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PRODUCTION TECHNIQUES, COSTS AND EXPORT PROSPECTS FOR NEW ZEALAND STRAWBERRIES

By G. F. THIELE, Senior Lecturer in Horticulture, Lincoln College, Canterbury.

INTRODUCTION

There has been a great deal of speculation in recent years on the prospects for increased production and export of intensive high value horticultural crops. A berry fruit survey in 1965 showed that there has been a notable increase in the strawberry acreage. Compared with the first survey in 1960, the New Zealand strawberry acreage has increased by 58% from 300 to 472 acres. Strawberry production has also increased because now 10-15 tons of strawberries can be harvested per acre when grown under polythene as compared with 3-4 tons on bare soil. In the 1966-1967 season Auckland alone exported over 200 tons of strawberries and the figure for the whole of New Zealand is likely to be about 300 tons for the 1967-1968 season. Most of the exported fruit is sold in Australia, but a limited amount has been air-freighted to London and exploratory consignments have been sent to a range of other countries including Italy and Hong Kong.

Production methods, costs, demand and returns, air freighting trade handling and promotion all warrant analysis in order to place the industry in true perspective. This is particularly important now devaluation gives New Zealand produce an advantage in Australia.

PRODUCTION METHODS

Compared with other horticultural crops, there is considerable agreement on the technical side of commercial strawberry production. It is not the intention of this bulletin to present full cultural information in detail. This information is available in the Department of Agriculture Bulletin, No. 321 on strawberry growing and from Horticulture Division advisory officers.

"Red Gauntlet" is the dominant variety having 70% of the acreage. Next comes "Cambridge Favourite" 20%. "Talisman" has gradually decreased in popularity and new varieties are continually under test at the Levin Horticultural Research Station. A promising high quality variety released recently is "Tioga".

Although "Red Gauntlet" consistently outyields other varieties, there is no doubt that a breeding programme to further increase yield, flavour and quality would be of great benefit to the industry.

Good quality virus-free plants raise the efficiency of strawberry growing. Although the Levin Research Station, Turners and Growers and other fruit and produce merchants in Auckland, have been responsible for the present high standard of plants available, there is still no Government strawberry certification scheme available in New Zealand like the one provided by the United Kingdom Ministry of Agriculture. With Australia our main export market, it is interesting to speculate on how long Australian growers will sit back and let New Zealand exploit the market. The Australian strawberry industry has been forced to its knees by virus infection but with the introduction of a Government certification scheme, the industry is gaining in strength at the rate of at least a million addi-

tional plants every year. The New Zealand strawberry industry cannot develop if so many small growers still select plants from existing fruiting beds and a certification scheme to support specialist plant growers must receive Government support in New Zealand as soon as possible.

Probably less than 1% of the New Zealand strawberry crop is grown in bare soil. Practically all growers now plant through black plastic laid in ridges with a machine. Commonly they use 3 foot strips of plastic which is 0.0015in. thick. Some northern growers use the thinner .001in. plastic and some the 30in. width, although I see disadvantages with this width. The rows of plastic are normally laid at 3ft. centres and, in the Auckland district where most crops are grown as annuals, the strawberries are planted by hand in double rows sometimes with more than 40,000 plants per acre. The more compact habit of "Cambridge Favourite" enables close within row planting to give up to 43,000 plants per acre whereas "Red Gauntlet" seldom exceeds 37,000 per acre. In southern districts, where the plants are left for two or more years, planting distance is normally extended to permit only 20-25,000 plants per acre. Quite definitely close planting of 9in. or less between plants and double row planting even in the South Island, plays a very important part in producing yields of greater than 10 tons per acre and up to 20 tons in one season.

Time of planting is important. In the north it is standard practice to plant in April. In the south planting time varies from the end of April until September. Growers generally favour autumn planting but with severe winters it may be better to delay planting until the spring. I have an open mind on this. American work suggests that autumn planting produces a better plant and a higher yield in the first year. This is logical but I am not convinced that a better plant is formed by planting in late April or early May in the South Island. Possibly even earlier planting is called for in the South Island, perhaps in March or even February. Of course, this would demand irrigation and induce problems of runner production but it is certainly worth considering.

It is difficult to make specific fertiliser recommendations but high production demands high rates of fertiliser applied before laying the plastic. Rates of at least 10 cwt. per acre of a complete pelleted fertiliser are common with normally a high nitrogen content. Treatment between planting and harvesting is well known. Most growers lay a mulch of hay or straw between the rows of polythene, and most of the larger growers follow the weed control practice of treating the straw in bales with methyl bromide before laying. In South Island districts, Simazine or a Simazine + Paraquat mixture is used between the rows before laying the mulch. Most northern growers merely use Paraquat or a Diquat-Paraquat mixture on top of the mulch. The wisdom of using Simazine where the crop is grown as an annual depends on the susceptibility of the crop to follow and the danger of residue in various soil types.

Simazine will damage plants if applied in the root zone soon after planting but, applied between the rows of plastic, it has proved quite safe. By dipping plants in a sludge of activated charcoal immediately before planting, the Simazine in the root zone will be inactivated. A promising herbicide under test for spraying the whole strawberry area without serious effect on the young plants is chloroxuron marketed under the trade name of Tenoran.

Disease and pest control is particularly important for export crops. Auckland growers use Parathion or Dibrom every 5-7 days if aphids, mites and leaf roller are troublesome. Southern growers more commonly use Phosdrin as required. The need for sprays to protect against botrytis vary according to district. Thiram up until seven days before harvest, Captan during harvest and more recently Difolitan have all been effective protectants if used regularly during humid conditions.

It is standard practice for northern growers to deblossom up until August to promote good plant development. Some South Island growers will also deblossom although I am not sure if this is a worthwhile practice in the south.

All the New Zealand crop is still harvested by hand and at the peak of the harvesting period requires 5-10 pickers per acre, depending on the crop. This is a major part of the cost of production and in some parts of the country a labour shortage limits the expansion of production.

In the U.S.A. several methods have been tested to mechanise harvesting. A rotating reel with long, curved, steel fingers working in a stripping action has produced promising results but like other fruit harvesters the fruit is mainly used for processing. Overseas markets for fresh strawberries are almost certainly limited and if New Zealand is to expand export in processed strawberries, development of a picking machine would be worthwhile. A more immediate need is the development of a picker carrier so that workers lying or sitting over the rows could work in comfort protected from the sun by a canvas cover. The value of such a machine to New Zealand would be high, the chances of successful development almost certain, and the cost of development low. It is therefore surprising that such a project is not given a high priority for research funds.

To cool strawberries quickly after picking is a key factor in quality export production. The fruit is highly perishable and failure to cool and keep them cool has resulted in some dismal failures on overseas markets. Without the co-operation of growers, airways, and overseas brokers, the further development of the export strawberry industry is impossible.

Fluctuating temperatures can also cause fruit to deteriorate. There is no doubt that wide temperature variations will cause condensation within the pack and this alone would suggest that a moderately low but even temperature of 40°F. would be preferable to occasional storage at 32°F. and then subsequently out of storage at 50°F. If the fruit is stored at some stage at very low temperatures, then it will be necessary to raise the temperature gradually. This is not always possible.

However, in spite of all the views on fluctuating temperatures, it has been proved conclusively in controlled experiments that it is the actual time at a high temperature that determines the life of strawberries. This emphasises the important part the grower must play in protecting the fresh fruit from direct sun and in removing the field heat as quickly as possible. It is possible that refrigerated containers transported by the New Zealand-Australia roll-on roll-off shipping service will supply fruit of a consistently higher quality to the Australian markets than the airways can.

COSTS AND RETURNS

Costs and returns, of course, vary according to district, practice, scale of operation, and whether or not the crop is being produced for export. A common figure quoted in the Auckland district for cost of production is $1000 per acre excluding fixed costs.

The estimated direct costs and returns per acre would be made up of the following:

Revenue: less harvesting and marketing costs)	$	$
12 tons at 15 cents per lb.		4032
Less Direct Costs:		
Cultivation	60	
Fertiliser (1½ tons)	150	
Plastic	120	
Plants (30,000)	400	
Straw	50	
Spray materials weedkillers	20	
Labour	200	
	—	1000
Gross Margin		$3032 per acre

The figure open to greatest argument here is revenue. On a conservative basis revenue is unlikely to be below 10 ton at 10c per pound = $2,240 in the Auckland district. In this case the gross margin would be $1,240 per acre.

Detailed figures have been kept at Lincoln College during the 1967-1968 harvesting season. These show the following costs and returns per acre for the first year of cropping (planted May, 1967).

	$	$	
Gross Revenue:			
Dessert		1798	
Jam		448	
			$2246
Less Direct Costs:			
Materials—			
Plants (23,000)	375		
Plastic	262		
Fertiliser (10 cwt.)	41		
Straw	20		
Spray Materials	13		
Punnets	105		
Rubberbands, cellophane	32		
		848	
Machinery at $1 per hour for tractor and 50c per hour for an implement		111	
Irrigation (electric power)		1	
Permanent and casual labour at $1 per hour		603	
Harvesting at $0.05c per lb.		379	
Transport		53	
Commission at 10% (including containers)		237	
			$2232
Gross Margin for first year			$14 per acre

At first glance this margin of $14.00 for the first year of the crop seems unimpressively low. Because of the diverse nature of horticultural products and the important part labour plays in costs of producing most intensive crops, it was considered essential to include permanent labour into direct costs. In addition it is normal in costing of this nature to include in the direct costs only items such as petrol and oil used by machinery but in this case it appeared more realistic to adopt a contract rate. In terms of gross margins commonly quoted for farming crops the figure for strawberries in this case would be in the vicinity of $600.

The essential difference between the Auckland estimate and the Lincoln figures is in yield. The Lincoln yield in the first season was 3½ tons per acre. Auckland district crops are grown as annuals but southern districts do not produce high yields of 10-12 tons until the second season. Hence accurate assessment of gross margins in southern districts should be made over at least three years. Two of the major items of expenditure, namely plants and plastic ($637) would not recur in the second and third years and labour and machinery costs would be down by a total of at least $350. If we assume a 15c per lb. return net of harvesting and marketing costs a gross margin of $3000-$3500 could be expected in the second season. We will continue to keep records to see if this is a reasonable assumption. The other major difference between the Auckland and Lincoln figures is in labour and machinery costs and where the contract rates of the Lincoln figures may be higher than necessary.

Gross margins being quoted in England for fresh market strawberries are very much less than New Zealand figures, for example:

	$ per acre
Revenue (less harvesting and marketing costs)	1000
Less Direct Costs	550
Gross Margin	$450 per acre

These are based on 10,000 plants per acre and a yield of approximately 2 tons per acre per year over three years at a net market return of 23c per pound. Yields are obviously well down on average New Zealand yields.

DEMAND AND PRICES

It is quite clear from the figures presented that a return net of harvesting costs as low as 10c per lb

can be economical even at yields as low as 3-4 tons per acre, provided the crop is produced efficiently and on a large enough scale to make overheads insignificant. There is though, clearly a limit to demand within this country and, as the Australian home crop increases, so too saturation will be reached in Australia. New Zealand is fortunate in that Queensland supplies are normally finished by early October. The Australian supplies from October to December come mainly from New South Wales, with Tasmanian fruit reaching Sydney markets during the end of November to end of December period. New Zealand supplies the market from early October but mainly through November and December and therefore competes generally with the Tasmanian fruit. Although Auckland's export of quality fruit is nearly finished by the end of December, southern gardens in Canterbury, South Canterbury and Otago can produce good quality export fruit well into March.

Clearly export markets can be saturated with fresh fruit and we must examine the prospects for processing. Freezing is costly and it is doubtful if this will pay. It is possible to preserve strawberries in casks but the economics of this and the demand have not been fully tested.

The other alternatives are for use in jams, cans or wine-making for which the cost of production would have to be 5-7 cents per lb lower than at the moment. Mechanical harvesting would overcome approximately 4 cents per lb of this but the scale of production would have to be greater than 10-15 acres per property to warrant the high capital cost involved.

This year, with a price war in progress on the Sydney market, the average price received for New Zealand fruit in Australia was approximately 45 cents per punnet of ¾lb. It is difficult to gauge an accurate average figure but some sources suggest the average could be as high as 55c. These prices are net of Australian commission which although rather flexible is normally about 10%. Prices on the Sydney market before Christmas normally average more than 60c per punnet but this season they were as low as 30c per punnet.

On the local market, early season prices may be 50c per punnet or more and may fall to 15c per punnet after Christmas. South Island prices may rise to 30-40c again in February and March for the second crop of "Red Gauntlet" berries. By this time the Auckland supplies are exhausted. Sometimes Auckland growers allow the public to harvest their own berries at the end of the season, prices ranging from 10-15c per lb. A standard jam grade price for several years has been 25c per lb although with increase in supply many growers reduce their prices to 20c per lb at the height of the season.

Average market prices recorded by the College this last season were:

Punnet grade (¾lb aluminium punnet)	33.4c
Jam grade per lb	19.6c

Contracting is a way of avoiding the uncertainties of price. Some firms contract with growers for the supply of strawberries packed for export at a standard rate of 30c per punnet. In this case the firm takes the risk of a loss on the export market but also benefits from high prices. The grower may also benefit by receiving a higher average price than he would on the local market although he must go to more trouble in producing a quality export pack completely free of pests and disease.

Another contract price sometimes quoted is 20c per lb ungraded in bulk with the firm packing for local market or export. This at first glance seems very low but the cost of marketing strawberries compared to handling in bulk is surprising when analysed.

DIRECT HARVESTING AND MARKETING COSTS (cents)

	Cost per lb Bulk	Cost per punnet
Harvesting	5.0	5.0
Packing (labour at $1 per hour)	—	4.0
Container (punnet)	—	2.0
Container (case)	0.5	—
Cellophane, rubberbands, etc.	—	0.5
Transport	1.0	1.0
Commission (fruit 10%)	—	3.0
Commission (case 10%)	—	0.5
Transport empty case	0.5	0.5
	7.0c	16.5c

The possibility of bulk supplies to firms packing for export as a means of marketing needs more consideration. New Zealand growers for some reason seem to be afraid of co-operative packing of horticultural produce. The loss of individual freedom may be more than matched by gains from higher prices brought about by organisation and improved quality of pack.

AIR FREIGHTING

The following rates per kilo apply for strawberries from Harewood (1lb = .484 kilos, 1 kilo is approximately 2.2 lb). The per punnet price quoted in the right column is based on the larger quantity rate taking ½lb as the standard size punnet and allowing 20% for container weight.

AIR TRANSPORT COSTS

	100-250 kilos price per kilo	250 kilos price per kilo	per punnet
Sydney	32c	25c	11 c
Melbourne	34c	27c	11.5c
Rome	$1.47	$1.25	53.5c
London	$1.47	$1.25	53.5c
Hong Kong	65c	65c	28 c

Air freight agents, firms which specialise in the handling and customs clearance of any air freight parcel, welcome the opportunity of handling export produce both in New Zealand and in the country of destination. Their charges per consignment from Harewood to Sydney would be:

Customs entry New Zealand	$2.50
Attendance New Zealand	0.75
Customs entry Australia	4.20
Attendance Australia	3.50
	$10.95

If the consignment is 250 kilos (about 500 punnets) this would add about 2.2c per punnet to the cost. If on the other hand two growers with insufficient strawberries individually to make up a 250 kilo consignment decided to let the air freighting firm handle their consignment in order to make it up to 250 kilos, the following situation would apply.

New Zealand customs entry and attendance fee for each exporter would be charged but the Australian customs entry and attendance would be for one consignment only as made out by the freighting firm. Assuming one grower had 100 kilos and the other 150 kilos:

(a) Not combined and not using an air freight firm

Freight costs		
100 x 32c	$32.00	
150 x 32c	48.00	
		$80.00

(b) Combined and using an air freight firm

Freight costs		
250 x 25c	$72.50	
Customs entry and attendance N.Z. x 2	6.50	
Customs entry and attendance Australia	7.70	
		$86.70
Figure in favour of not combining		$6.70

Although the use of an air freight firm is not warranted solely on the basis of saving on freight costs, such firms do provide a very useful service to those growers not within ready access of the airport. By booking air space they ensure a minimum of delay and see that the produce is handled in the best way possible.

Perishable goods demand priority but strawberry growers have no guarantee that their fruit will be taken on the proposed flight and air lines accept no responsibility for delays. Strawberry growers cannot easily book the exact air space required. It is important, too, that strawberries do not have sudden widely fluctuating temperatures but in the non-pressurised rear compartment, where the fruit is normally loaded, temperatures could drop below freezing point in the high altitudes. When temperatures rise suddenly again, as they are liable to do

when the aircraft lands, serious condensation can take place within the covered punnet.

Possibly the greatest advance in overseas freighting could come with the roll-on roll-off ferry between New Zealand and Australia as mentioned earlier. Strawberries could be loaded in refrigerated containers in New Zealand and transported to Sydney in three days for a cost of about 2c per punnet. If New Zealand is to explore the berry fruit export business fully she could well consider the possibilities of controlled atmosphere storage which, although costly initially for a small industry, will keep strawberries and other berry fruit in good condition for several weeks and could well be a means of allowing New Zealand to compete with fresh fruit on more widespread markets.

TRADE HANDLING AND PROMOTION

As more and more New Zealand growers become excited over the export of berry fruits, so the handling of these exports becomes more chaotic. Some people advocate Government control over exports and rightly believe that a few poor consignments could spoil all trade in strawberries. Most people concerned with the industry will agree that speculators and inefficient exporters will eventually give New Zealand strawberries a bad name, but few will agree that the Government should set up a strawberry marketing board similar to the Apple and Pear Board in function and constitution.

At the other extreme several large, well organised, growers and exporters will strenuously oppose any attempt to organise exporting because they have established their own business for their own profit.

Government already controls export of berry fruit to some extent, firstly by inspection by quarantine officers before the fruit leaves the airport, and secondly by certificates of approval issued by the Director, Horticultural Division, allowing individual growers to export.

Already some large firms are contracting direct with growers to export their fruit for them. It seems to me that the Government could well decide to license specific firms (for example, large scale fruit and produce merchants) so that they alone will be allowed to export. This unfortunately would eliminate the lively enterprising grower, but it would lead to much greater efficiency and uniformity of the strawberries, and would benefit all growers eventually. The number of exporters initially could be perhaps three or four, but eventually more firms with suitable facilities could apply for a licence. In this way firms with overseas contacts and companies with large financial backing could do much more for the strawberry grower than the individual could himself. They could use their overseas contacts to extend and promote trade, a factor which is sadly lacking at the moment. In fact inadequate market research and transport costs are the major factors limiting the expansion of horticultural production in this country.

Many potential northern hemisphere markets could well be explored to advantage; for example Canada, S.E. Asian markets and several countries in Europe. Trade barriers, quarantine and customs will have to be determined in a wide range of countries in much the same way as the Apple and Pear Board has explored and promoted pip fruit markets. Market research is essentially a Government responsibility and could well pay high dividends for horticultural produce generally if tackled immediately. Berry fruit growers deserve support for their foresight last year in forming a Berryfruit Growers' Federation affiliated to the New Zealand Vegetable and Produce Growers' Federation. Their responsible action in seeking self-taxation in the form of the Berry Fruit Levy Act, 1967, will no doubt be reflected in benefits to the industry, consumers and to the country, and will result in more funds being available for market and other forms of research.

Once markets have been firmly established for fresh and processed goods, the production of strawberries on a large and highly mechanised scale could expand rapidly and have a major effect on New Zealand's economy and export earnings. If we accept an average net revenue per acre of $2000, it only requires 1000 acres of strawberries to produce the same net revenue as 30,000 acres of wheat, assuming an average gross margin of between $65-70 per acre for wheat, or the same as 80,000 acres

in sheep production assuming an average gross margin of $25 per acre. It is interesting to speculate the solution of a linear programming matrix using strawberries, wheat and sheep production as possible alternatives with the constraints determined on a New Zealand-wide basis.

Imagine if adequate markets were available and labour constraints were minimized by machine harvesting, 80,000 acres of strawberries would yield a net revenue of $160,000,000 instead of $2,000,000 in sheep. Fantastic perhaps, for strawberries alone at the moment but not for berry fruit as a whole. New Zealand is richly endowed with the natural resources of suitable fertile land, water and climate to allow intensification of primary production.. The markets are available if adequately explored. Support for further organisation of the industry and for research is essential before it is destroyed in the early stages by inefficient over-production and chaotic marketing.

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