

# Asparagus production in New Zealand: the contribution of agronomic studies

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## Abstract

Yield per hectare and area of the asparagus crop in New Zealand are given for the years 1963 to 1999. The results of agronomic studies on cultivar evaluation, plant density and soil type conducted since 1970 are outlined. The importance of considering past production records and these past agronomic studies in helping to achieve the national goal of doubling the current yield per hectare of asparagus by 2010 is discussed.

*Additional key words: asparagus production, New Zealand, agronomic studies*

## Introduction

At a March 2000 asparagus industry forum to discuss priorities and formulate a research policy, one of the goals decided was to at least double the average yield of the New Zealand crop by 2010. Discussion and comment at the forum inspired me to review selected aspects of past production records, and also consider the influence of results of agronomic studies on cultivars, plant density and soil type (i.e., studies of factors that cannot be changed after the crop is planted). This review is intended as a contribution to achieving the goal of a two-fold increase in the yield per hectare of the New Zealand crop by 2010.

## Areas and Yield of Asparagus

Annual records of national asparagus production have been available since the first publication of New Zealand Horticultural Statistics by the Department of Agriculture in 1969. In that publication production for the years 1963 to 1968 was given and so 37 years of annual national asparagus production records are currently available (Fig. 1). There are three major phases in the production record:

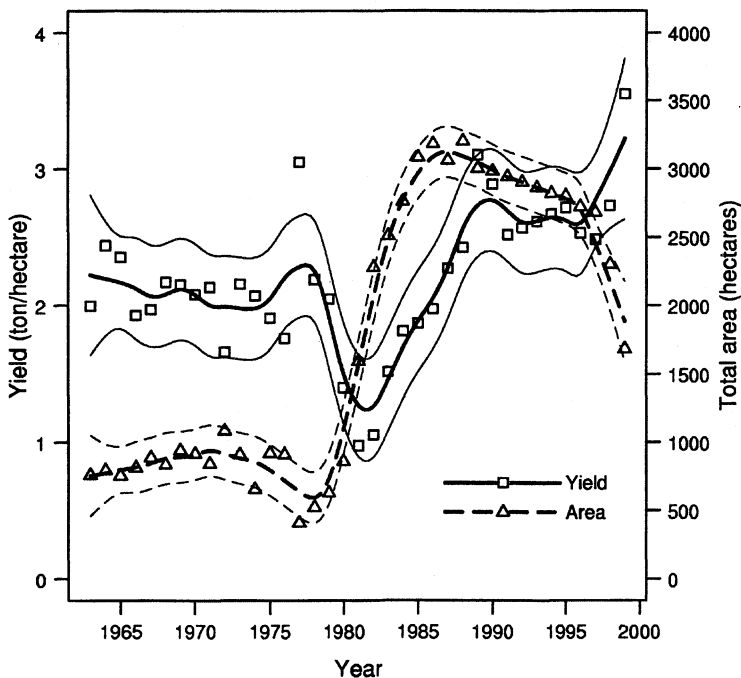
- 1963 to 1976 when the national asparagus crop occupied a much smaller area (average 860 ha) than in recent times. During this time most asparagus was grown in Hawkes Bay, which had 80% of New

Zealand's asparagus area in the early 1970s (Findlay and Ryan, 1974). Open-pollinated cultivars were grown, the dominant one being cv. Mary Washington 500W.

- 1977 to 1985 when there was a nearly eight-fold increase in area of the national asparagus crop. The main characteristics of this time were the planting of large areas of asparagus outside of Hawkes Bay and the removal of old beds in Hawkes Bay. The plantings were with hybrid cultivars, the most widely used being cv. Rutgers Beacon and F<sub>2</sub> cv. New Zealand Beacon.
- 1988 to 1997 when the area decreased slightly each year from a peak of 3200 ha. New plantings were with either hybrid cultivars (other than Rutgers or NZ Beacon) or clones.
- The loess smoothing routine in S-Plus (MathSoft) was used to calculate and display trends in both area and yield of asparagus in New Zealand in the years 1963 to 1999 (Fig. 1).

## Cultivar Evaluation

Evaluation of experimental and commercial hybrid cultivars from North America and Europe started in New Zealand in the 1970s at three sites – DSIR Lincoln, Levin HRC and a grower's property (conducted by Watties Research) in Hastings. Bussell *et al.* (1981), Falloon (1982) and Falloon and Nikoloff (1982) reported results from these earliest trials. A wider range of North



**Figure 1. Fitted lines (bold) and associated 99% pointwise confidence bounds (fine) for yield (t/ha) and area (ha) of asparagus crops from 1963 to 1999 in New Zealand.**

American and European hybrid cultivars were evaluated in the early 1980s at 29 sites, both on research stations and grower properties, covering all of New Zealand's major asparagus growing regions. Bussell *et al.* (1985), Brash and Bussell (1986) and McCormick and Thomsen (1995) reported this work (which has become known as National Asparagus Cultivar Trial No 1). Important results from these trials were:

- Cv. Rutgers Beacon yielded 30% to 60% higher than the control cultivar Mary Washington 500W in the three 1970s trials, but an average of 10% lower in National Asparagus Cultivar Trial No 1.
- Cv. 56x22-8 (= 'Jersey Giant'), Limbras Early (= Limbras 10 and Limbras 22) and Limbras Maincrop (= Limbras 18 and Limbras 26) yielded about double that of cv. Mary Washington 500W in both the three 1970s trials and National Asparagus Cultivar Trial No 1.

- Cv. UC 157 (a cultivar with excellent spear quality and colour) gave satisfactory yields only in Canterbury.

Cv. Jersey Giant was the highest yielding cultivar in a trial at Massey University (Nichols, 1985) conducted at the same time as National Asparagus Cultivar Trial No 1. The consistent excellent performance of cv. Jersey Giant in these trials led to it being used as the control in National Cultivar Trial No 2. However, when difficulties were experienced with large scale production of all-male hybrid seed of cv. Jersey Giant it was replaced with a dioecious hybrid Syn 4, which has the same female parent as cv. Jersey Giant. Syn 4 has been a high yielding cultivar commercially in New Zealand and is still used as a control in cultivar trials.

National Cultivar Trial No 2 was planted in 1986. It contained experimental hybrids from Watties Research and DSIR breeding programmes and all-male hybrid

replacements for the discontinued dioecious Limbras hybrids evaluated in National Cultivar Trial No 1. The intention of planting at seven sites and harvesting for two years was not fulfilled. It was well established at only three of the sites (due to problems of long distance transport and handling of seedling transplants) and harvesting and data analysis were not completed as intended (due to the intervention of government restructuring and the advent of user pays). Results from this trial have not been published.

National Cultivar Trial No 3 was planted between 1991 and 1994. It contained Syn 4 as the control cultivar and new Californian hybrids, New Zealand experimental and commercial hybrids, and New Zealand cloned cultivars. The trial was planted in each of the major asparagus districts of New Zealand. All aspects of establishing and recording the trials and of data analysis and reporting were under the supervision of the New Zealand Asparagus Council Research Committee. Detailed results of these trials have been published in several, mostly confidential, reports.

It seems, from the results of National Cultivar Trials Nos. 2 and 3, that Syn 4 and JWC 1 are the best seed cultivars in most New Zealand conditions. Cv. Taramea may be a suitable cultivar in some areas. The New Zealand cloned cultivars yielded poorly in National Cultivar Trial No 3. Some other New Zealand cloned cultivars have yielded up to 248% better than cv. Syn 4 in other trials harvested in 1991 and 1992 (Fraser-Kevern *et al.*, 1996). These initially promising results have not been confirmed by further trials.

### Plant Density

There have been varying recommendations on correct planting density in New Zealand. These have ranged from 10,300 plants/ha (Moffitt, 1959) to 30,000 plants/ha (Brandon, 1968), with the current recommendation being 22,000 to 30,000 plants/ha (Bussell, 1996). Attempts made in New Zealand since the late 1960s to experimentally determine correct planting densities have not produced useful results, primarily because trials have been conducted on low yielding sites. It should be noted that, with the exception of cv. Limbras 10 at Levin HRC (Bussell *et al.*, 1997), the correct density has been calculated to be or can be seen to be above the highest density (45,000 to 66,000 plants/ha) planted in the trials.

### Soil Type

The need to have the correct soil type (a moderately free draining sandy loam) has been emphasised in advisory publications on many occasions (e.g., June, 1951; Moffitt, 1959; Brandon, 1968; Franklin *et al.*, 1980; Bussell, 1996). It has been shown that crops on either less freely draining soils (e.g., clay loam) or more freely draining soils (e.g., dune sand) often yield only about half those on an ideal soil (Findlay and Ryan, 1974; Bussell *et al.*, 1985, Bussell and Prasad, 1988).

### Concluding Comments

1. Yields during most of the 1990s have been only about 0.5 t/ha higher than yields in the mid-1960s to the mid-1970s (Fig. 1). These disappointing 1990s' yields were caused by an unfortunate combination of factors. These included:

- the commercial unavailability of cv. Jersey Giant and UC 157 until the mid to late 1980s,
- the high cost (and then unavailability) of cv. Limbras and a few other high yielding European hybrids, e.g., Lucullus from the late 1970s,
- and the ready availability and low cost of cv. Rutgers Beacon and New Zealand Beacon.

Incorrect choice of soil type or plant density may have further contributed to poor yields of some blocks established in the 1980s.

2. Though there is currently an upward trend in yield (Fig. 1) I suggest that there is no room for error in terms of cultivar, soil type or plant density in new plantings over the next decade if the goal of doubling yield per hectare by 2010 is to be achieved. An important contribution towards achieving the goal would be a more detailed knowledge than appears to be available at present of cultivars, soil type, plant density and ages of current crops. We can hope that current new trials studying cultivars and plant density will also make an important contribution.

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**Appendix 1. Yield (t/ha) of fresh export, fresh domestic and process asparagus in New Zealand and total area (ha) of the crop in each year from 1963 to 1999.**

year	fexport	fdom	process	total	area	t/ha
1963	0	303	1217	1520	761	2.00
1964	0	443	1495	1938	795	2.44
1965	0	162	1614	1776	755	2.35
1966	0	153	1416	1569	814	1.93
1967	0	308	1441	1749	887	1.97
1968	0	299	1521	1820	838	2.17
1969	0	260	1764	2024	940	2.15
1970	0	290	1613	1903	915	2.08
1971	0	292	1506	1798	843	2.13
1972	0	400	1394	1794	1082	1.66
1973	0	437	1524	1961	909	2.16
1974	0	276	1082	1358	656	2.07
1975	0	455	1300	1755	920	1.91
1976	0	350	1250	1600	910	1.76
1977	0	200	1050	1250	410	3.05
1978	0	350	800	1150	525	2.19
1979	90	450	750	1290	630	2.05
1980	102	450	650	1202	860	1.40
1981	150	500	900	1550	1590	0.97
1982	200	900	1300	2400	2280	1.05
1983	205	900	2700	3805	2510	1.52
1984	600	950	3450	5000	2760	1.81
1985	1000	1000	3750	5750	3080	1.87
1986	1400	875	4000	6275	3180	1.97
1987	1550	1450	3950	6950	3060	2.27
1988	1900	2000	3850	7750	3200	2.42
1989	1250	2000	6050	9300	3000	3.10
1990	1600	2400	4600	8600	2980	2.89
1991	1700	2850	2850	7400	2940	2.52
1992	1670	2650	3125	7445	2900	2.57
1993	1650	2420	3400	7470	2860	2.61
1994	1625	2200	3700	7525	2820	2.67
1995	1600	2000	4000	7600	2800	2.71
1996	1250	1825	3800	6875	2720	2.53
1997	1400	1650	3600	6650	2680	2.48
1998	1450	1425	3400	6275	2300	2.73
1999	1500	1250	3210	5960	1680	3.55