New Zealand, the Ideal Place for Growing Apples

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New Zealand has developed a worldwide reputation for attaining high performance from apple orchards and, as a result, has developed an apple industry which is ranked among the top two or three apple industries in the world in terms of international competitiveness. Some of the reasons for this position in the world of apple growing are presented here.

PERFORMANCE LEVELS

The AgFirst database shows average gross apple production in tonnes/ha (Fig. 1) and fruit size (Fig. 2) over the last three seasons for producing orchards. At the levels of cropping shown in Figure 1, biennial bearing is a relatively minor problem compared to many apple growing regions.

INTERNATIONAL APPLE GROWTH STUDY

In this international trial of Jonagold/M.9 trees at six locations, tree size in New Zealand was moderate (Fig. 3). When yield is expressed as kg/cm^2 trunk cross-sectional area, New Zealand tree performance in this international trial has been greatest over the first 4 years of the study (variety Jonagold) (Figs. 3 and 4). Relative to other participants in this study, the New Zealand apple trees have been able to carry a regular increasing crop load while continuing to increase trunk cross-sectional area. In regard to trunk cross-sectional area, Italy and Georgia have grown much more than New Zealand but this has been done at the expense of cropping.

Now that the New Zealand production capability has been described, we can look at the factors responsible for this high production.

1. Suitable growing season climate
2. Absence of winter chilling injury
3. Adequate winter chilling
4. Minimal soil and water stress
5. High performance clonal rootstocks
6. Efficient low cost planting systems
7. Effective canopy management with regard to light interception
8. Cooperative marketing system

GROWING SEASON CLIMATE

New Zealand's mid-latitude oceanic climate gives it unique conditions for temperate crops. Being surrounded by ocean and isolated from any continental climatic effects means there is a long growing season with high light levels and moderately cool summer temperatures.

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Average growing degree days (GDD) above 10˚C for the growing season (September to April) are 1282 in Hawke's Bay, falling to 840 in Canterbury. Being inland, Central Otago has marginally more than Canterbury at 876. Through October/November, the critical cell division period,

TABLE 1

Average maximum summer temperatures (˚C).

	Hastings	Nelson	London, UK*	Spokane, USA*	Detroit, USA*	Romeral, Chile (hot year)
September	17	15	10	9	6	20
October	19.5	16.5	13	15	13	26
November	21.5	19	17	20	19	28
December	24	20	20	24	25	32
January	25.5	22	22	29	28	32
February	25	22	21	28	27	32
March	23	20.5	19	22	23	26
April	20.5	18	14	16	16	20
May	17	15	10	7	8	

*July in the Northern Hemisphere is January in the Southern Hemisphere.

FIGURE 1

Average gross apple production (3-year average, 1996-98) for the major varieties in three fruit districts.

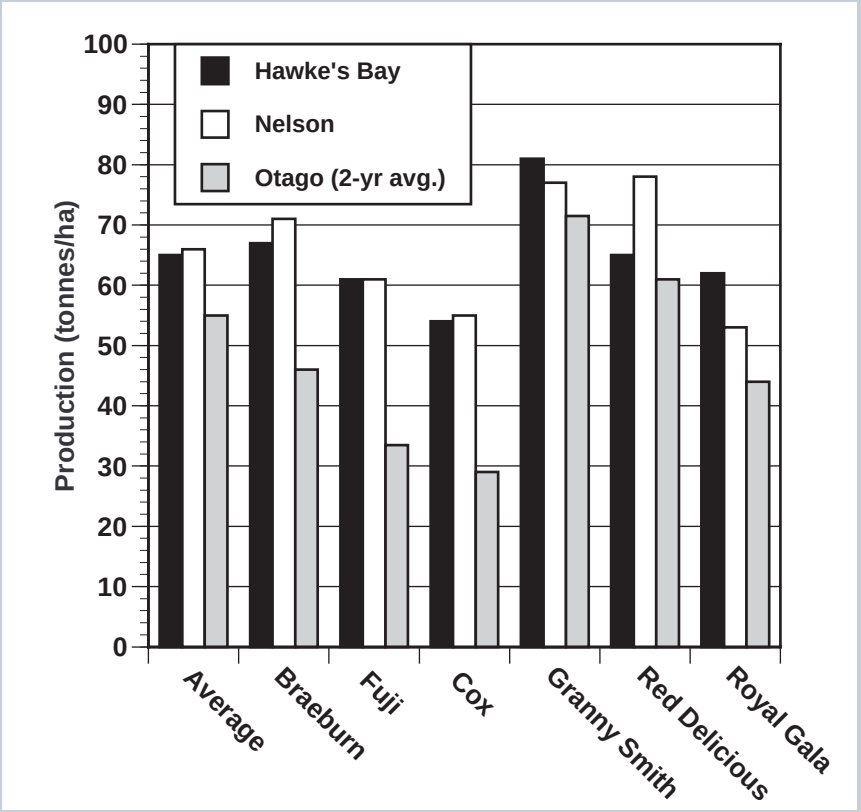
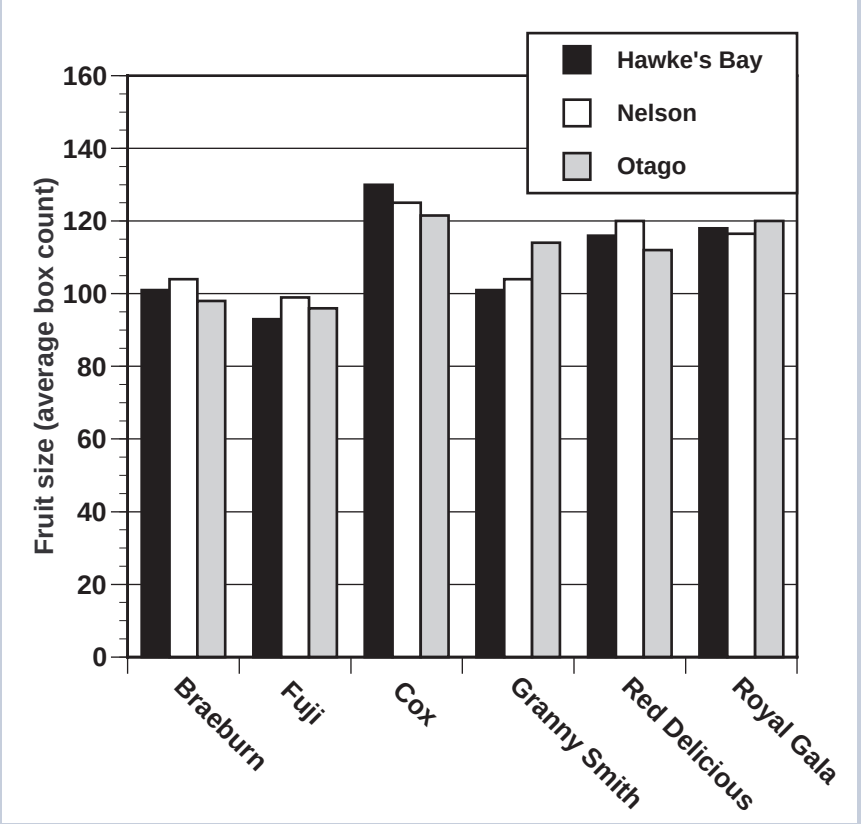


FIGURE 2

Mean fruit size (box count) for the yields presented in Figure 1 for the major apple varieties in three fruit districts.



Hawke's Bay averages 248 GDD and Central Otago 146 GDD.

Summer temperatures are cool in New Zealand (Table 1). Continental climates at similar latitudes experience summer temperatures that place heat and water stress constraints on apple leaf photosynthetic efficiency. Cooler high latitude continental climates with similar summer temperatures to New Zealand experience shorter growing seasons that do not allow high levels of carbohydrate reserves to build up during the postharvest period. The long cool growing season in New Zealand enables the apple tree to compress two growing seasons into one in regard to shoot and bud development. Medium vigor rootstocks such as MM.106 in these conditions tend to behave in a similar manner to M.9 in other parts of the world in regard to bud development.

WINTER CONDITIONS

Winters are mild with winter freeze injury absent. Average Richardson chill units range from 1500 in the Gisborne area to >2500 in Central Otago with Hastings and Nelson having between 1500 and 2000. In the very warm winter of 1998, Gisborne made only 1000 chill units but, with the rapid warming and high spring temperatures experienced that year, bud break was good and particularly uniform albeit a week or so later than normal. Poor winter chilling cannot be considered a serious limiting factor to apple production.

For Hawke's Bay, on average, the first air frosts occur around mid-May and the last in late September. Colder low lying areas will experience earlier autumn and later spring frosts. Orchards in these locations install frost protection. Frost injury is seldom a problem in Nelson.

SOILS

A wide variety of soils is used, ranging from deep fertile alluvial soils with high moisture holding capacity to shallow sandy or clay soils of low fertility. With appropriate fertilizer use, drainage and good irrigation management, most soils have similar productive capacity, indicating that high orchard performance is not directly related to soil type or high natural fertility. The critical factor in high performance in regard to soil is the avoidance of, or management of, limiting soil and water stress.

CLONAL ROOTSTOCKS

The majority of New Zealand apple orchards are planted on high performance clonal rootstocks at densities of 600 to

FIGURE 3

Tree size, as trunk cross-sectional area (TCA), for Jonagold/M.9 trees for New Zealand and five other worldwide locations.

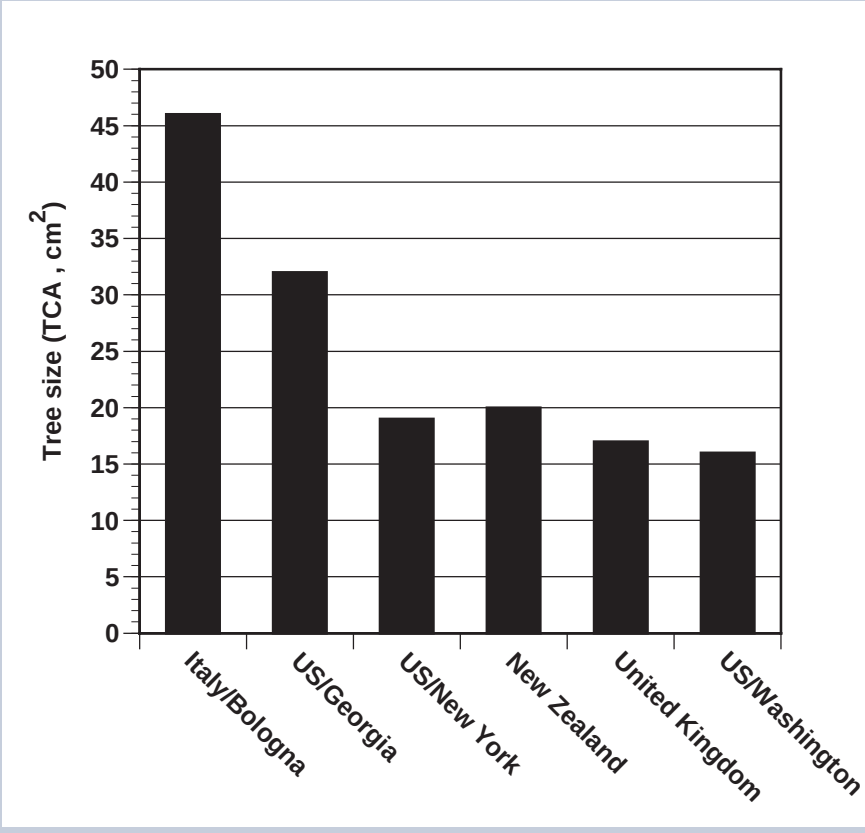
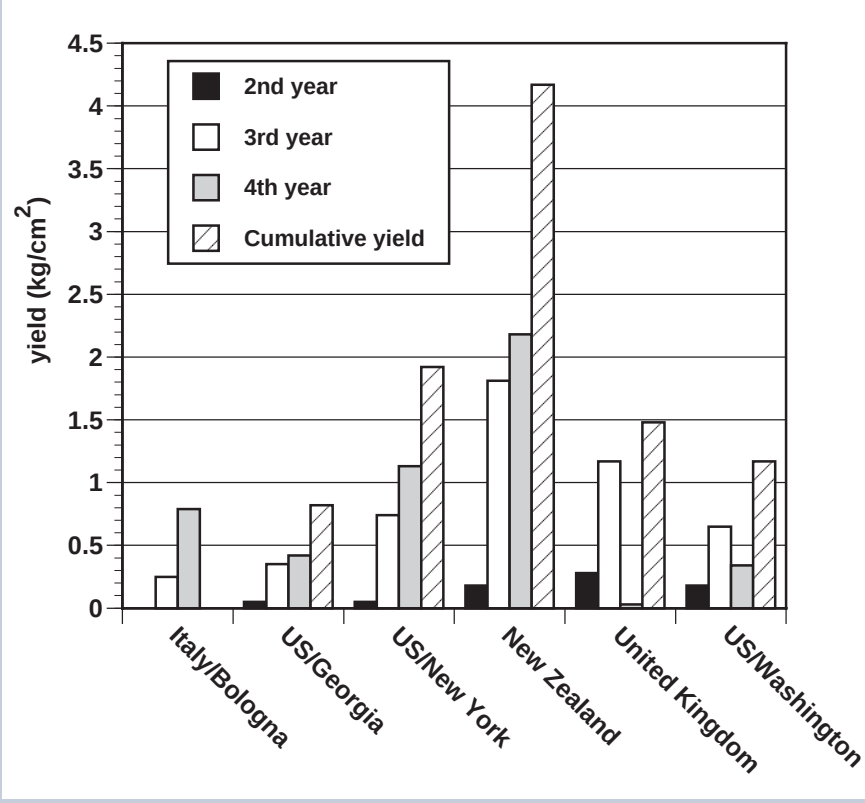


FIGURE 4

Yield adjusted for tree size (kg/cm^2)for New Zealand and five other worldwide locations during years two to four.



1250 trees/ha (240 to 505 trees/acre). MM.106 is the dominant rootstock with Merton (M.) 793 favored for poorer soils and replant situations with high *Phytophthora* risk.

Until recently there has not been a lot of interest in dwarfing rootstocks. Reasons for this have been the high performance of MM.106 and its ability to give high levels of early production under New Zealand conditions and the absence of woolly apple aphid resistance among existing dwarf rootstocks.

There is a move into dwarf trees now with an increase in tree densities up to the 2000 trees/ha (810 trees/acre) range.

The following tools are used to achieve small trees for high density orchards:

1. Dwarf rootstocks such as M.26 (fire blight a major problem), Mark (tissue proliferation problems) and M.9.
2. Interstock trees such as M.9 /MM.106 and M.9/M.793 (root suckers a problem).
3. Dwarfing practices for MM.106 or M.793 at 1250 to 1500 trees/ha (505 to 607 trees/acre) using trunk girdling or root pruning to control tree size.

With interstock trees and applying dwarfing techniques to standard rootstock it is possible to retain woolly apple aphid tolerance in the root system. With the general move away from harsh pesticides, our ability to control woolly apple aphid arising from root infestation will become difficult as it was a hundred years ago when the New Zealand industry adopted the woolly apple aphid resistant Northern Spy rootstock. History therefore suggests that we should be wary of using rootstocks which lack good woolly apple aphid tolerance.

EFFICIENT LOW COST PRODUCTION SYSTEM

Over the years a very efficient, relatively low cost production system has evolved. This system uses single rows and medium densities with trees trained as central leader slender spindle or central axis tree forms. The tree form closely resembles the natural growing habit so orchards can be brought into production quickly with low labor requirement for tree training and pruning. Tree canopy is carefully managed to maintain high levels of light throughout the fruiting zone. This is achieved by maintaining an open canopy with adequate gap between the upper tree canopies to allow good light penetration into the lower tree. Tree height in the Hawke's Bay region is 4 to 4.5 m (13 to 14.8 ft) for between-row

spacings of 4.5 to 5 m (14.8 to 16.4 ft). Chemical thinning is extensively used.

MARKETING SYSTEM

Over the last 40 years the New Zealand apple and pear crop has been marketed under a single desk cooperative system. I believe this has been an important factor in the industry success. It has given it stability and also the critical mass to develop leadership in new varieties.

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PRESIDENT'S WELCOME ADDRESS

2000 IDFTA Conference, Napier, New Zealand

continued from page 33

to maximize our efficiency. Organizations like the IDFTA keep these new ideas, rootstocks, varieties and orchard designs before us. Above all, presenting the failures and successes of others from over the world in an open forum of growers like you and me is what keeps this organization on top and makes it a vital tool for our success.

The Board of Directors and I would like to sincerely thank the New Zealand Fruitgrowers Federation for their help and publicity for these meetings in your country. We would also like to thank the New Zealand fruit growers for their openness and for lending their orchards to tour. Above all, I thank each and every one of you for attending. I would like to challenge every person in this room to promise to exchange business cards with a grower from another country so that, when this meeting is over, there will exist a link between the growers of New Zealand and the growers of our international organization.

Dr. Steve Blizzard
IDFTA President

IDFTA SUMMER TOUR 2000

June 24-27, 2000
Lake Champlain Region, New York, Vermont and Quebec

Headquarters: Sheraton Burlington Hotel and Conference Center, 870 Williston Road, Burlington, VT 05403. Phone 802-865-6600 or 800-325-3535

Registration: Summer tour registration and accommodation details will be mailed to all IDFTA members. Questions regarding registration should be directed to Charles Ax, IDFTA Business Director, 14 S. Main Street, Middleburg, PA 17842-1014; phone 570-837-1551; fax 570-837-0090.

The summer tour has been very capably organized by a committee including Kevin Iungerman, Steve Hoying, Kevin Bowman and Eric Brown (IDFTA board member), all from New York; Elena Garcia from Vermont; and Bob Petch from Quebec.

Pretour to Quebec: Saturday, June 24, 2000

An optional Saturday tour departing from Burlington has been organized by Bob Petch, long-time IDFTA board member from Hemmingford, Quebec. He has arranged a day of visits to four farms in his district just north of the US-Canada border in Quebec.

Sunday, June 25, 2000

Evening registration and possibly an industry overview program.

Monday, June 26, 2000

The all-day tour will feature five orchard stops and will include lunch. Cornell University research and extension staff including Terence Robinson, Jim Schupp, Jan Nyrop, Dave Rosenberger, Kevin Iungerman and Steve Hoying will be participating. The stops are as follows:

1. Chazy Orchard, Chazy, New York. A pioneering orchard in the growing of McIntosh and in establishing CA storage. Recently vertical axis plantings on M.26 and B.9 have been planted. In addition to McIntosh and Courtland, new plantings include Honeycrisp.
2. Forrence Orchards, Peru, New York. Peter and Mason Forrence will show their new packingline and planting systems, especially the vertical axis. The family farms over 1,000 acres and picks about half a million boxes of apples per year.
3. Robert Rulfs Farm Market, Peru, New York. Thirteen apple varieties are grown on 75 acres to meet the needs for the market. Flowers, vegetables and small fruit are all grown and sold. The greenhouses produce hanging baskets and bedding plants and the bakery makes fresh apple pie.
4. Tom and Bill Everet Northern Orchards, Peru, New York. A sixth-generation farm with 200 acres of apples. Recent replant orchards include Honeycrisp, Gingergold and Gala on M.9 or M.26. Replant trials are underway, evaluating fumigation, bioremediation, fertilizer and bioassay.
5. Northern Orchard, Peru, New York. An orchard of 460 acres with fruit packed on the premises and sold wholesale. A Honeycrisp block will serve as a discussion site for this new variety. A new farm market has been established.

Tuesday, June 27, 2000

The all-day tour will feature orchards and packing and processing facilities in New York and Vermont and will include lunch.

The first visit will be to the Gunnison Orchard, Crown Point, New York. The farm includes 160 acres of apples, a packing house and new cold storage. The stop will feature a 1991 trial of Empire on 12 new Cornell-Geneva (CG.) roostocks with M.9, B.9, M.26 and M.7 planted for comparison.

Shoreham, Vermont, area visits will include packing facilities, vertical axis plantings and the oldest M.9 blocks in the Lake Champlain area.

At orchards near New Haven, Vermont, there will be discussions of integrated fruit production methods.

In Waterbury, Vermont, a large apple juice facility will be visited along with a visit to the famous Ben and Jerry ice cream facilities.