Kerikeri to Nelson but 80% is grown in the Bay of Plenty.

Around the world, a limited number of countries grow kiwifruit, often in areas that are climatically difficult for kiwifruit. For example, in areas prone to early or late frosts, or that have no rainfall in the summer months.

Essentially kiwifruit has two very narrow bands of latitude around the world in which it will grow satisfactorily commercially. Kiwifruit vines require a site free from spring and early autumn frosts with a well drained soil. It likes an adequate but not excessive supply of moisture throughout the year and a relatively high atmospheric humidity. Although frost tender when in leaf, it benefits from a certain amount of winter chilling for full fruitfulness the following season. Hail will damage leaves and fruit at any time. So, we have a vine that is sensitive climatically as to where it will grow.

Kiwifruit has several critical seasonal climatic factors for optimum vine growth and fruit production.

It is economically important for the industry that the vines receive sufficient winter chill to initiate flower buds and that pollination is effectively carried out. To reduce season to season variability in flower bud initiation, growers can use a spray applied to the vines in August - it has become a valuable orchard management tool.

July	Winter Chill	Flower bud initiation
September	Bud Burst . . .	Leaf burst
November	Flowering	Pollinating
Summer		Fruit growth
Autumn	Fruit maturity/harvest	

Table 3: Critical climatic seasonal requirements

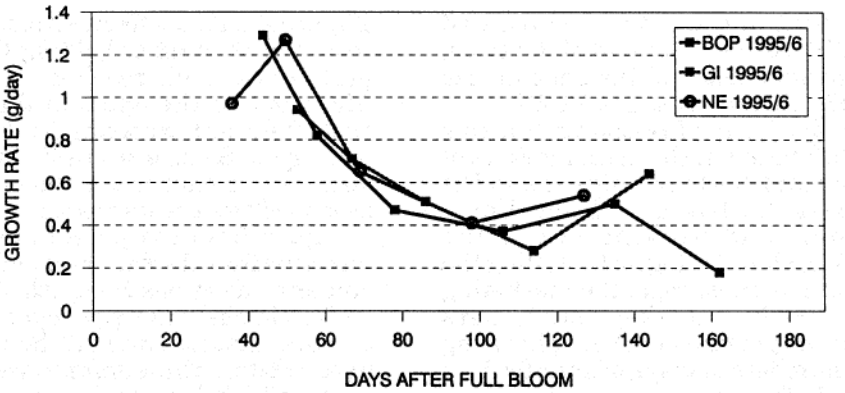

Figure 1: Regional Fruit Growth

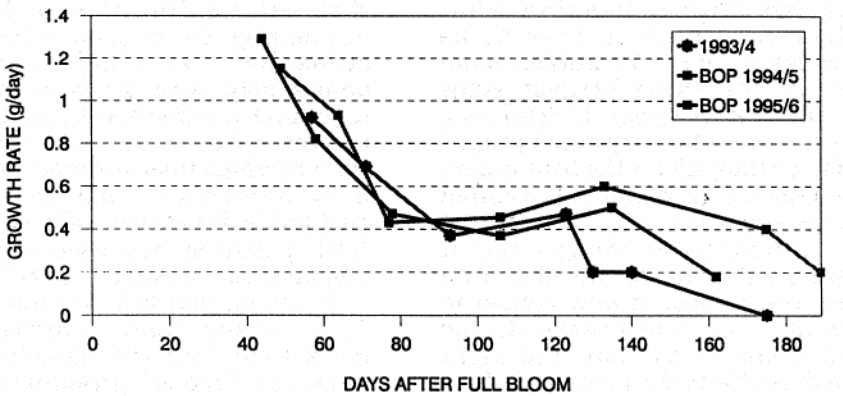

Figure 2: Seasonal fruit growth

To ensure effective pollination, growers place beehives in their orchards. These hives are especially prepared for kiwifruit pollination and the bees are fed sugar syrup to encourage pollination. The big influence on bee activity however is weather. Bees will not leave their hives if it is raining. Therefore, weather is very critical at this time of flower pollination to form fruitlets that develop into fruit. Some of the seasonal production variation is due to either good or poor pollination.

Having set fruit, the number of cells in each fruit increases for the two months after pollination, say to the end of January. Then, for the remainder of the season, these cells increase in size to give the final fruit size.

There are seasonal and regional variations in fruit growth (Figure 1, Figure 2).

It should be noted that these are average fruit sizes and growth. Within these averages are variations. Kiwifruit are graded by weight into eight different counts - the number of fruit in a standard tray. The distribution across these eight counts varies seasonally, and in some cases quite dramatically. Take the variations in the 1994 and 1995 season for example (Figure 3). In 1994, there was

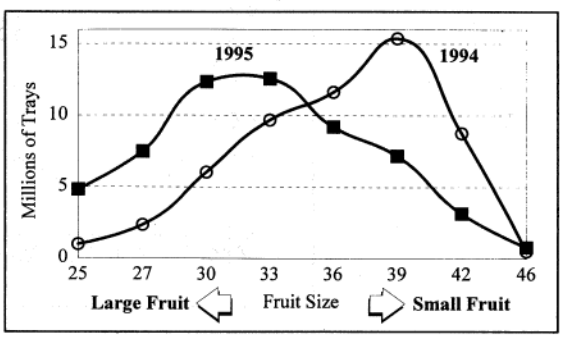

Figure 3: Seasonal changes in distribution of fruit size.

16.8% of the fruit in count 42. This reduced in 1995 to 5.7%. At the other end of the scale, in 1994, there was 10.9% of the fruit in size 30 but in 1995 this increased to 21.2%.

The New Zealand Marketing Board's marketing staff based in the main markets of Europe, Japan and North America and in the emerging markets, based in Hong Kong, Kuala Lumpur and working out of the Auckland office, plan strategies for selling the crop. For example, in Europe, the marketing staff work with the key customers (particularly supermarkets) in planning deliveries of numbers of trays of specific fruit sizes by week for the season. These are supported by plarmed advertising and promotional campaigns. Imagine what happens when all the plans have to be changed because we have 12 million more trays to sell in the three largest sizes compared to the previous year. It involves a great deal of extra work for very many people.

A further factor that affects the fruit is date of maturity or harvest. Kiwifruit is harvested when its soluble sugar level, its Brix content reaches 6.2%. It used to be thought that it was cool evenings that made the Brix level increase. However, research undertaken in the late 1980s and early l990s demonstrated that it is the mean of the day and night temperatures that affects the increase in Brix level. That is, a warm day following a cool night negated the effect of the cool night in increasing the Brix level.

There is a variation of two or even three weeks in reaching a Brix level of 6.2% (Figure 4). This affects ships waiting to load fruit and the cost of holding these vessels in ports until fruit reaches maturity is high. There is also the effect in the market when customers are expecting fruit to arrive but it is delayed. Sales lost at this early time of the year are in fact never made up during the season. They are lost sales.

Apart from the points raised above that directly affect the fruit size and harvest dates, climatic variations have other effects.

Pest incidences vary depending on winter climate, that is how well the population does over winter, the summer weather on how pests will thrive and breed and the autumn weather for late infestations. It is fortunate that with kiwifruit the number of pests are not as high as on some other horticultural crops but nevertheless they do vary seasonally and growers have to take appropriate action to take control of them. The industry has developed the "Kiwigreen" system which involves monitoring pest levels in growers orchards and only spraying when pest levels dictate control measures. So called "soft" pesticides are used to meet consumer demands for residue-free fruit.

However, quarantine requirements of the 55 or so important countries in which we market our fruit still have to be met. Fruits must be free of quarantine pests and practically free of other pests.

Diseases affect kiwifruit at two main stages. At flowering, there is a disease called Sclerotinia that can cause significant losses to growers. Its effect can vary not only from

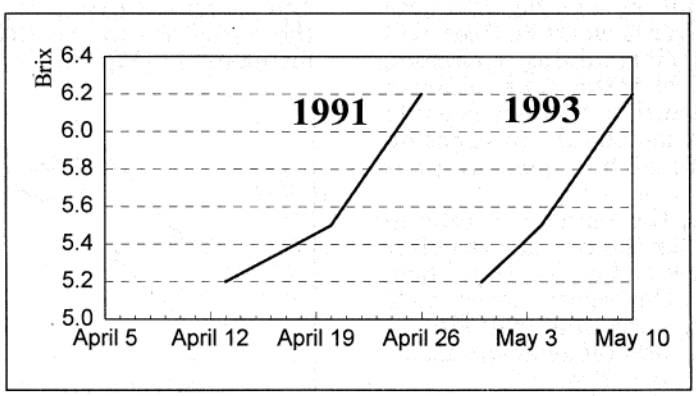

Figure 4: Key maturity dates for Hawkes Bay.

season to season but even from vine to vine where losses can be up to 25 or 30% of the potential fruit.

In storage, the main disease problem is Botrytis. This fungus has the ability to develop at zero degrees centigrade - an unusual fungus indeed. Infection of fruit takes place in the orchard but the disease only manifests itself after a few weeks in cool storage. In some seasons, losses can be quite high and in others they are low. We are still learning what factors control Botrytis in the orchard and therefore innocculum levels to infect the fruit. Opening up the leaf canopy to aid air movement through the leaves and fruit does appear to reduce the disease incidence.

Finally, the storage potential of kiwifruit varies seasonally - a year can be described as a soft fruit year (as distinct from a Botrytis year) or a good storing year. Although all fruit will soften with time, the rate can be faster in some seasons compared with others. Why this is so is not understood but clearly climate is the key factor. To complicate the issue, there are regional differences. Fruit from Nelson for example does not, in general, store as well as fruit from the Bay of Plenty.

In summary, the kiwifruit industry - growers, packhouses/coolstores and the marketers have to cope with wide variations in average fruit size, the distribution of fruit sizes, different dates of maturity, soft fruit or Botrytis years as well as the many challenges of competing in the international fruit market with, particularly, summer fruit in the northern hemisphere markets. There would be great value in climate prediction which will help the industry to develop systems to predict seasonal changes and seasonal events which will enable better planning to take place. The industry needs to know how much fruit will be produced, when it will be ready for harvest, what will be its count size distribution and how well it will store. That is a challenge for our Climatologists and Meterologists and that is only for the single variety Hayward. New varieties will be coming on stream - that is a whole new challenge.