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COMMERCIAL ORCHARDING IN

NEW ZEALAND

A Thesis presented for the  
Degree of Master of Arts  
and Honours  
in Geography

by

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University of New Zealand

1957

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## INTRODUCTION

In recent years commercial orcharding in New Zealand has assumed a new form. Fruit exports are growing year by year and orchard production has become concentrated within certain districts. Alongside this change, and in part responsible for it, has been the formation of grower organizations. Indeed, New Zealanders are fast becoming aware that there is a fruit industry developing in this country which, even though limited in prospects, will be a worthwhile contributor to our primary production. It is with the view of providing an accurate picture of the present character of the industry that this thesis is presented.

The purpose of this investigation will be achieved if it helps to give a broad view of the industry as it differs from place to place, and if it succeeds in inducing those interested in the industry to undertake a systematic stocktaking and review of the elements which underlie these differences before embarking on any scheme of future development.

The geographer who defines his discipline as the study of the 'likenesses and differences among places on the face of the earth'<sup>\*</sup> is well equipped to present such a chorological survey. Using the regional technique a geographer can produce a balanced study of the

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\* James, Preston E. and Jones, Clarence F. (Edit.). American Geography Inventory and Prospect. Syracuse, (1954), p. 4.

present character of the industry, reveal its wider application and suggest the processes by which the present character has been derived.

In this thesis the regional studies represent 70 per cent of the total work. They are preceded by a series of maps explaining the general features of commercial orcharding and followed, in Part II, by an attempt to evaluate the locational factors of orcharding and the factors influential in affecting the present day regionalization. The thesis has been conceived as a unit, in which the regional studies are the core. The overall diversity is presented; a generalization into regions for the sake of clarity is made and Part II analyses the factors underlying the regional differences.

Wherever possible statistics and ideas have been presented in visual form and in this thesis maps, diagrams and illustrations are more important than the accompanying text.

Field work for the thesis was completed during 1956 and the summer of 1957. During this period all the major orcharding districts were visited. Eighty per cent of the orchards were seen and a more intensive study was made on 20 per cent of the holdings in each district. Questionnaires and impressions collected during this field work provide the basic information for the thesis. Statistics were obtained from the Horticultural Division of the Department of Agriculture and are based on records available at the end of the 1955-1956 season. Where statistics were not available estimates, based on questionnaires, have been made and where possible verified by district officers of the Horticultural Division.

By no means is it claimed that the whole field has been covered by this survey. Rather, this thesis should be regarded as a general reconnaissance survey which the author hopes future workers will use as an outline for a more detailed study of commercial orcharding in each of the major regions.

Preparation for a Dominion survey of this nature has involved much travel and many interviews, and I would like to acknowledge the willing co-operation that I have received from orchardists and officers of the Horticultural Division, Department of Agriculture. Mr Leslie Curry, my tutor, has carefully guided the work since the outset and I am grateful for his many helpful suggestions. To Ray Crutcher and Terry Satten who helped with the processing of the maps and photographs, and to my typist, Mrs Wright, I offer my sincere thanks.

The thesis is dedicated to my teachers both at Thames High School and Auckland University College. I sincerely hope that they will find in this work some reward for the everlasting contribution that they have made to my education.

PART I

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## Chapter I:

GENERAL FEATURES AND DISTRIBUTION OF COMMERCIAL ORCHARDING

Comparatively speaking, commercial orcharding is only a minor agricultural activity in New Zealand.<sup>1</sup> In all, there were 15,473 acres of land actually planted in fruit trees at the 1st January 1955,<sup>2</sup> and these are distributed unevenly throughout the country in non-contiguous, sheltered pockets of flat, or near flat land (see Figure 1).

By acreage, the Nelson orcharding area is the largest in New Zealand, followed by Hawke's Bay, Central Otago and Auckland. But such a basis of comparison over-emphasises the significance of Nelson with its larger orcharding holdings and lower per acre fruit production. Both Auckland with its closely interplanted orchards and Hawke's Bay with its greater per acre fruit production have a larger number of orchard holdings than Nelson, and exemplify some of the many district contrasts which are found in commercial orcharding in New Zealand (see Figure 2).

As opposed to most other categories of agriculture, orcharding is characterized by the intensive utilization of small areas of land. Whereas 60-80 acres of dairying land usually supports one working unit, one tenth this area of orchard land requires at

- 
1. The Report on the Farm Production Production Statistics 1954-55 indicates that 43,400,000 acres of land were occupied, of which .04% were in orchards.
  2. Unpublished statistics, Department of Agriculture, Wellington. All statistics are from this source unless otherwise acknowledged.

Figure 7.

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1970-1971, 1972.

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entirely normal, under conditions  
of the 100. It is followed in order  
by 1000, 100, 1000, 100, 1000,  
1000.

(see Hypothesis 1 for a list of 1000.)

# DISTRIBUTION OF COMMERCIAL ORCHARD ACREAGE 1956

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50 ACRES

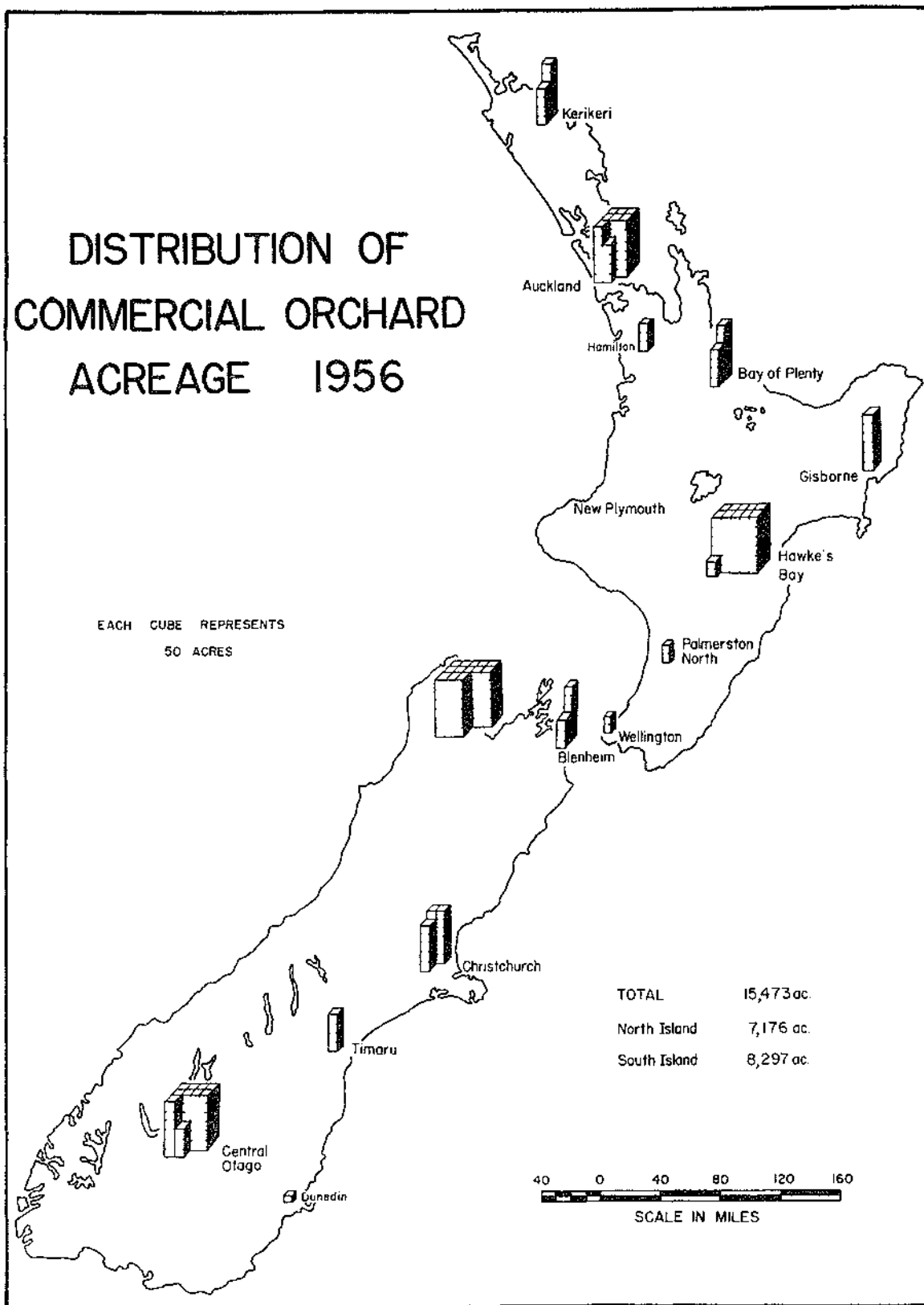


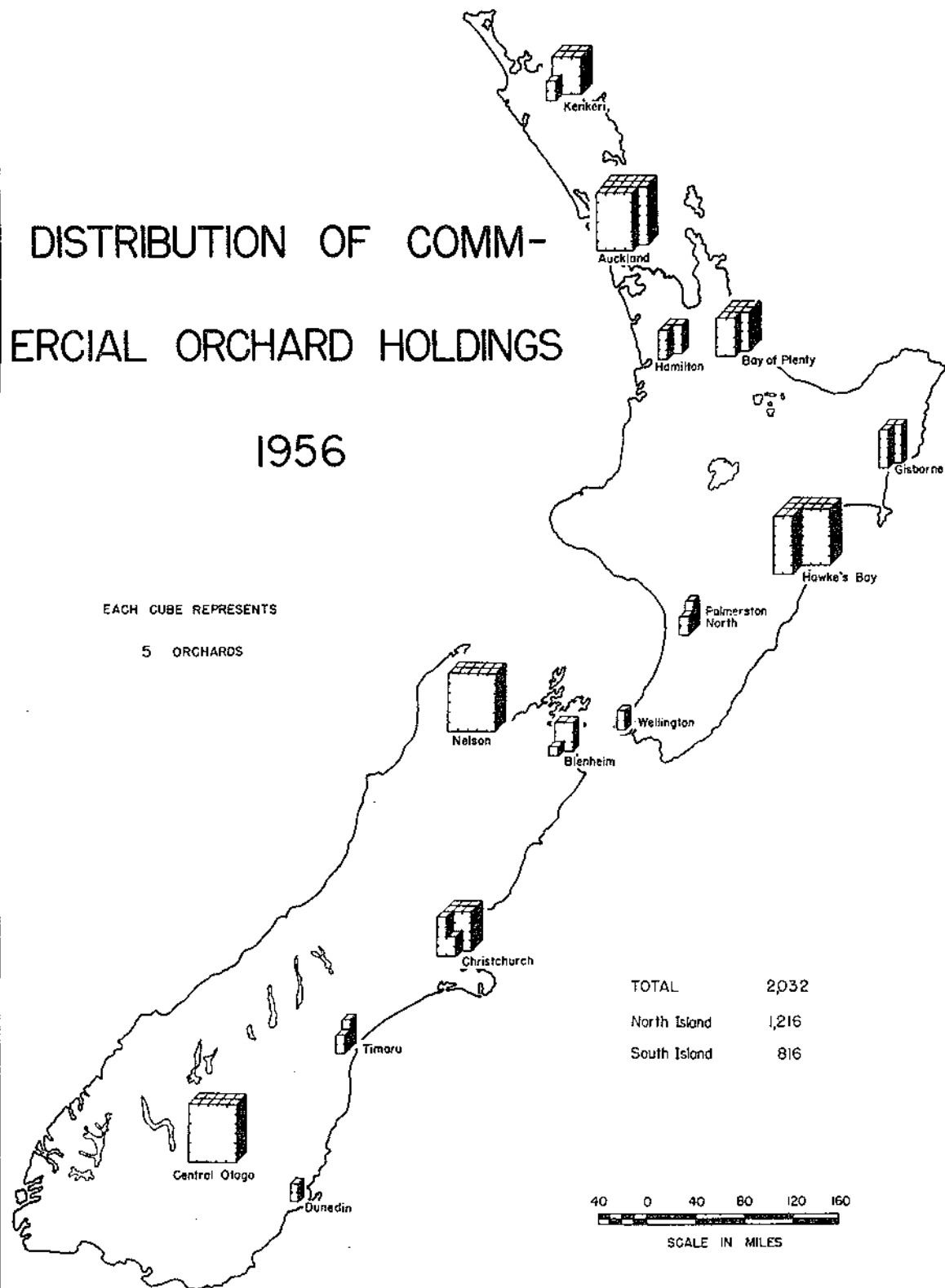
Figure 2. WINTERFALLS, WISCONSIN: 1966  
March 24, 1966.

subject has not reached 20000  
and any other subsisting district.

# DISTRIBUTION OF COMM- ERCIAL ORCHARD HOLDINGS 1956

EACH CUBE REPRESENTS

5 ORCHARDS



least one permanent man, as well as seasonal labour. Orchards are a close-knit and an intensive element of the land use complex, and only where there is a certain concentration of holdings does orcharding contribute to the character and amenability of an area.

As for a characteristic New Zealand orchard landscape, none really occurs, for diversity from district to district and even within a district is a feature of orcharding within this country. However, in comparison with other countries the small, owner-operated New Zealand orchard, with its abnormally high production per acre and degree of mechanisation presents a contrast to the much larger sized orchards of England and the specialist fruit farms of the United States. The New Zealand orchards are tidy and compact. Each one is late with its own packing shed and spray equipment and with its low, much-branched trees patterned into parallel rows from 14 to 18 feet apart.

Apples are the most important fruit grown and together with pears and quinces contribute, by value, 74 per cent of the Dominion's orchard production. Yet, despite this predominance, New Zealand orchards seldom produce only one kind of fruit, as until recently insecure markets made diversification advisable. Apples, pears, peaches and plums are often found together on the same holding, although district specialization is becoming increasingly pronounced.<sup>3</sup>

#### PIP FRUIT

Apple growing in New Zealand is not far different from the

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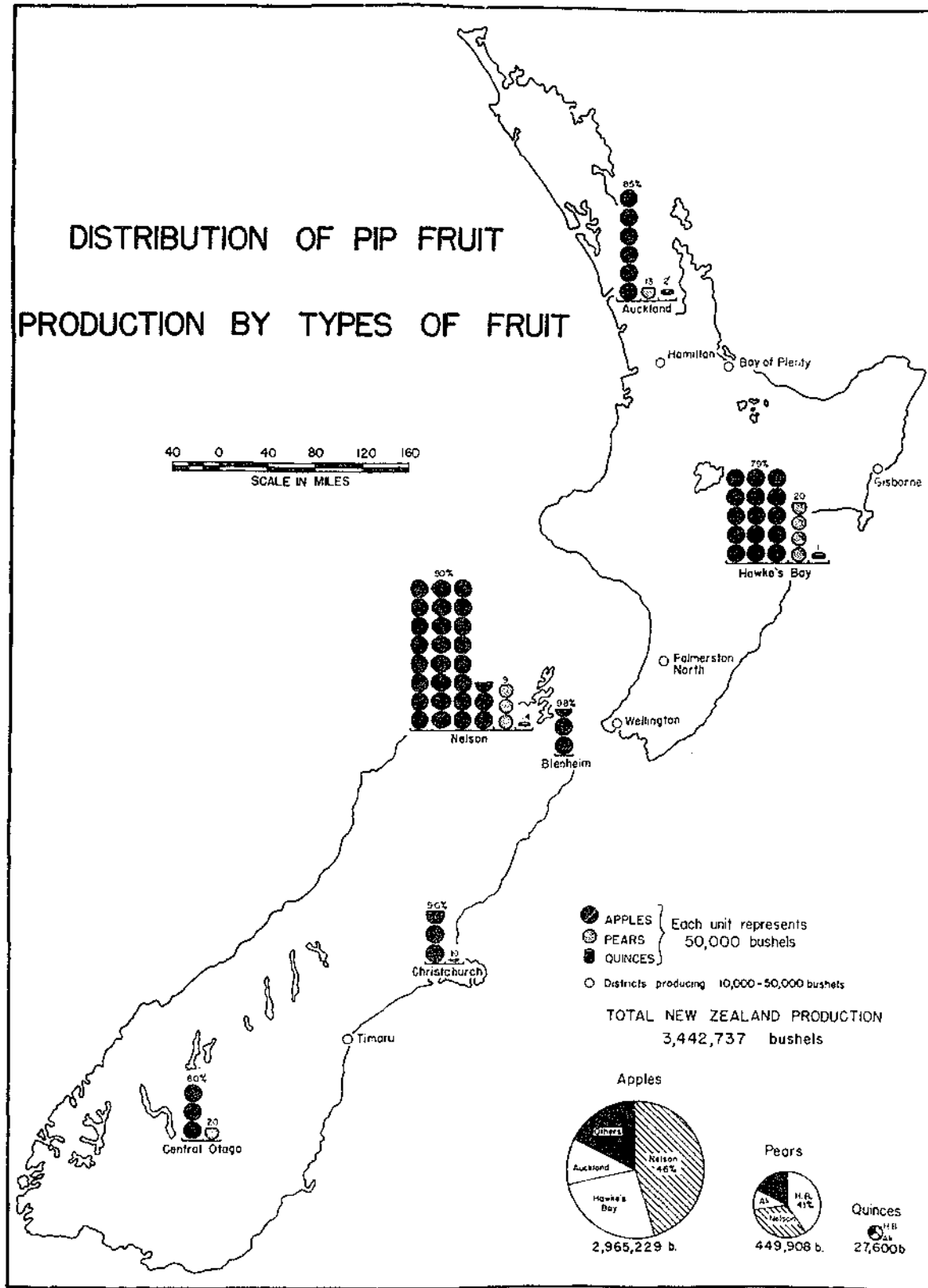
3. For both fruit tree varieties and diseases commonness are used in the text. Scientific names are in Appendix VIII if required.

Figure 3.      DISTRIBUTION OF PIP FRUIT PRODUCTION  
BY TYPES OF FRUIT.

Nelson and Hawke's Bay are the major  
pip fruit producing areas. Hawke's  
Bay is the leading pear producer.  
Figures indicate the relative import-  
ance of apples, pears and quinces in  
each district.

# DISTRIBUTION OF PIP FRUIT PRODUCTION BY TYPES OF FRUIT

40 0 40 80 120 160  
SCALE IN MILES





general practice overseas. The only noticeable differences are that smaller trees, seldom more than 20 feet tall, are preferred, and that a surprisingly large number of varieties are grown. One hundred and thirty-nine different varieties were recorded in the 1953 Orchard Survey,<sup>4</sup> but of these, five varieties, Sturmer, Delicious, Granny Smith, Jonathan and Cox's Orange Pippin account for 69 per cent of the trees (see Figure 4).

Nelson, producing 46 per cent of the Dominion's apple crop, is the most important district, followed by Hawke's Bay with 28 per cent and Auckland with 10 per cent (see Figure 3).

#### Pears and Quinces:

Although fewer in number, pear trees are found with apple trees on practically every pip fruit orchard. During the six year period 1949-55 the average pear production for the Dominion was 449,908 bushels, but as a result of encouraging prices paid by the Apple and Pear Marketing Board, production has increased annually, and in 1955 560,867 bushels were produced.

As opposed to Nelson's predominance in apple production, Hawke's Bay produces 42 per cent of the Dominion's pears, in comparison with Nelson's 31 per cent.

In general, pears are planted on the damper sections of orchard holdings, and occupy a large proportion of the previously poorly drained orchard land on the Horwetaunga Plains. The naturally drained, clay soils upon which 70 per cent of Nelson's orchards are

---

4. Watt, J.M. The Official Survey of the Fruit-growing Industry of New Zealand, Wellington, 1956.

Figure 4.     DISTRIBUTION OF APPLE TREES BY  
VARIETIES.

Sturmers are by far the most important variety grown. Granny Smith is the only one of the five most important varieties which is grown in the Auckland district.

# DISTRIBUTION OF APPLE TREES BY VARIETIES

40 0 40 80 120 160  
SCALE IN MILES

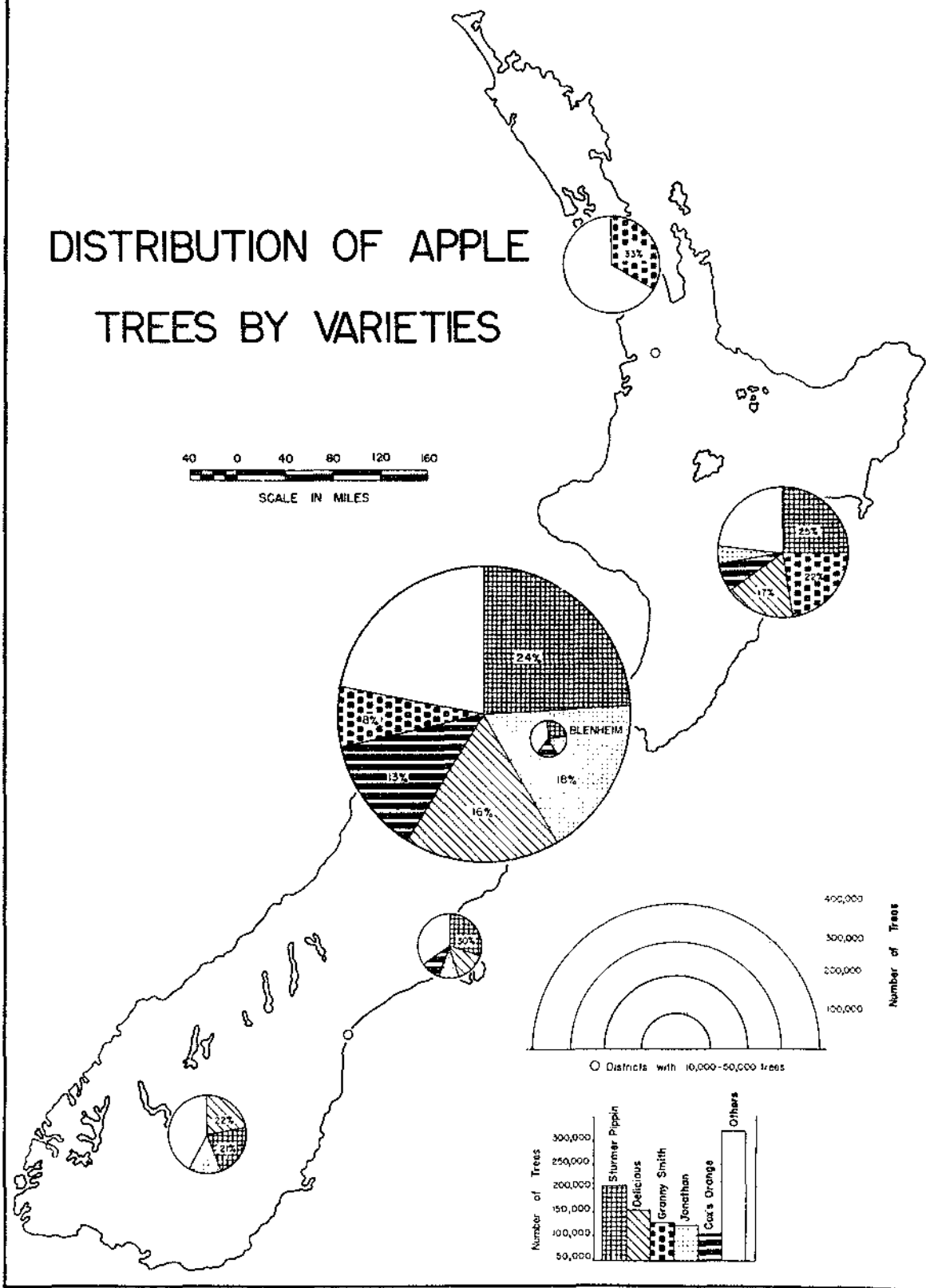
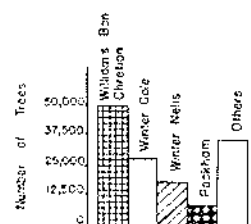
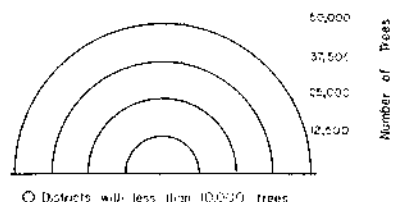
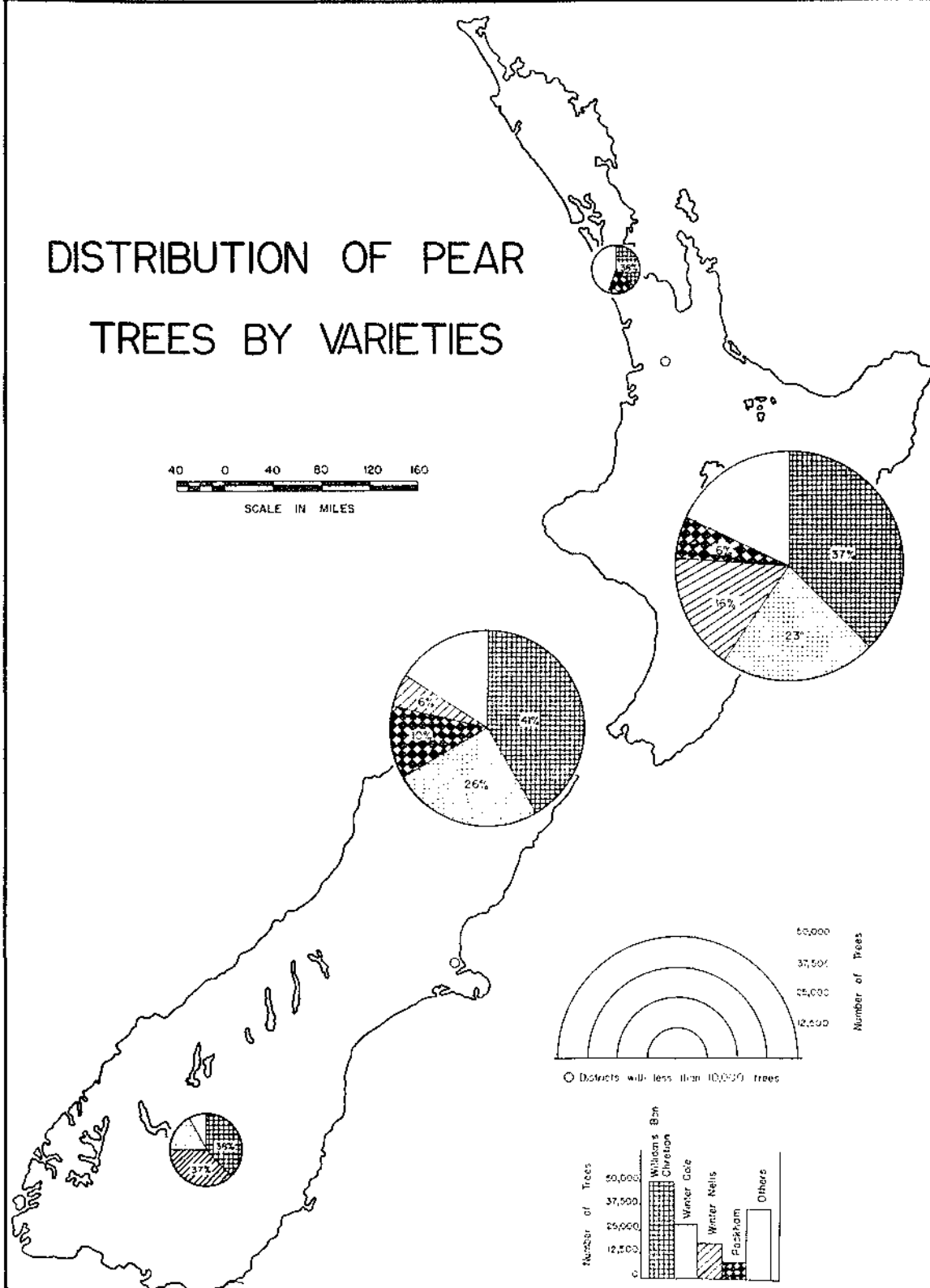
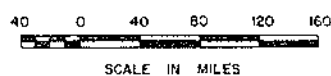


Figure 5.    DISTRIBUTION OF PEAR TREES BY  
VARIETIES.

William's Bon Chretien, the most  
sought after variety for canning,  
is the most popular variety in  
all districts.

# DISTRIBUTION OF PEAR TREES BY VARIETIES



planted, are less suited to pear culture. Also making its impact felt is the demand for pears by the expanding fruit processing industries of Hastings.

Pears for processing are in greater demand than apples. Sixteen per cent of the pear crop was utilized in this manner in 1955 and one-third of this amount was supplied by orchards in Hawke's Bay.

Usually taller than the average apple tree, pear trees yield a greater production per acre.<sup>5</sup> Production is increasing annually, and although pears have not been exported during the last two years, this trade will recommence as the New Zealand demand is exceeded.

Quince production on the other hand is declining rapidly. Many trees were planted during World War II when there was a ready market for jam quinces, but since 1949 there has been a marked decline in the number of quince trees on orchard holdings. Auckland with the largest local market possesses almost 50 per cent of the trees, while Hawke's Bay and Nelson have 25 and 10 per cent respectively.

#### STONE FRUIT:

In comparison with pip fruit, the production of stone fruit is distributed more evenly throughout the Dominion. Both in terms of production and value, Central Otago with its high sunshine totals, cold winters and irrigated orchards is the most important growing area. However, the North Island fruitgrowing areas, although less favoured climatically, have a definite market advantage in being nearer

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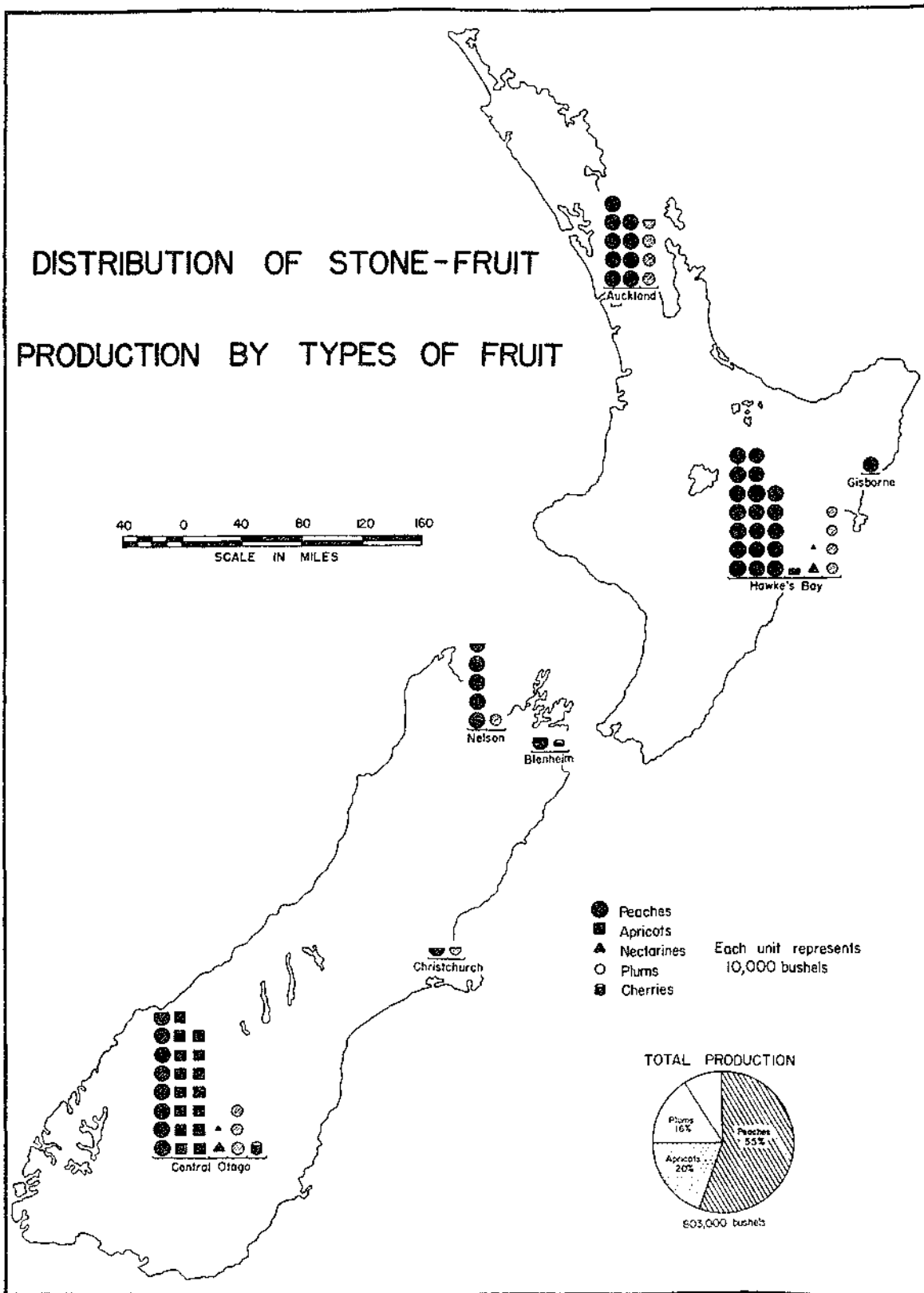
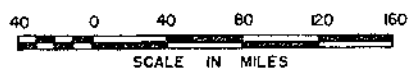
5. The average production for the Dominion is 200 bushels per acre in the case of apples and 400 bushels for pears.

Figure 6.

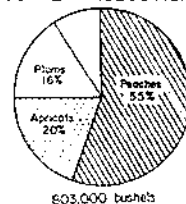
DISPARITIES OF STONE FRUIT PRODUCTION  
BY TYPE OF FRUIT.

Central Stago is the major stone fruit producing district. Peaches are the most important stone fruit in all districts other than Central Stago.

# DISTRIBUTION OF STONE-FRUIT PRODUCTION BY TYPES OF FRUIT



TOTAL PRODUCTION





the high consuming areas.

Mixed orchards are even more characteristic with stone-fruit than with pip-fruit. Especially is this true in the South Island for in the North Island peaches dominate stone-fruit production (see Figure 6).

#### Peaches:

Peaches are by value the most important stone-fruit produced in this country and are second only to apples in terms of the number of trees planted on commercial orchards. Trees grow to about 18 feet in height and, like all stone-fruit, appear to produce more and better fruit on light, well-drained soils.

The most important growing district is Hawke's Bay, which produces 43 per cent of the Dominion's total, a large proportion of which is used by local canneries.

The importance of the Golden Queen variety, which represents over one quarter of the peach trees recorded, reflects the importance of fruit processing to the stone-fruit industry. Golden Queen is the most sought after variety of peach for canning, and dominates the peach tree statistics, particularly in Hawke's Bay and Nelson (see Figure 7). In other districts, varieties are more evenly proportioned in response to the demand for fresh fruit as well as from the canneries.

#### Nectarines:

Although more limited in its distribution, the nectarine is closely related to the peach. Both belong to the species Prunus persicae and the trees are similar in appearance,

Figure 7.    DISTRIBUTION OF PEACH TREES BY VARIETIES.

# DISTRIBUTION OF PEACH TREES BY VARIETIES

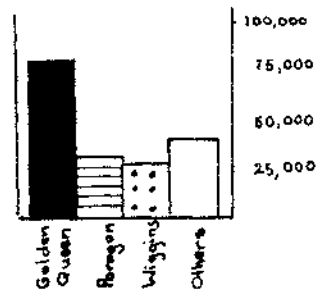
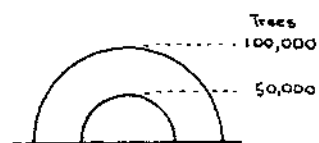
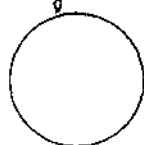
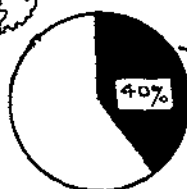
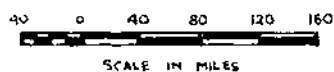
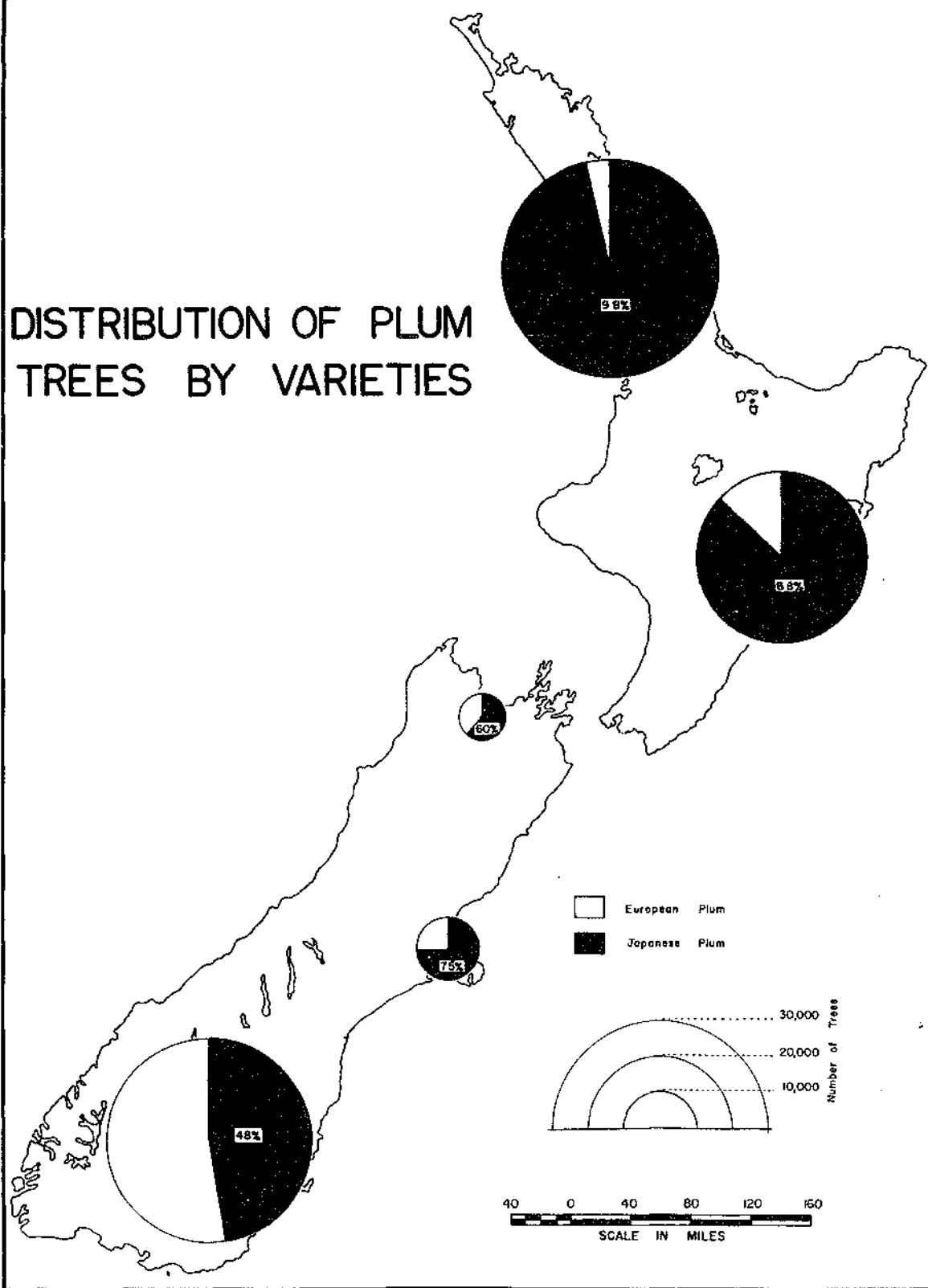


Figure 8.    DISTRIBUTION OF PLUM TREES BY  
                  VARIETIES.

Japanese plums are produced for the fresh fruit market in the North Island. In Central Otago European plums are preferred for jam making.

# DISTRIBUTION OF PLUM TREES BY VARIETIES



growth responses and bearing habit. Indeed it is only in the outward appearance of the fruit that the two can be clearly distinguished. The fruit of the nectarine is free from the downy covering of the peach; it is usually smaller and richer in flavour and aroma when fully mature. In effect, the nectarine is a smooth-skinned peach.

Central Otago and Hawke's Bay, producing about equal quantities of this fruit, are the two most important nectarine growing districts and together contribute 85 per cent of the Dominion's production.

#### Plums:

Plums are grown in every fruitgrowing district in New Zealand, but only at Christchurch do they form the major variety of stone fruit produced (see Figure 6). Auckland, with a large adjoining market, is the largest plum producer with 27 per cent of the Dominion's production, followed by Central Otago with 24 per cent and Hawke's Bay with 20 per cent.

In all three districts plums are used for processing, but in the South Island where there is a greater proportion of the smaller sized European plum, this method of disposal is more significant. The larger and more succulent Japanese plum has a greater command of the fresh fruit market and, as is shown in Figure 8, has largely replaced the European plum on North Island orchards.

#### Apricots and Cherries:

Although apricots and cherries are unrelated, they have a similar distribution. Both need high summer

temperatures, low humidity and a long period of winter sunshine to produce their best fruit. Accordingly, South Island fruitgrowing districts dominate in the production of these fruits, even though the danger of frost during blossom necessitates the costly use of frost nets to protect the developing buds.

Cherries, small red fruit when ripe, have a high value per unit of volume and do not suffer the same disadvantage of other South Island stone fruit in being a great distance from the major markets in the North Island.

Central Otago with 63 per cent, Glenheim with 16 per cent and Christchurch with 9 per cent, lead the Dominion's production of this crop.

Apples, smooth-skinned golden fruit are popular for both processing and fresh-fruit sales. Central Otago dominates the production of this fruit and contributes 92 per cent of the Dominion's crop. The remainder come from favourably situated orchards at Christchurch and Hawke's Bay.

#### CITRUS FRUIT:

Commercial citrus production in New Zealand is limited to coastal districts of the Auckland Province from Gisborne north. Practically all varieties of citrus are produced, but as Figure 3 shows, the three most important are grapefruit, lemons and sweet oranges.

The Bay of Plenty with 44 per cent of the citrus production

Figure 10.

Map of the region.

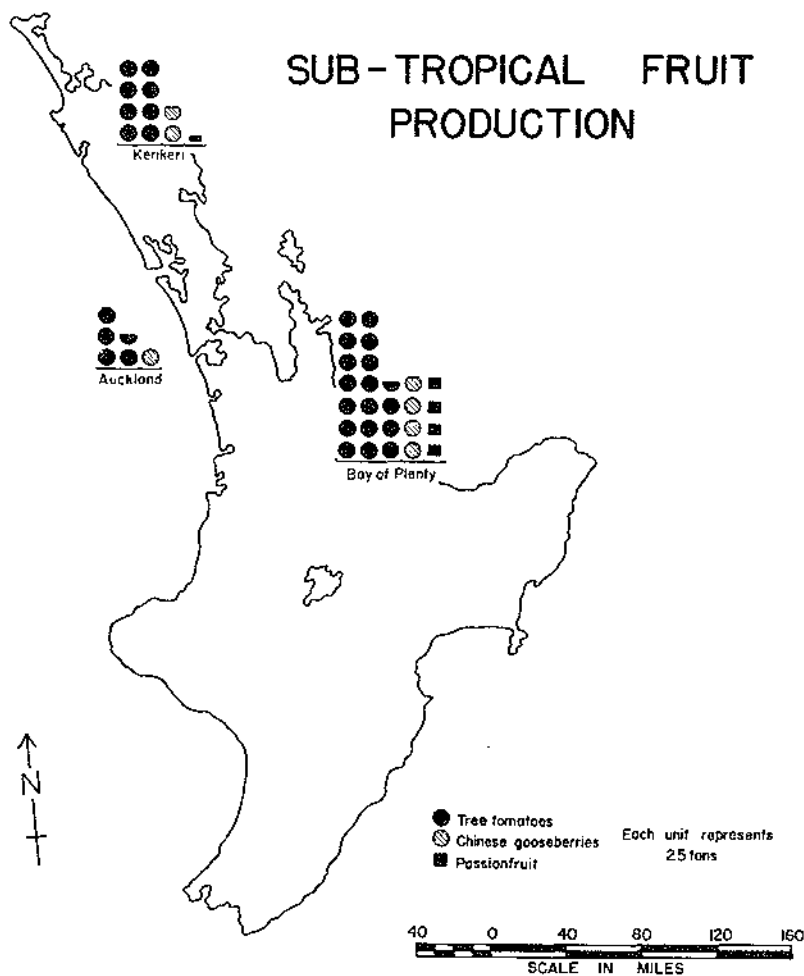
Figure 11.

Map of the region.

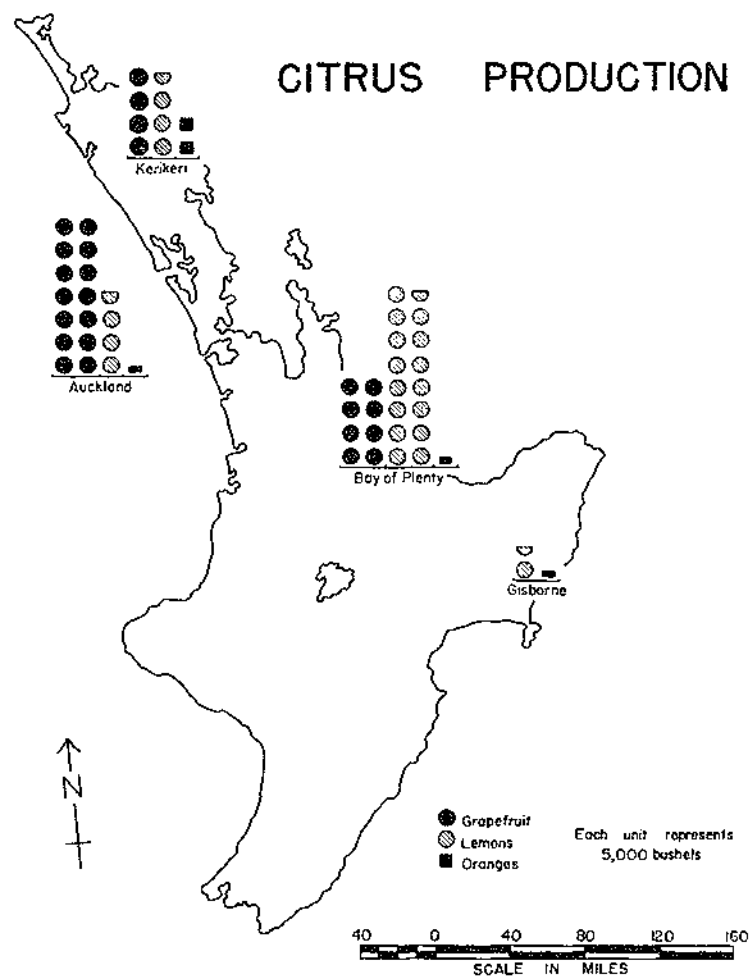
Commercial citrus and subcitrus  
fruiting in the region is controlled  
by the amount of water available.  
The day of plenty is by far the  
most abundant year.



## SUB-TROPICAL FRUIT PRODUCTION



## CITRUS PRODUCTION



is the most important citrus growing area, followed by Auckland, Kerikeri and Gisborne. In each of these areas the rows of dark green, bushy citrus trees are an important part of the orchard landscape.

None of the citrus growing areas of New Zealand are frost free, but some more favourably situated sites within these areas are virtually frost free and it is such locations that are usually occupied by orchards. As no part of New Zealand is too hot for the growing of citrus, the degree of frosting is of prime importance in the comparative success of citrus growing in this country, and accounts for the northerly concentration of citrus production.

#### SUB-TROPICAL FRUIT:

There are at present four major species of sub-tropical fruit grown commercially in New Zealand. These are, in order of importance, tree tomatoes, Chinese gooseberries, passionfruit and feijoas. Small areas of these fruit are established in the Auckland Province at Kerikeri, near Auckland city, and at Tauranga and Te Puke in the Bay of Plenty. The latter is the most important producing district and contributes 61 per cent of the Dominion's sub-tropical fruit production. Also, it is the only district in which specialized, sub-tropical orchards are found. Elsewhere, subtropical fruit occupy small blocks on citrus holdings, or are planted on headlands close to shelter belts.

Even more frost-tender than the citrus tree, sub-tropical fruit are planted only in areas where the liability of frost damage

is at a minimum.<sup>6</sup>

Sub-tropical fruitgrowing is the most recent development of commercial orcharding in New Zealand. Most areas have been planted in the last ten years, and the expansion will continue as the fruit increases in popularity.

As fruit which mature in the winter, the sub-tropicals have avoided a good deal of competition which summer ripening fruit experiences, but already the relative ease of marketing which some districts possess is making itself felt in the character that sub-tropical orcharding is assuming.

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6. All of the four sub-tropical fruitgrowing areas have less than eight severe frosts per year (Fig. 33).

Figure 11.

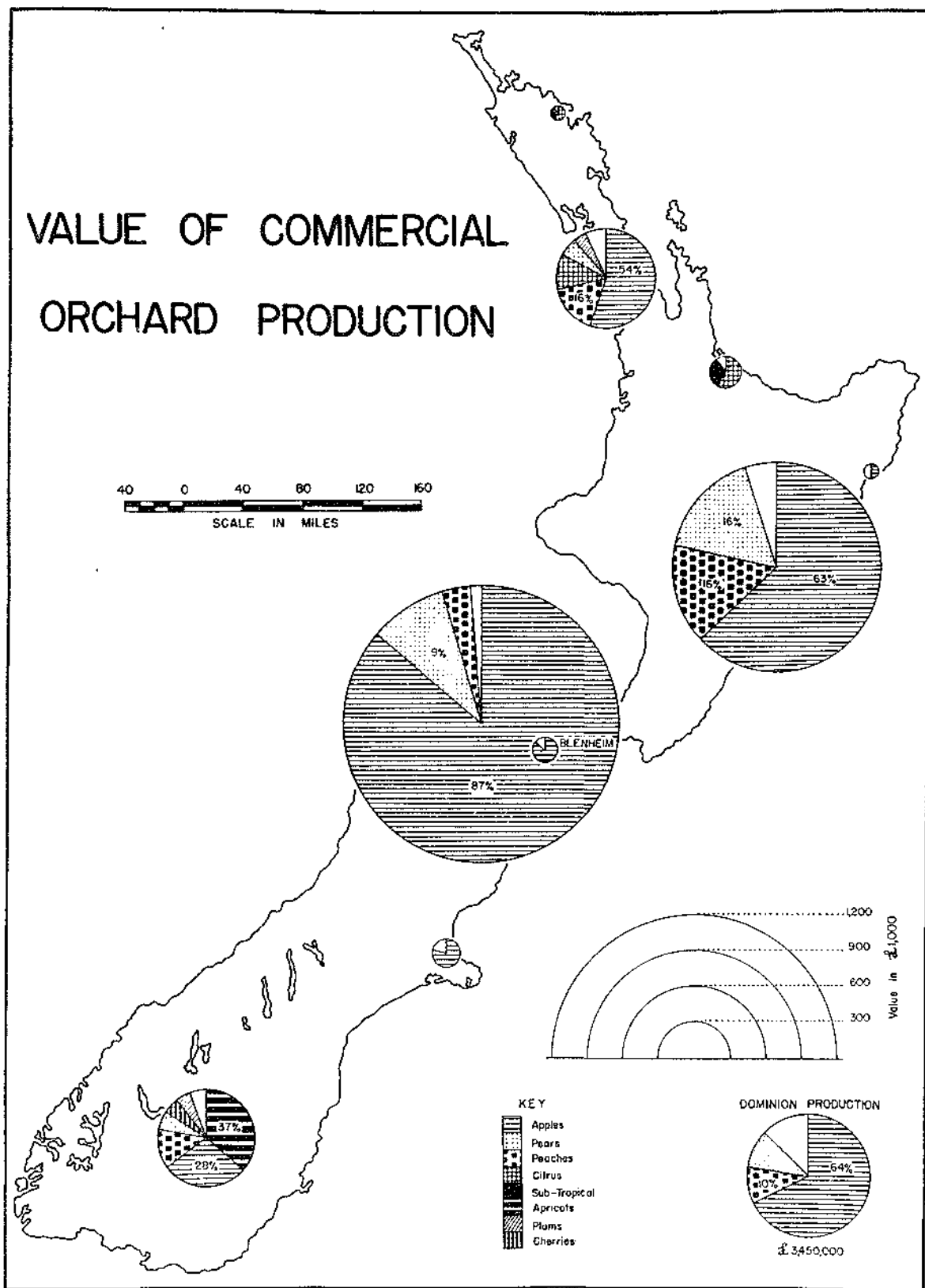
Diagram of Control System

Production.

This map provides a more uniform, statistical basis for the comparison of commercial orcharding areas than would production by bushels. Japan, Korea's Bay, Central Otago and Auckland Island : as the major orcharding districts. The difference between areas specializing in pip or stone fruit production and those with processing areas can be easily recognized. (See Appendix I in reference to this figure.)

# VALUE OF COMMERCIAL ORCHARD PRODUCTION

40 0 40 80 120 160  
SCALE IN MILES



## Chapter II:

THE REGIONAL VARIETY OF COMMERCIAL ORCHARDING IN NEW ZEALAND

Apples, pears, peaches and citrus are in themselves interesting topics for study, but to the geographer the areal patterns to which these fruit give rise are more important. When compared on a uniform basis as in Figure 11 several marked areal differences in orcharding are apparent and it is these differences which form the basis of the regional subdivision (see Figure 12).

The differentiation of an area as an orcharding region is based essentially on the type of fruit produced and the techniques employed. That is, upon the inherent characteristics of commercial orcharding, with such functional relationships as marketing, labour supply, climate and soil considered where relevant. Genesis, or the development of commercial orcharding, has had a profound influence on the present day character of the regions and is considered accordingly.

Every orchard holding is in some respect different from its neighbours, but it is convenient for discussion to group these holdings into regions which have a certain degree of homogeneity.<sup>7</sup>

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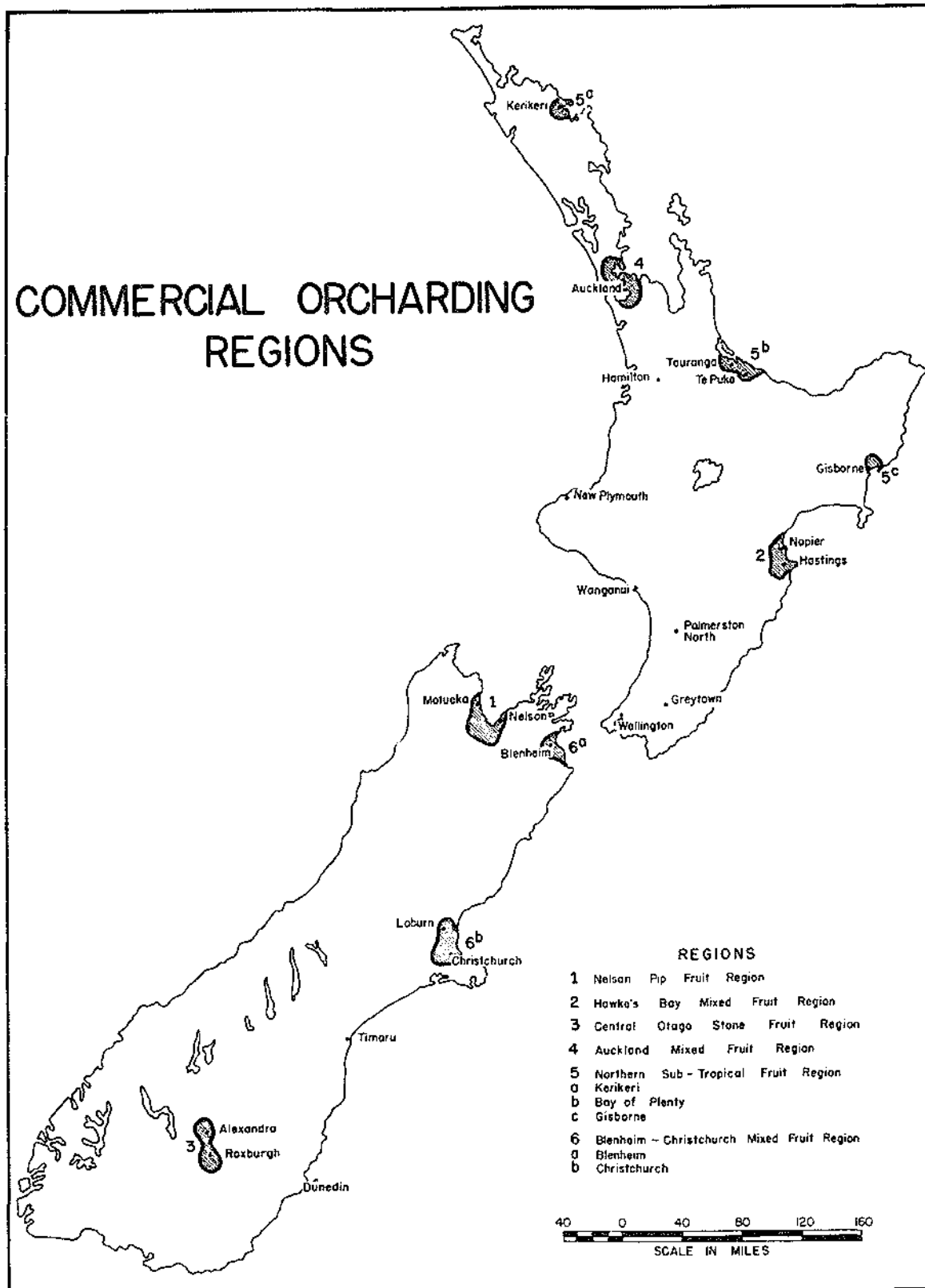
7. The region in this sense is used as a technique. There are no fixed and definitely bounded zones, but only areas with a certain degree of internal homogeneity and are considered as a unit for the purposes of discussion. They are intellectual concepts rather than concrete objects. See Whittlesey, Darwent, 'The Regional Concept and the Region Method', American Geography Inventory and Prospect. James, P.E. and Jones, C.F. (editors).

For the purpose of this thesis six regions have been defined—three in the North Island and three in the South Island. In the case of the major regions, Nelson, Hawke's Bay, Central Otago and Auckland, contiguous areas are delimited, but with the Northern Sub-Tropical Fruit Region and the Blenheim-Christchurch Mixed Fruit Region non-contiguous areas are considered together. Each of these two composite groups may be considered as minor regions in which there is a marked degree of similarity between their respective parts (see Figure 11).

Figure 12. 000 RECTAL ORGANOID 200111.



# COMMERCIAL ORCHARDING REGIONS



### NELSON PIP-FRUIT REGION

Situated on the southern shores of a deep coastal indentation, Nelson has for many years held pride of place as a fruit-growing district. Compared with other orcharding districts, a larger area is planted in orchard and orchard produce annually exceeds £1,000,000 in value.

The fruit-growing area is essentially a coastal strip, consisting of the plains of the Waima and Motuoka Rivers together with the seaward section of the Moutere Hills which separates them (see Figures 13 and 14).

Two contrasting orchard landscapes may be recognised: one on the flat alluvial plainland with its pocketed soils and the other on the broad expanse of the gently rolling Moutere Hills, with their long northward slopes and heavy clay soils. Both areas are characterised by the absence of high winds, by more than 2,400 hours of bright sunshine annually and no late frosts.<sup>8</sup>

Throughout this narrow coastal strip the orchards are irregularly spaced and show little relationship to the varying physical conditions. Steeper slopes have been neglected and there is a marked preference on the Moutere Hills to utilize the long, gently sloping, northern aspects; a preference which dates back to the original speculative plantings when a conscious attempt was made to copy methods already practiced in Tasmania.

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8. See Appendix V. A late frost in respect to orcharding is said to occur when the temperature in the screen falls below 31.9° Fahrenheit after the blossoms have set.

Figure 13. COMMERCIAL ORCHARDS IN THE WILSON  
RIVER REGION.

Orchards are located on the seaward  
section of the Centere hill country  
and the alluvial plainslands. This  
map should be compared with Figure  
14 so that the extent of the two  
contrasting orchard landscapes might  
be realized.

# COMMERCIAL ORCHARDS IN THE NELSON PIP FRUIT REGION

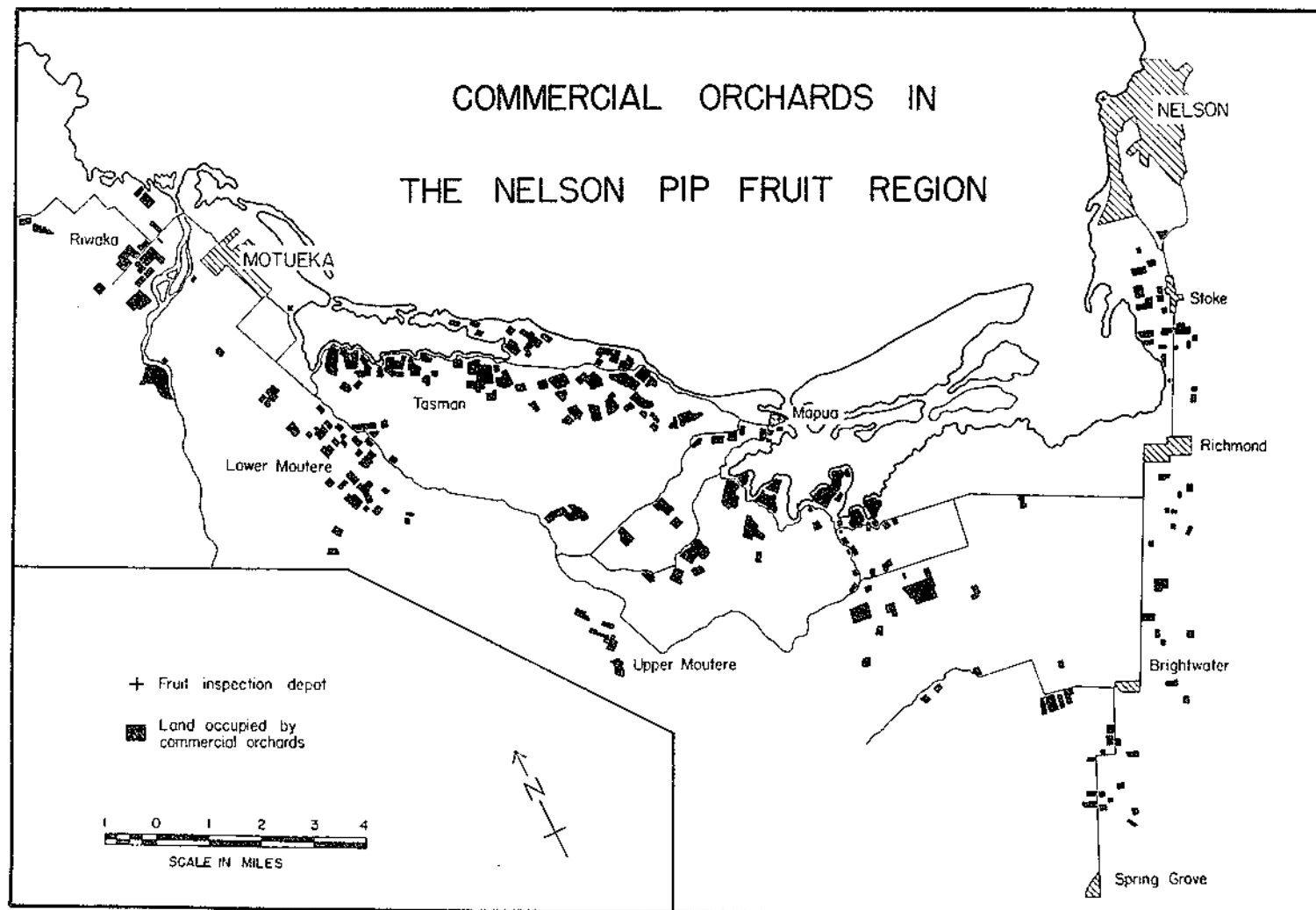


Figure 14. LAND USE AND SOIL CATEGORIES.

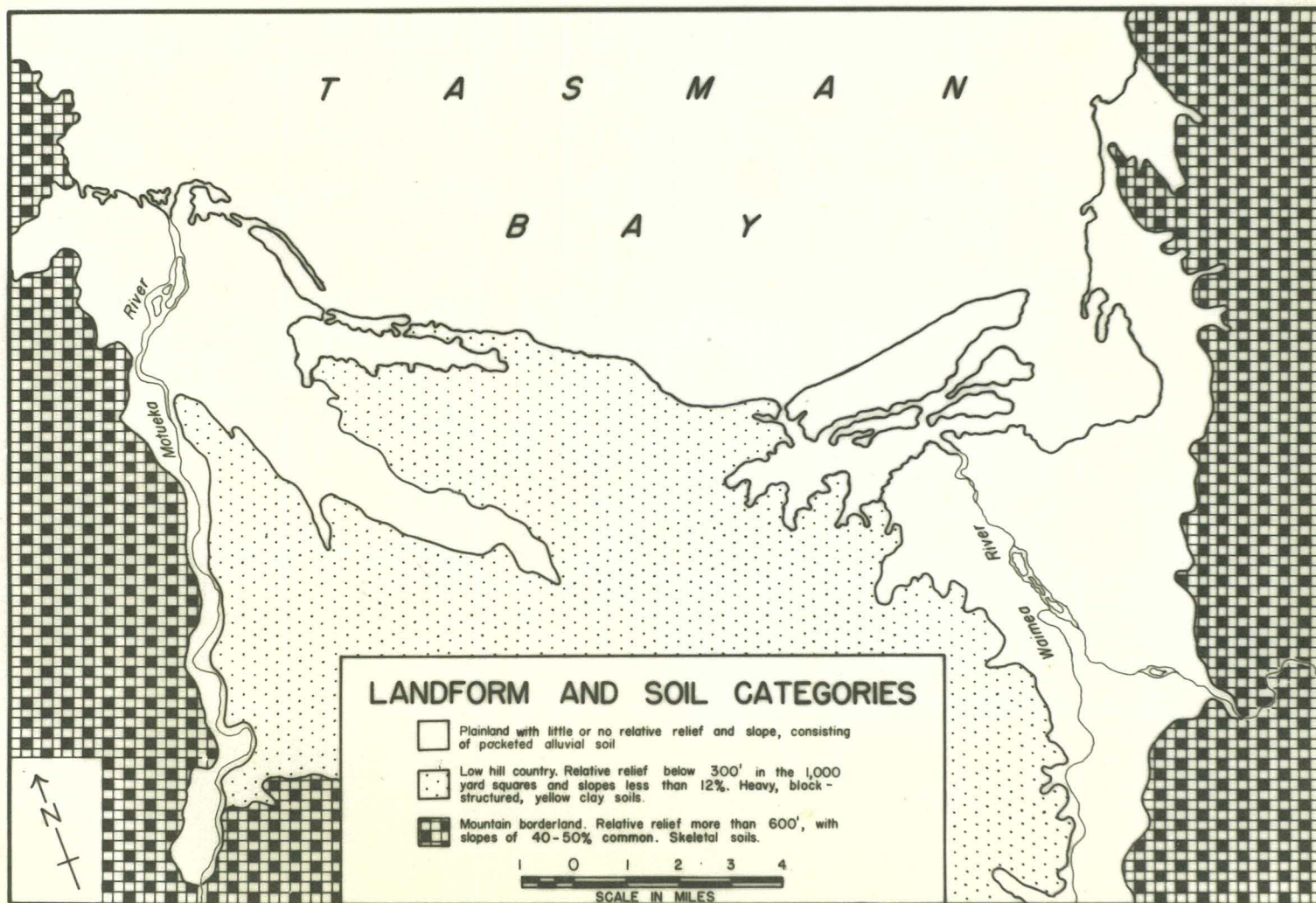






PLATE I. AN ORCHARD ON THE MOUTERE HILLS.

The low, uniformly spaced apple trees give a ribbed appearance to the orchard landscape. The land on this orchard has been clean cultivated.

(Photo: National Publicity Studios)

Early settlers were quick to perceive the similarity of this region with successful fruit-growing areas overseas and planted fruit trees. Prior to 1911 fruit was produced commercially from orchards at Stoke, Waimea and Riwaka, but after this date considerable development took place on the Moutere Hills.

Following the successful shipment of apples to England in 1908 new horizons were opened for orcharding in Nelson. Land-development companies began operation in 1911 and a great expansion of orcharding took place until the War called to a halt the speculative planting in 1916.<sup>9</sup>

During the 'boom years' there was inevitably much-ill-advised planting, while many of the new owners lacked both the practical experience and the capital necessary to bring the orchards into successful production. Accordingly, many orchards reverted to scrub-land and the orchard area has gradually declined over a period of years, until there is now less than 3,900 acres in fruit trees.

Original development had been stimulated by the suitability of the climate and the potential overseas market, together with the popular, though erroneous belief, that apples succeeded best on poor clay soils, especially if the land faced the sun. The Moutere Hills possessed these natural advantages and at the same time were a wasteland of manuka (Leptospermum scoparium) and bracken fern (Pteridium esculentum) where land was cheap and available for immediate development.

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9. 'It has been estimated that upwards of 7,000 acres were planted in fruit trees under these schemes in the boom years 1911-16.' N.J. Adamson, 'Fruitgrowing' in Land Use on the Moutere Hills, Nelson. Nelson Catchment Board, (Nelson, 1949).



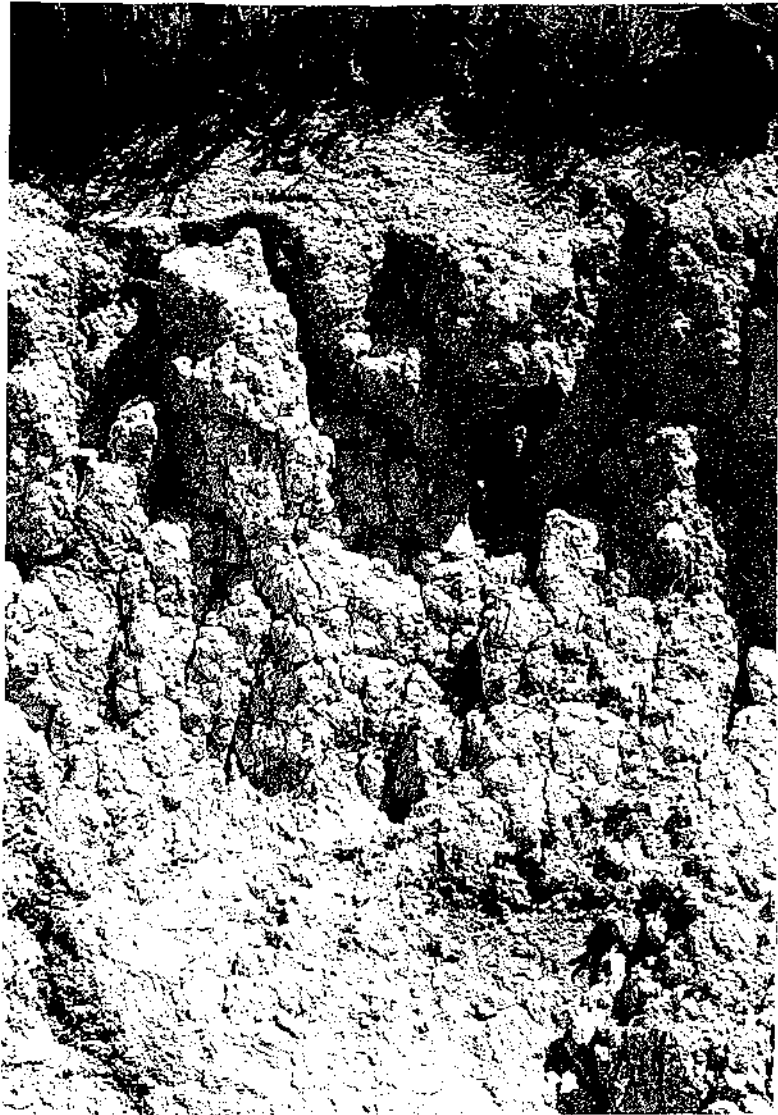


PLATE II. A SOIL PROFILE OF THE MANUKA CLAY LOAM.

Heavy clay soils of this nature predominate on the  
Southern Hills.

(Photos: Cawthron Institute).



PLATE III. PEACH TREES GROWING ON A STONY  
ALLUVIAL SOIL NEAR BRIGHTWATER.

Soils on the plains are not usually as stony as the one shown here; however, this plate does indicate the contrast between the soils of the plainland and the intervening hill country. All the region's stone fruit is grown on the alluvial plainland.

The land companies exploited these natural advantages, and although their activities have been much criticised subsequently, there has emerged a flourishing orchard industry the like of which may not have developed had it not been for the persuasive selling policies used. Of the orchards remaining today, over two-thirds were planted between 1913 and 1916 and most of these were part of land development enterprises.

Holston's premier position as an orcharding region is due to its extensive apple-growing industry. Nowhere else in the Dominion are apples so important in the orchard economy and this region accounts for 46 per cent of the country's total apple production. By value, 77 per cent of the region's production comes from this fruit alone, with pears contributing 9 per cent and peaches 3 per cent.

FIGURE 15: VALUE OF ORCHARD PRODUCTION IN HOLSTON.

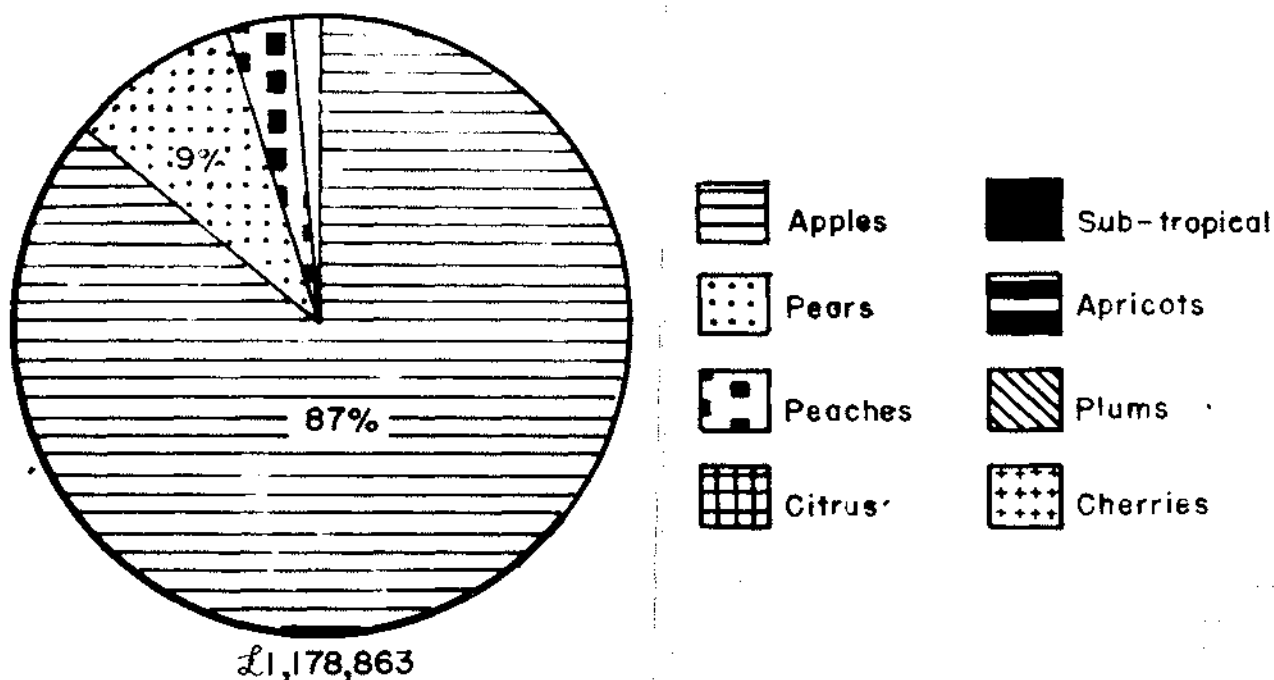
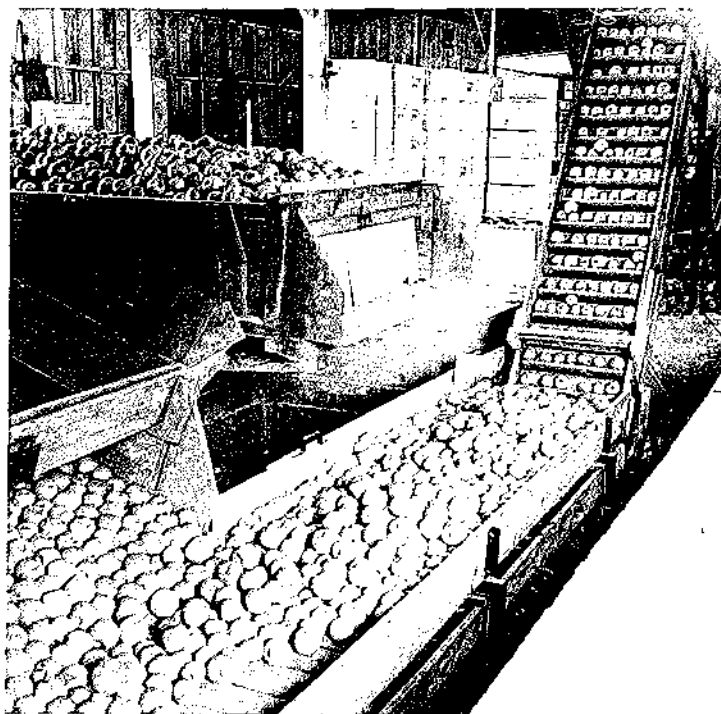
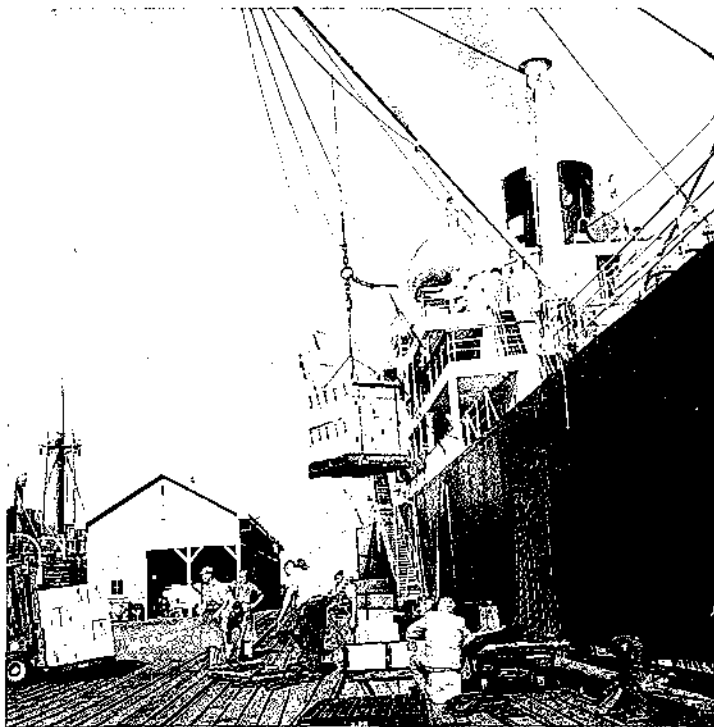
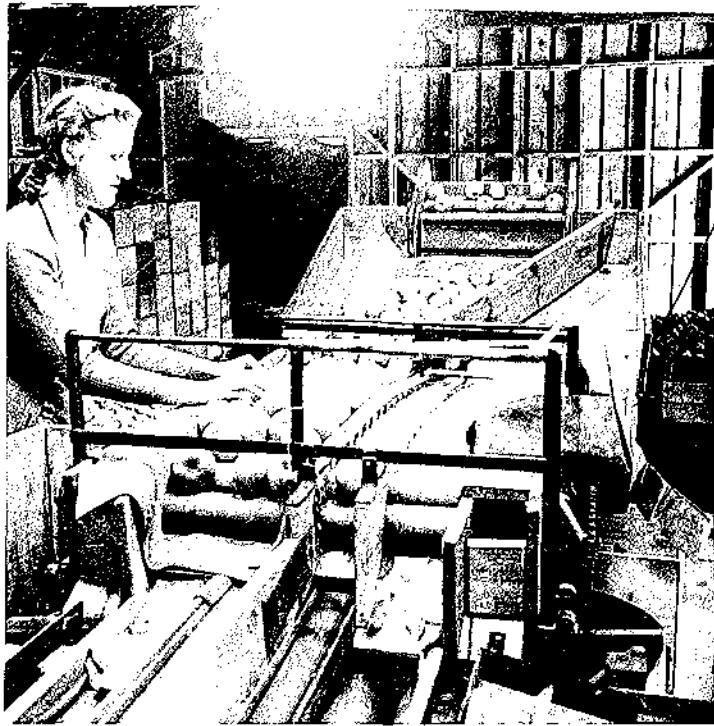


PLATE IV. MECHANICAL AIDS FOR PACKAGING

Mechanization is advanced to a greater degree and is more specialized in Nelson than in any other fruitgrowing region. Fruit is carried to the packing shed in low, rubber tyred trailers, instead of wooden boxes. This is bulk harvesting. In the packing shed the fruit is carried from the trailer to the grading machine by a conveyor belt. The packed fruit cases are loaded onto wooden pallets. This enables the cases to be lifted and carried by fork-lift trucks, both at the packing shed and the wharves or cool store docks.

(Photos: Dept. of Agric., Nelson)





Apart from some orchards at Brightwater and Kivuka, apple trees are present on every orchard. Pear trees are not nearly so universal and occupy the damper hollows where apples will not tolerate the excess of soil moisture during winter. Apples prefer the better drained, sloping land and the low, uniformly spaced trees give a ribbed appearance to the orchard landscape. Sturmer, Jonathan and Delicious in that order are the major varieties of apples produced, whilst William Bon Chretien dominate the pear tree statistics (see Figures 4 and 5). In comparison, stone-fruit, grown on the alluvial plainland, are of minor importance in this predominantly pip-fruit region.

Although physical advantages have played their part in making this region suitable for pip-fruit culture, the predominance of apples and pears and the uniformity characteristic of Nelson's orchards is directly related to the speculative planting ventures. The prospects for the apple industry were bright in the first decade of this century and trees were planted extensively. As a result, the varieties and layout then popular remain today.

The concentration on the apple crop, the difficulty in obtaining seasonal labour, and the preference for the one-man, owner-operated orchard have all contributed to the high degree of mechanization on Nelson orchards. Indeed, mechanization is advanced to a greater degree and is more specialized in Nelson than in any other fruit-growing region. In all, 350 tractors were operated on orchard holdings in 1956, whilst two-thirds of the apple crop is sprayed by

one man operated blast sprayers and handled by some method of mechanical bulk harvesting.

Such a concentration of equipment indicates the high application of capital per acre on orchard holdings in this district.<sup>10</sup> This is a common characteristic of orcharding throughout the Dominion and to a degree the holdings may be said to be over capitalized, for the same machinery which is needed to operate the typical 10-16 acre holding could adequately cope with the requirements of treble this area.

In Nelson the average size of a holding is 13 acres, compared with 8.5 acres in Hawke's Bay. This difference is largely counterbalanced by the higher yield per acre attained in Hawke's Bay, where production averages 650 cases of apples per acre, as opposed to 500 cases in Nelson.

Trees no more than ten feet tall are favoured on the heavy clay soils in Nelson, and picking and pruning operations can be carried out without the aid of ladders. Taller trees do yield a larger crop, but with the increased ladder work production costs rise proportionately and in this area, where labour is scarce, the smaller tree is suited to both the physical and economic conditions.

Seldom, if ever, is the land between the trees devoted to the cultivation of cash crops. More often, a leguminous cover crop is planted in the late summer and turned under during the spring to leave

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10. Capital invested on the typical Nelson orchard, as shown in Figure 16, represents £4,000 for buildings and £1,700 for equipment and machinery.



the ground clean cultivated during the harvest season from January to April. Due to this practice and the liability of this region to heavy falls of rain of short duration, accelerated soil erosion is a major problem on the sloping land of the Noutere hill country.

The Maene clay loam, a heavy blocky soil, has only a shallow upper horizon and on most of the low rounded hills this has been removed by erosion leaving the yellow domes conspicuously outlined in aerial photographs. As a result, tree growth is retarded on the hill tops, whereas trees in the depressions are often half buried beneath deposited soil.

One of the most successful efforts to check the progress of this unnecessary damage has been the laying down of permanent pasture in the area between the trees.<sup>11</sup> Already one-fifth of the orchards have been grazed but, nevertheless, soil depletion on the remainder continues for the want of a more progressive policy on the part of the growers. In the foreseeable future there must be a considerable increase in the number of grazed orchards if production in this region is to be increased, or even maintained.

At present, however, accelerated soil erosion poses a lesser economic problem for the Nelson orchardist than does the elimination of disease and insect pests. In comparison with other South Island districts, the absolute humidity of this region is high<sup>12</sup> and aids the

11. E. Bigger estimates that on clean cultivated land accelerated soil erosion proceeds at three times the rate that it would on grass-land of similar slope. ('Soil Erosion and Orchardling,' Orchardist, Vol. 8, No. 11, 1955.)

12. See Figure 32.

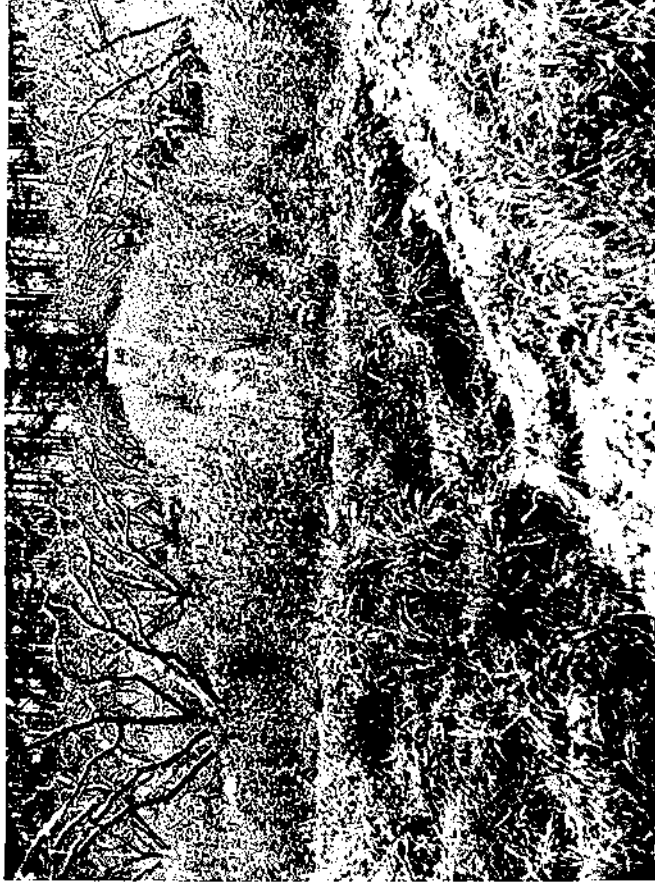


PLATE V. ACCELERATED SOIL EROSION ON THE MONTERO HILLS.

Accelerated soil erosion is a major problem on the sloping land of the Montero hills. In this orchard the leguminous cover crop has not reduced the liability to damage.

(Photo: Soil Conservation and River Control Council)

PLATE VI. CONTOUR PLANTING OF ORCHARDS.

On this orchard an attempt has been made to reduce the damage from erosion by planting and cultivating the land along the contour. Note the large packing shed in the foreground. Similar buildings are present on all orchards.

(Photo: Soil Conservation and Rivers  
Control Council.)







insubstantial amount of insecticide. Between November and February is the most critical period and during this time orchards must be sprayed once every 10-14 days.

Black scale, collared scale, red scale, collar scale and roller caterpillars, are economically the most important diseases and pests.<sup>13</sup> However, with the aid of blanch sprays started by one man a greater measure of control is being obtained and at a lower cost than was previously possible.

Spraying is but one of the orchard operations which has become increasingly mechanized in the last few years to help increase efficiency and to circumvent the scarcity of seasonal labour. Apart from the 400 males employed permanently or temporarily in this region, more than 300 seasonal workers are required. Unlike Toroko's Bay, where adjacent cities serve as a reservoir of seasonal labour, 75 per cent of Helicon's seasonal labour force must be imported from outside the region. Holiday workers are attracted by newspaper and radio advertisements and at least two-thirds of the orchard proprietors provide accommodation for their seasonal workers, a practice common only in Helicon and Central Otago.

The disposal of fruit in this pine fruit speciality region rests almost entirely with the Aanda and Pear Marketing Boards. Receiving depots are located at Port Nelson, Picton and Motueka. During the harvest season fruit-laden trucks carrying the packed apples from the orchards to these tide-water depots are a common sight on

13. See Appendix VIII for scientific names.

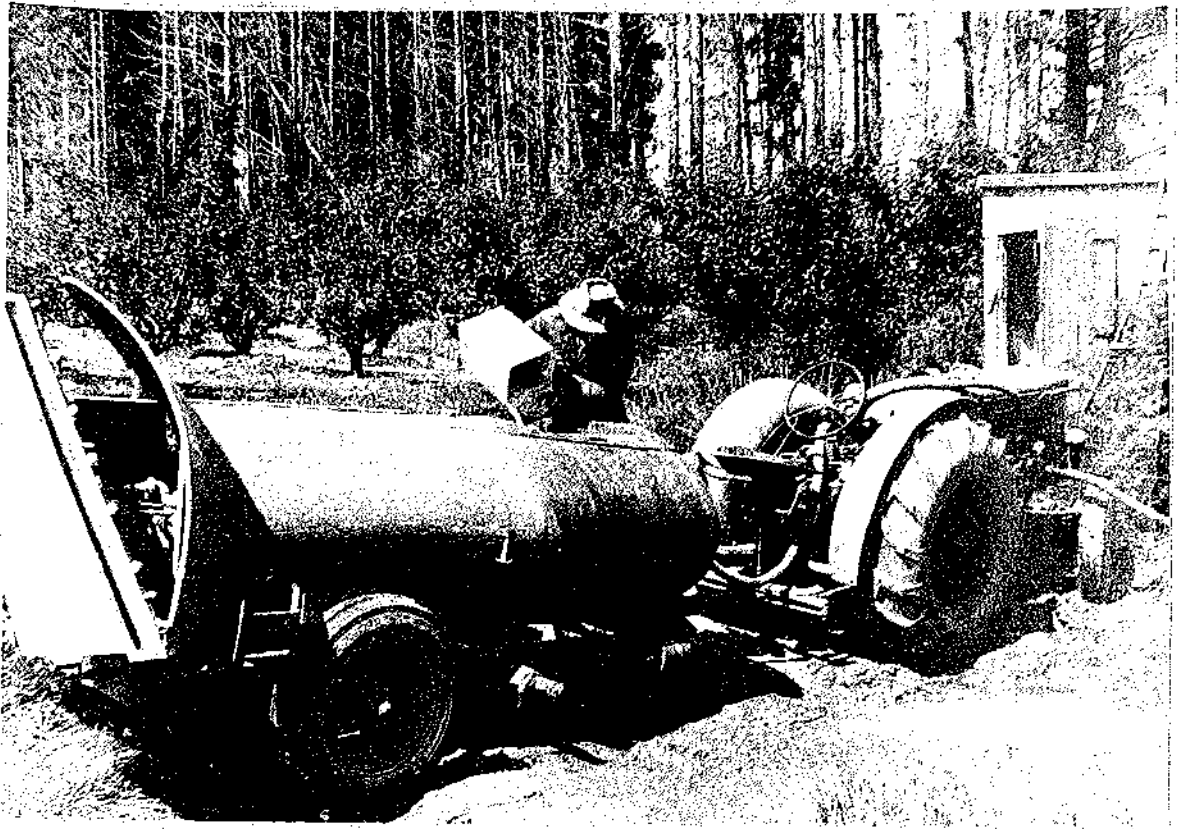


PLATE VIII. AN AUTOMATIC BLAST SPRAYER.

Regular spraying is essential in this region.  
Here a grower is mixing a spray into a one  
man operated, automatic, blast sprayer.

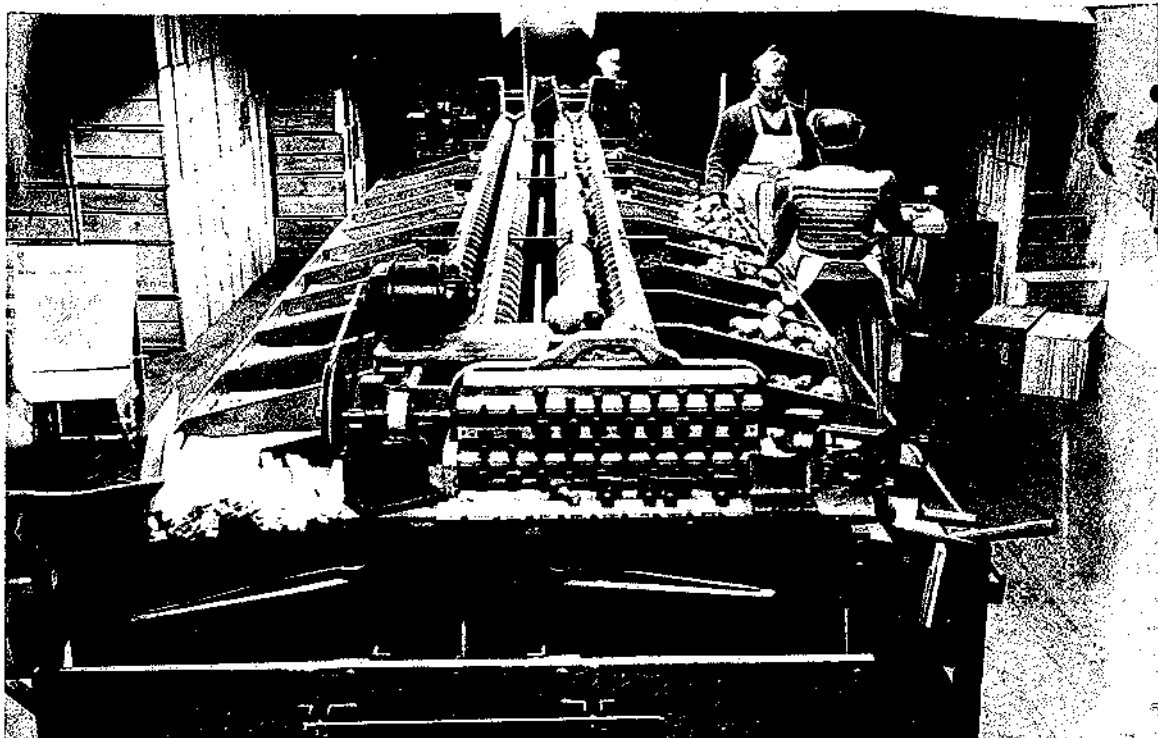


PLATE IX. PACKING FRUIT AT NIGHT.

Seasonal labour is difficult to obtain in this region. Here a grower and wife pack the fruit which has been picked during the day.

(Photo: National Publicity Studios.)



the dusty wet local roads. On the islands, the fruit is either placed in adjacent cool-storage or shipped to Wellington for export.

Fortunate though Nelson is in having three conveniently situated ports, transport difficulties have been a problem of constant concern to Nelson orchardists. South Island markets are only reached by a costly road haul to the railhead at Blenheim, while much of the export fruit must be trans-shipped twice before reaching the holds of overseas vessels. Losses resulting from the additional handling seriously impair the standard of the fruit and transport problems must be solved if orcharding is to continue its progress.

Out of all it is from the South Island apples and with only a small local market, the Nelson region is particularly oriented towards the export trade. In 1955 almost two-thirds of the Nelson apple crop was exported, representing a greater proportion of the total crop than in any other commercial orcharding region.<sup>14</sup>

Outside the Apple and Pear Marketing Board, the greatest consumer of apples are the canning-works. Altogether 34,375 bushels were used in 1955. Apples are pulped at Nelson and dehydrated at Motueka, while some are still used for cider.

In contrast to apples, no pears were exported in 1955 and although 48,397 bushels were used by canning-works, three times this amount were accepted by the Apple and Pear Marketing Board for sale within the Dominion.

Stone-fruit marketing is not controlled by a Government

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14. See Figure 27.

agency and fruit is sold direct to the local and Wellington markets and to local canneries.

The six fruit processing firms operating in this region, two in Nelson and four in Motueka, employed 253 persons during 1956. Nevertheless, there is no marked orientation of orcharding towards fruit processing in this region as there is in Hawke's Bay, and only one orchard, 50 acres in area, is operated by a canning company.

### Conclusion.

In contrast to all other commercial orcharding regions in New Zealand, Nelson stands out as an area of piri-fruit specialisation. Almost as many apples are produced here as in all other districts combined and the stocky apple tree standing in strong contrast to the light grey, almost yellowish, soil is the most conspicuous item of the orchard landscape.

Specialisation and uniformity, both directly related to the speculative development of orcharding in this region, are the most important regional characteristics. Linked with them is the difficulty in obtaining seasonal labour to harvest and deliver the crop and the trend towards increased mechanization over the last three years.

The prosperity of Nelson is largely dependant on horticultural industries of which commercial orcharding is the most important, and although the area planted in orchard has fluctuated widely in the last forty years, future prosperity seems assured.

Soil erosion, insect pests, disease and transportation present many problems, but they can be solved in the light of our present technology. It seems certain therefore, that the association of the Nelson district with apple growing will continue in future years.

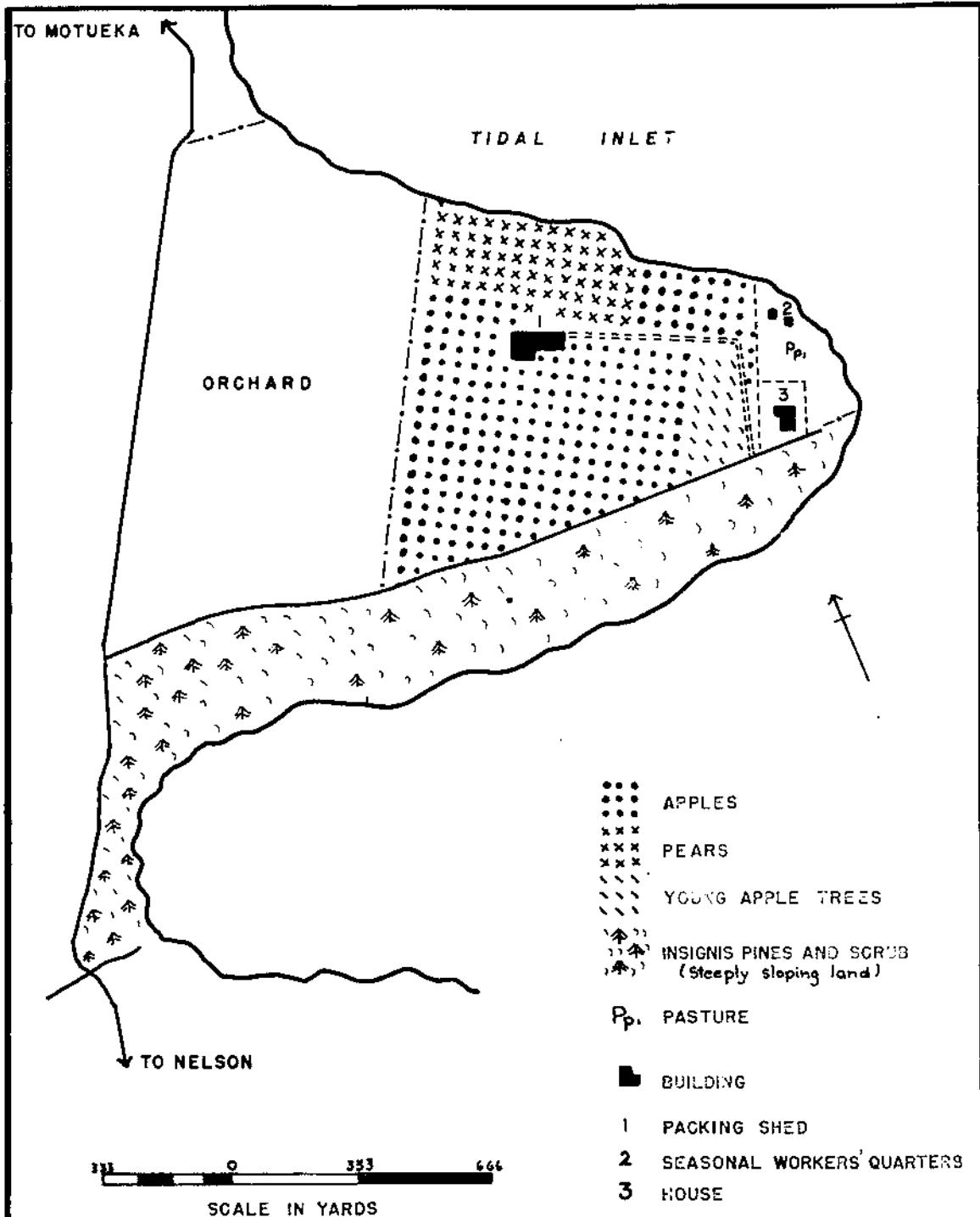
TABLE I: HORTICULTURAL PRODUCTION IN NELSON 1954.<sup>15</sup>

	Acreage	Six year Av. Prod.	Value in £s
Pip-fruit	3,275	1,500,000 bushels	1,000,000
Stone-fruit	400	30,000 "	30,000
Berry-fruit	240	360 tons	50,000
Tobacco	3,080	4,500,000 lbs.	900,000
Hops	645	1,000,000 lbs.	215,000
Tomatoes (glass-house)	31	1,500 tons	150,000
Tomatoes (outdoor)	300	3,500 tons	100,000
Peas and beans (unprocessing)	2,100	3,000 tons	140,000
Other vegetables	260	1,250 tons	37,000
<hr/>			
TOTAL:	10,331		£2,672,000

15. Adamson, H.J. 'Value of Horticultural Production in Nelson.'  
Orchardist, Vol. 13, No. 7, Aug. 1955.

Figure 16. A TYPICAL HIBISCUS ORCHARD.

This orchard, located on the north-facing slope of the peninsula, is typical of many orchards in this region. Apples occupy 83 per cent of the total area and pears are grown on the low-lying, dampor land. Pines and scrub occupy the more steeply sloping, southerly slope.



## A TYPICAL NELSON ORCHARD

AREA 14 acres

### HAWKE'S BAY MIXED FRUIT REGION

The Hawke's Bay Mixed Fruit Region is the most concentrated and most intensively farmed commercial orcharding region in New Zealand and is second only to Nelson in value of production and acreage occupied.

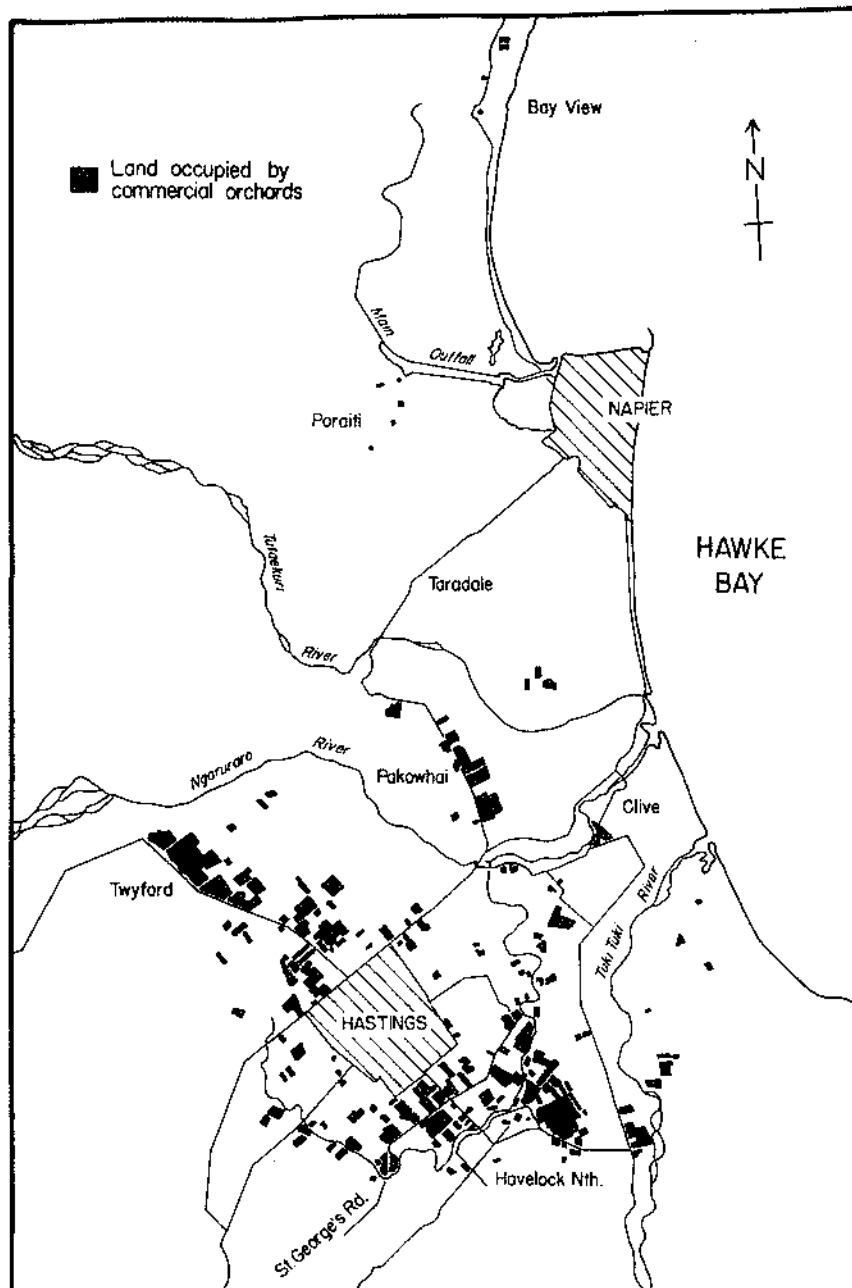
The fruitgrowing area is located near the southern shore of Hawke's Bay with a pronounced concentration of orchards around Hastings. So situated, with the main axial ranges of the North Island shielding the area from the prevailing westerly air streams, this region enjoys a comparatively low absolute humidity and high insolation (see Figures 32 and 34).

The 3,076 acres of orchard land in this region produce £889,770 worth of produce annually. Of this, 63 per cent is contributed by apples, 16 per cent by peaches and a further 16 per cent by ~~peaches and~~ pears. In respect to the predominance of apples this region is similar to Nelson, but the comparative significance of the stonefruit production justifies the designation 'mixed'. In general, every orchard is mixed with approximately two-thirds of the area occupied by pit fruit and one third by stone fruit.

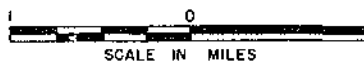
Figure 17. COMMERCIAL DEERHORN IN THE NATHAN'S  
BAY MIXED HORNED REGION

Deerhorns in this region are concen-  
trated around footings.





COMMERCIAL ORCHARDS IN THE  
HAWKE'S BAY MIXED FRUIT REGION



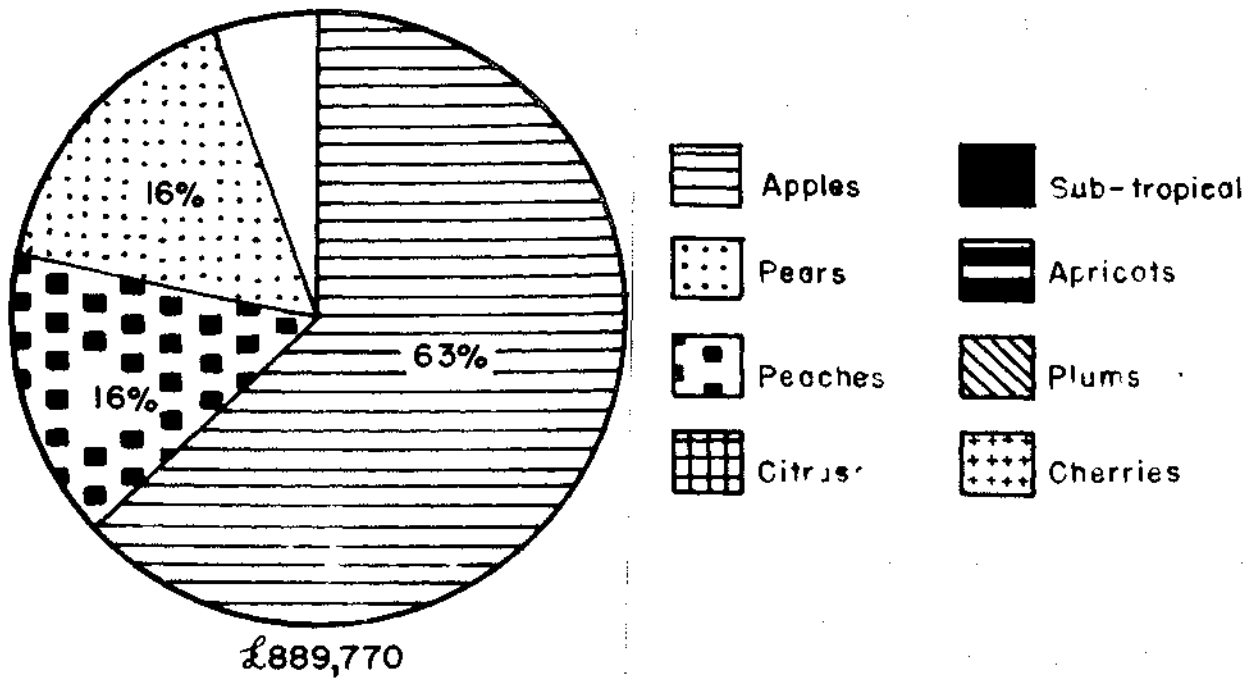


FIG 18: VALUE OF ORCHARD PRODUCTION IN PACKING DAY.

Unlike Nelson, speculative planting has played a part in the development of orcharding in this region. The nearest approach to it has been the subdivision of those large estates, the trees in which were already in full production.<sup>16</sup>

Orcharding in this region had its beginning as part of a combined crop, livestock and fruit economy. As disease reduced competition from other North Island districts orcharding expanded, especially during periods of boom prices. At least 30 per cent of

16. The Brisley Estate, a peach plantation, located just to the west of Hastings, consisted of sixty rows of trees each a mile long.

the orchards were planted by individuals who recognised the climatic advantages of this region in relation to disease and pest control. Good prospects for the early establishment of a fresh fruit trade and fruit processing industry were additional factors. Fruit processing was commenced in 1899 and the progressive nature of the industry has been partly responsible for the continual expansion of the orchard acreage. In comparison acreage in other regions has declined.

These independently planted orchards exhibit considerable diversity. Holdings are irregular while tree spacing and row orientation vary from orchard to orchard. As a result the orchard landscape looks like a jig-saw thrown carelessly together.

Today, as a result of recent specialization, apples have become the most important single crop. But, nevertheless, this is still the largest producing district for pears, peaches and nectarines.

Altogether one-fifth of the Dominion's apple trees are grown in this region where they occupy 54 per cent of the total orchard land. Sturmer is the most popular variety followed by Delicious and Granny Smith (see Figure 4). The Jonathan apple, so popular in Nelson has never found favour in this region since the attacks of powdery mildew during the 1920's.

In comparison with other commercial orcharding regions the outstanding feature of apple growing in Hawke's Bay is the high production per acre. With alluvial soils of high inherent fertility and the availability of irrigation water, apple trees grow

to 20 feet or more in height and produce an average of 650 cases per acre. Indeed, winter pruning to check the phenomenal growth presents a major problem for the Hawke's Bay orchardist. Only on the lighter sandy soils at Teyford are there low, stunted apple trees with a habit similar to those of the Nelson region. Management costs on orchards with tall trees are naturally greater but this is offset to a degree by the high production per acre. On the better orchards production rises to over 1,100 cases per acre.

Pears are particularly suited to the damper soils prevalent in the Pakowhai district, and this physical advantage together with the demands of the progressive canning industry has established Hawke's Bay as the leading pear producer in the country. More than one-third of the Dominion's pear trees are located in this region and 37 per cent of these are William's Bon Chretiens; the most sought-after variety for canning (see Figure 5).

Although 30 percent of the orchard acreage is devoted to stone fruit, these provide only 20 per cent of the production by value. This discrepancy is due to the fact that a greater value of production per acre can be obtained by growing pip fruit.

Peaches are the most widely grown stone fruit and occupy 68 percent of the stone fruit acreage. At least one quarter of the crop is utilized by local canneries, who themselves have planted more than 50 acres in these trees. The remainder of the crop is distributed widely to North Island markets. The low incidence of brown rot has given a definite advantage to this region and peach production



PLATE X. APPLE TREES IN HAWKE'S BAY.

The outstanding feature of apple growing in Hawke's Bay is the size of the trees and the production per acre. Trees like the one shown above would yield more than 1,000 bushels per acre, annually.

(Photo: National Publicity Studios.)



PLATE XI. SHEEP GRAZING BETWEEN FRUIT TREES.

This practice is almost unknown in Nelson, but is more common in Hawke's Bay where the orchards have been longer established and the tree foliage is higher from the ground.

will increase as long as the more humid districts are hampered by this disease.

Canning has been, and still is, a major stimulus to peach production, and the Golden Queen, a late variety of yellow clingstone favoured for processing, accounts for 45 per cent of the peach trees planted (see Figure 7).

Plums, nectarines and apricots are also grown. The importance of the first, however, is decreasing except for prune plums which are expected to increase as dehydration offers new opportunities. Apricots are only of minor importance except at Poraitai where the frost free, northerly sloping land is suited to their culture.

With apples, pears, peaches and apricots all contributing to orchard production, fruitgrowing in Hawke's Bay is truly a mixed economy. Pip and stone fruit trees are grown on the same holding, though usually in well-defined blocks and not interplanted as in Auckland. Stone fruit were often planted as a crop from which an early return could be obtained, but large blocks have been planted to meet the need of the fruit processing industry. Physical conditions, especially the low humidity of this region, have contributed to the development of the tree association, while the influence is also evident in the particular methods used.

As is to be expected, the methods used on the more intensive, mixed holdings of Hawke's Bay are very different from those in Nelson. Owing to the presence of stone fruit the harvest season begins at least a month earlier in this region and through this extension a

more ordered picking season is possible without the high degree of mechanization found necessary in Nelson.

Damage from climatic phenomena, gales, hail storms and late frosts, is frequent in Hawke's Bay and produces serious problems for the orchardist (see Figure 33).

Shelter belts are universally used to protect trees from the strong south-westerly gales which are common from September to December. Poplar (Populus pyramidalis) is widely used and orchard holdings are virtually walled in by rows of tall poplar trees, stark and bare in winter and gold hued in autumn. They, together with the peach tree blossoms contribute to the kaleidoscopic changes for which the Hawke's Bay landscape is famed.

Running alongside these belts of trees and cutting across the orchards at regular intervals are steep sided drains. The high water-table on the low-lying Heretaunga Plains is a major problem, and the provision of artificial drainage is essential. "Other things being equal, the height of the water table is the limiting factor in the use of the Plains' soil for orcharding."<sup>17</sup> For this reason the more easily drained sandy loam soils are preferred for orcharding.

However, as if to counterbalance the disadvantage in having to artificially drain the land, the high water table aids irrigation. At least one-quarter of the orchards are irrigated and this proportion rises significantly on holdings within a two-mile

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17. Land Utilization on the Heretaunga Plains. D.S.I.R. Bulletin No. 70 (1939), pp. 8.





PLATE XIX. NATURE'S WAY TO SPRING.

The peach trees are just beginning to blossom, while the cedar shelter-belts are still stark bare of foliage.

(Photo: National Publicity Station.)

radius of Hastings where artesian water is available. Considering the unreliable nature of the Hawke's Bay rainfall this is a practice which could well be extended.

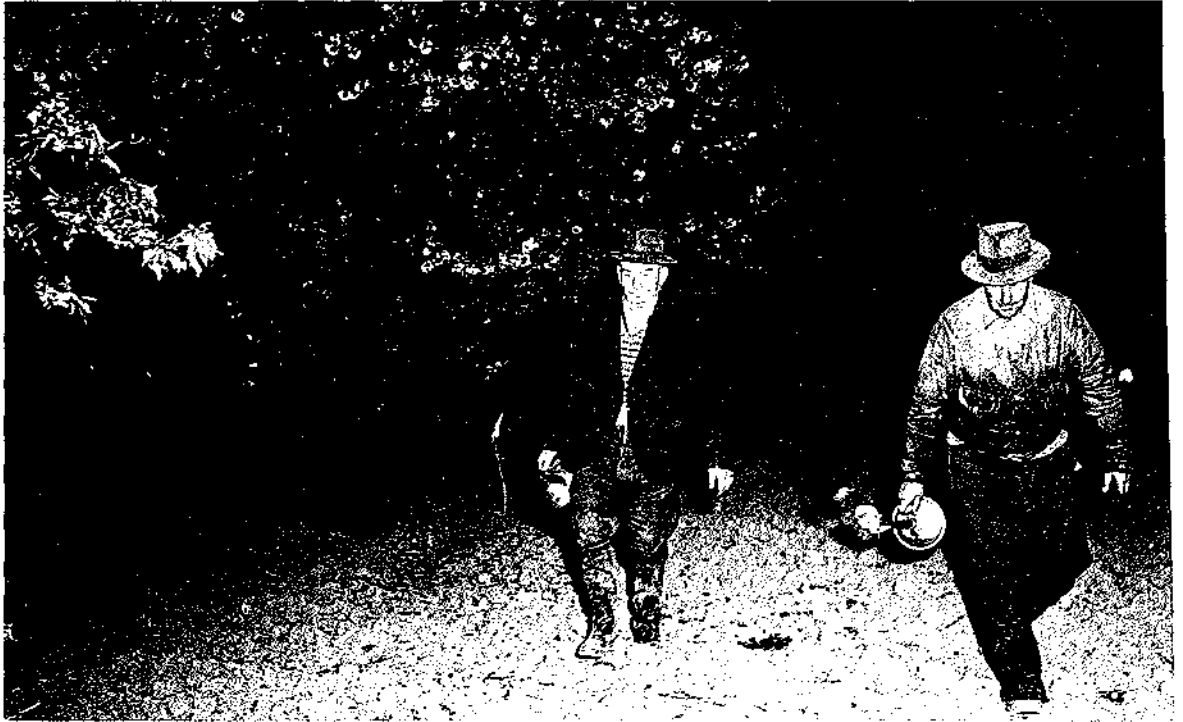
Late frosts, another anomaly of the Hawke's Bay climate, are never as serious as in Central Otago. They are sufficiently dangerous, however, to warrant expenditure on frost fighting equipment. Heavy frosts are experienced in the vicinity of Hastings from March to August, but they are not of sufficient intensity to injure dormant deciduous trees. Frosts have been recorded in September, October and even November, and it is at these times that deciduous fruits suffer.<sup>18</sup> Damage to stone fruit is always likely but serious damage to the more hardy and later developing pip fruit is rare.

Such climatic fluctuations are not a feature of the Nelson climate so that the shelterbelt and drain, sooty fire pot and irrigation pipe are characteristics which contribute to the distinctiveness of commercial orcharding in Hawke's Bay.

On the typical 8 to 10 acre orchard of this region there is a greater application of labour and a lower degree of mechanization than is usual in Nelson. Stationary spray plants with pipes stretching to every corner of the orchard are still in use, and bulk handling of fruit is not general. A reliable indication of the degree of mechanization is given by the number of automatic blast sprayers in use; only one-third of the holdings possess them in this region as opposed to two-thirds in Nelson.

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18. See Appendix V.



LATE WINTER. NIGHT LIGHTING.

Late spring floods do occur in  
Farkes's Bay. Here the men are  
lighting the walls of oil with  
kerosene torches.

(Photo: National Publicity Studios.)

Obtaining seasonal labour does not present a major problem for the Hawke's Bay orchardist. Lying adjacent to two cities, each with a population of over 30,000, this region is assured of a reliable supply of seasonal workers, 70 per cent of whom are women and school children. Seasonal accommodation is not necessary on the orchard and the compact, seasonal worker's phaze is not part of the ensemble of farm buildings.

Also a product of this reservoir of workers, particularly weekend workers, has been the use of contract labour. In this, and only in this region, the itinerant labour gangs so characteristic of sheep farming in this country make entry into the orchard industry. During winter, orchards are pruned and in the harvest season the same gangs reappear to do the picking of the fruit.

In no other orcharding region are the methods of marketing so diverse. Here fruit is sold direct to the consumer in this region, then elsewhere in the Dominion and more than one-fifth of the pear crop and three-quarters of the peaches are used by canneries (see Figure 19). Nevertheless, the Apple and Pear Marketing Board is still the largest buyer.

In the case of stone fruit, the importance of processing can be gauged from the proportion of the peach crop utilized in this manner. Two canning corporations operate in Hawke's Bay and together they use 212,000 bushels of fruit. Seven hundred people are employed at the peak of the season and peaches are by far the most important fruit processed.

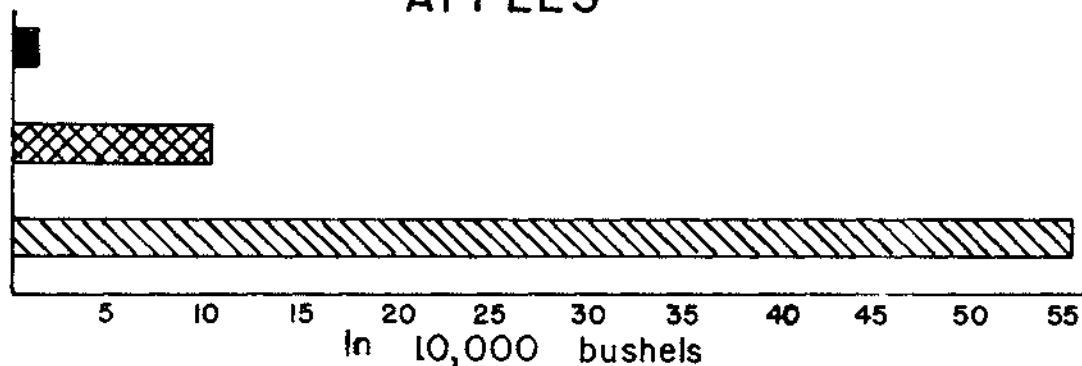
Figure 19. UTILIZATION OF THE MARKET'S DAY

PEACH CROP.

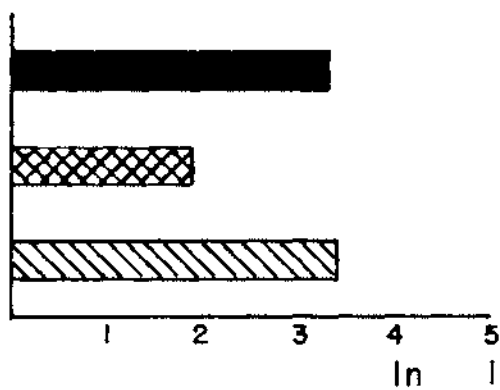
Processing factories take a far greater proportion of the peach and pear crop than they do of the apple crop.

# UTILIZATION OF THE HAWKE'S BAY FRUIT CROP — 1955-1956

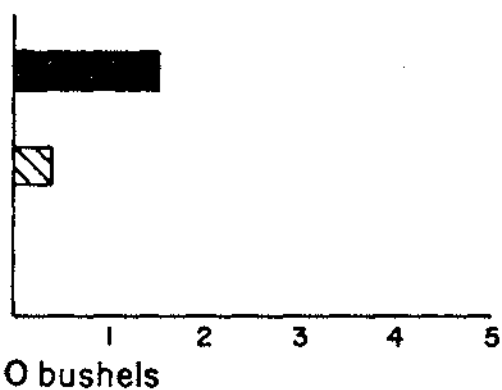
## APPLES






## PEARS



## PEACHES



-  Apple and Pear Board
-  Direct to consumer
-  Processing



PLANO, ARIZ. 7-20-1919. 7-20-1919. 7-20-1919.

Since the first cannery was established in 1899 fruit processing has been closely linked with the development of orcharding in Harko's Bay. Indeed, the canneries of Hastings are for the stone fruit grower, what the government inaugurated Apple and Pear Marketing Board is for the pip fruit grower. They act as a price regulator, which since its inception has done much to stabilize prices, guarantee profits and make progress possible.

#### Conclusion.

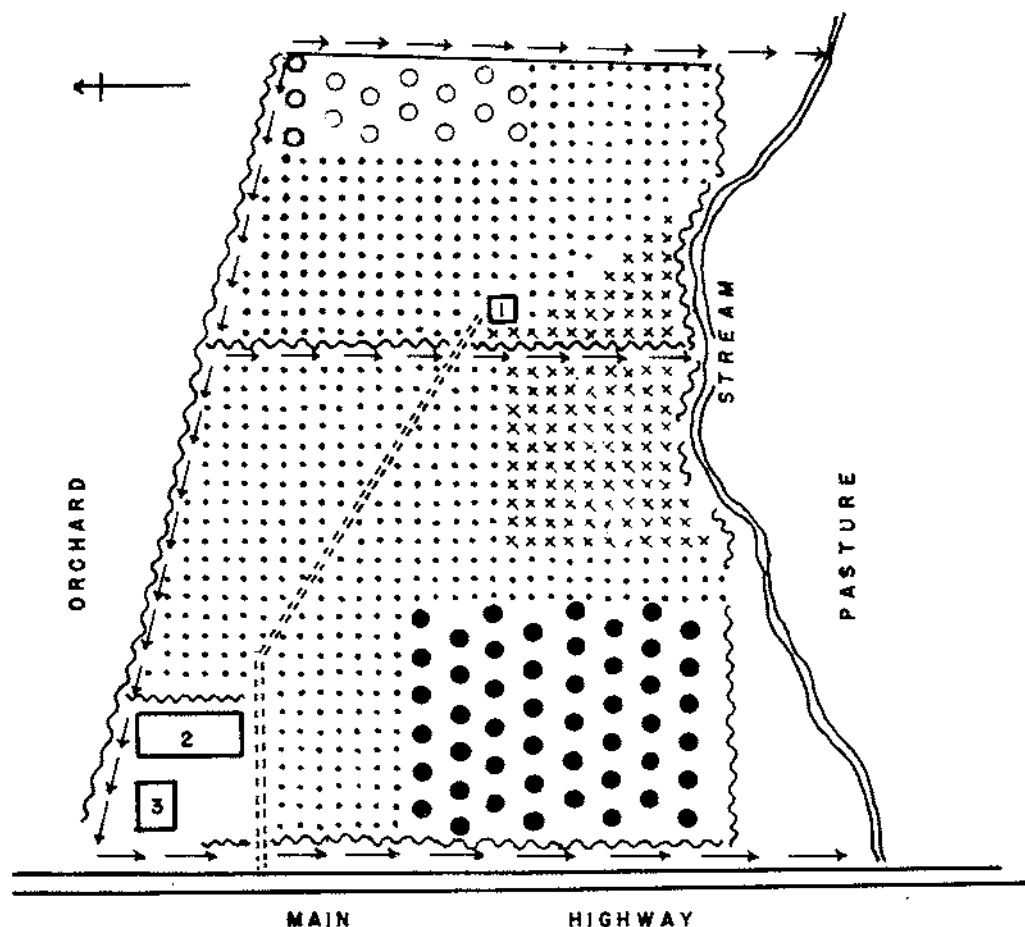
Although this region is always liable to suffer damage from unusual climatic occurrences, its comparative advantage for orcharding is greater than any other region in New Zealand. Under stimulus from a steadily growing North Island market and a progressive canning industry, commercial orcharding in Harko's Bay has developed steadily. This has been achieved without the speculative planting booms and subsequent decline too often the case in New Zealand orcharding regions.

In the light of the nature of development, the relative importance of this region in relation to the rest of the Dominion can be expected to increase. Within the region itself, ample suitable land is available for orcharding, and within the foreseeable future the typical mixed orchard with its shelter belts and drains will expand at the expense of pastureland on the Heretaunga Plains.



Figure 20. A TYPICAL SAKAZA'S DAY ORCHARD.

In comparison with Figure 16, notice the mixed character of this orchard. Apples, pears, and peaches are all grown on the same holding. Shelter-belts and dunes surround and subdivide the holding.



- ..... APPLES
- xxxx PEARs
- PEACHES
- OTHER STONE FRUIT
- ~ POPLAR SHELTER BELT
- ↖ DRAIN

- BUILDING
- 1 SPRAY SHED
- 2 PACKING SHED
- 3 HOUSE

50 0 50  
SCALE IN YARDS

## A TYPICAL HAWKE'S BAY ORCHARD

AREA 10 acres

### CENTRAL OTAGO STONE FRUIT REGION

Lying just to the east of the main axial ranges of the South Island, the Central Otago Stone Fruit Region is situated within a rainshadow trough associated with temperatures of continental extreme. Irrigation water is available so that favoured by the low rainfall, high summer and low winter temperatures this region is well suited for the growing of quality stone fruit.<sup>19</sup> More apricots, nectarines and cherries are produced than in any other commercial orcharding region and 66 per cent of the region's production comes from stone fruit alone. In comparison, pip fruit are of minor importance.

Broken into three wedge shaped basins by the ranges through which the Clutha cuts in gorges, the orcharding area occupies the sandy plains and impinging alluvial fans near the confluence of major tributaries with the mighty Clutha.

Alexandra in the centre, with 1,500 acres of orchard land, is the largest of the three districts and is connected with the more northerly Cromwell basin by the scattered orchards along the Cromwell Gorge. Orchards in the Roxburgh area to the south are more closely confined to the river bank and extend for 25 miles in a narrow strip, no more than two miles across at its widest part.

In this region commercial orcharding has been made

- 
19. Low rainfall reduces the incidence of brown rot -- the most serious fungoid disease attacking stone fruit. High summer temperature and ample sunlight influence the development of colour in ripening fruit, and low winter temperatures enforce a period of tree dormancy.

Figure 21. COMMERCIAL ORCHARDS IN THE CENTRAL  
OTAGO STONE FRUIT REGION.

The orchard holdings are closely confined to the Clutha River. Only on the sandy plains near the confluence of a major tributary are the orchards more dispersed.

Erratum: Scale of inset map should read 1 : 1,500,000.

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# COMMERCIAL ORCHARDS IN THE CENTRAL OTAGO STONE FRUIT REGION

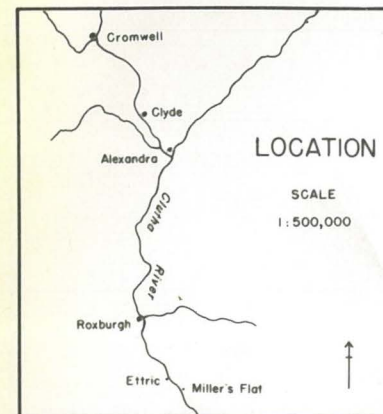
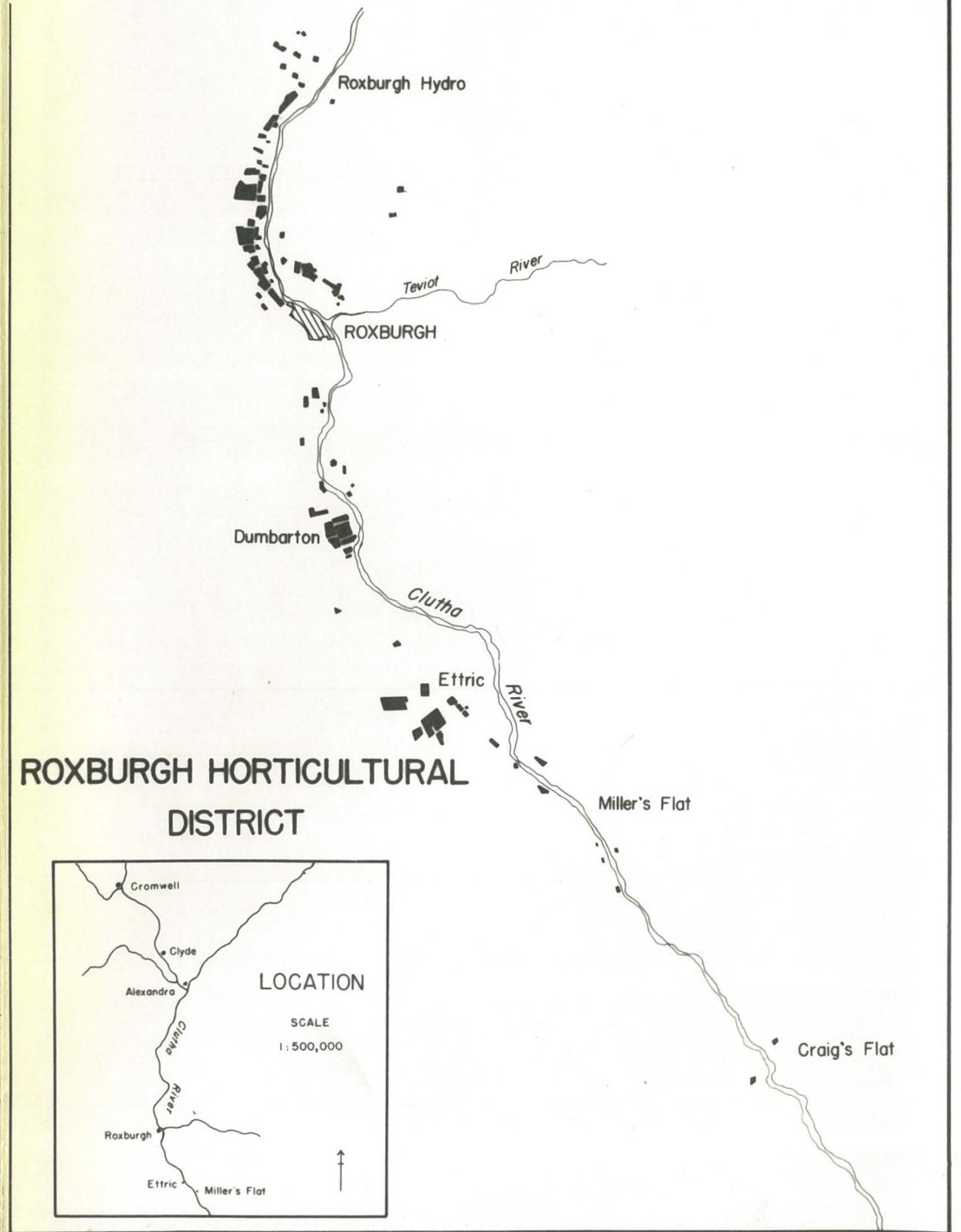
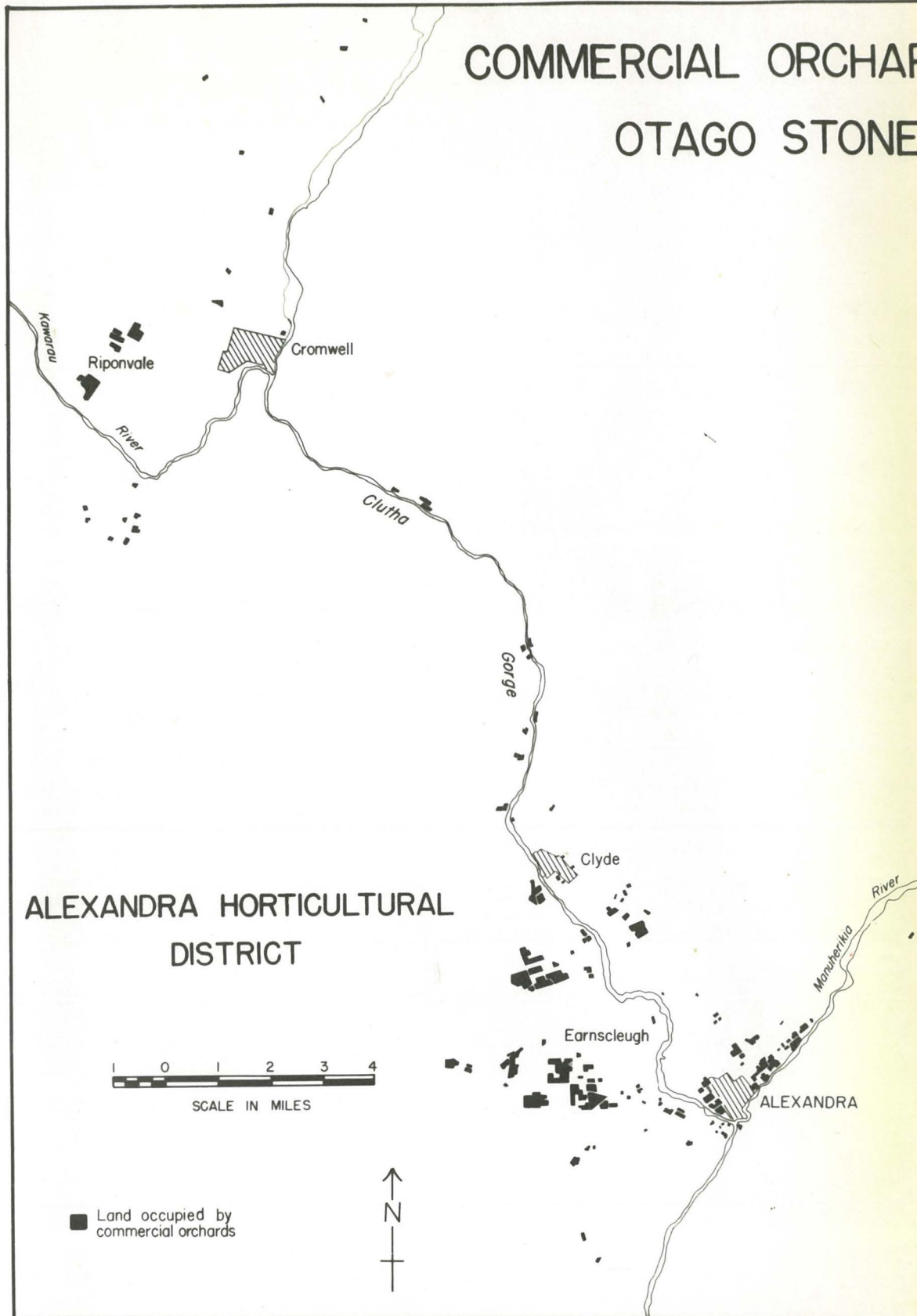


PLATE XV. CONTRASTING LANDSCAPES IN CENTRAL OTAGO.

In this region orcharding has been made possible by irrigation. Both photographs were taken near Alexandra.

(Upper photo: National Publicity Studios.)





possible by irrigation and the green hues of the orchard land and adjacent pasture present a dramatic contrast to the angular rock-strewn hill country, almost devoid of vegetation but for the aptly named scabweed (Raoulia spp.) which spreads across the bare rock surface.

Variation is to be expected in any orcharding region extending over a distance of 50 miles, especially when situated in an area of complex microclimates as is the case here. However, stone fruit dominate the tree association and the unique physical conditions, together with the difficulty in marketing the crop, lend a unity to this region, which makes it easily distinguished from other fruitgrowing districts.

Like Nelson, speculative planting during the apple boom of 1910 - 1916 aided the expansion of orcharding in this region, though not to the same extent as in the former district. Far more important in the development of orcharding industry in Central Otago has been the availability of water from the disused sluicing claims. As gold began to peter out, miners, many of whom had been employed on country estates in the United Kingdom, began to look for additional means of support. This and the knowledge held by some of the progress made in similar areas in other parts of the world where irrigation water was available, caused the diversion for agricultural purposes of many of the water races originally constructed for gold mining.<sup>20</sup>

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20. Kemp, S. 'The History of Fruitgrowing in Central Otago.'  
N.Z. Journ. of Agric., Vol. 90, No. 2. (1955), pp. 169-187.



The first commercial orchards were planted in 1864 but extensive development did not take place until the 1880's when railways began to penetrate into Central Otago. At this time Central Otago was favourably situated for supplying fresh fruit to Dunedin, then the largest city market in the country.

Climate and irrigation were here the stimulus and their part in the early success cannot be denied. However, to a large extent the proximity of the market made the development possible. But, as the balance of population has shifted toward the North Island, this comparative advantage has waned as transport costs have increased. This has resulted in a growing specialization, so that today new plantings comprise mainly apricot and cherry blocks.<sup>21</sup> These fruit are costly, and in some cases impossible, to produce in northern orcharding regions where disease is more prevalent.

That Central Otago is the region of stone fruit production par excellence is well shown on Figure 11. Orchards are usually mixed, not so much as a result of a combination of pip and stone fruit, but rather as a result of a combination of different types of stone fruit with pip fruit, where present, accounting for less than 10 per cent of the total trees. Orchard specialization is the exception rather than the rule in this region. In pip fruit regions a guaranteed market has made specialization possible, but the stone fruit grower has no such security. Instead, he must rely on auction prices which vary from season to season and even day to day. Therefore, as orcharding is a long-term investment, a wise orchardist distributes

21. Almost half the apricot trees and one quarter of the cherry trees recorded in the 1953 Orchard Survey were under 5 years of age.



his investment so that a loss on one type of fruit may be counter-balanced by a substantial profit on another.

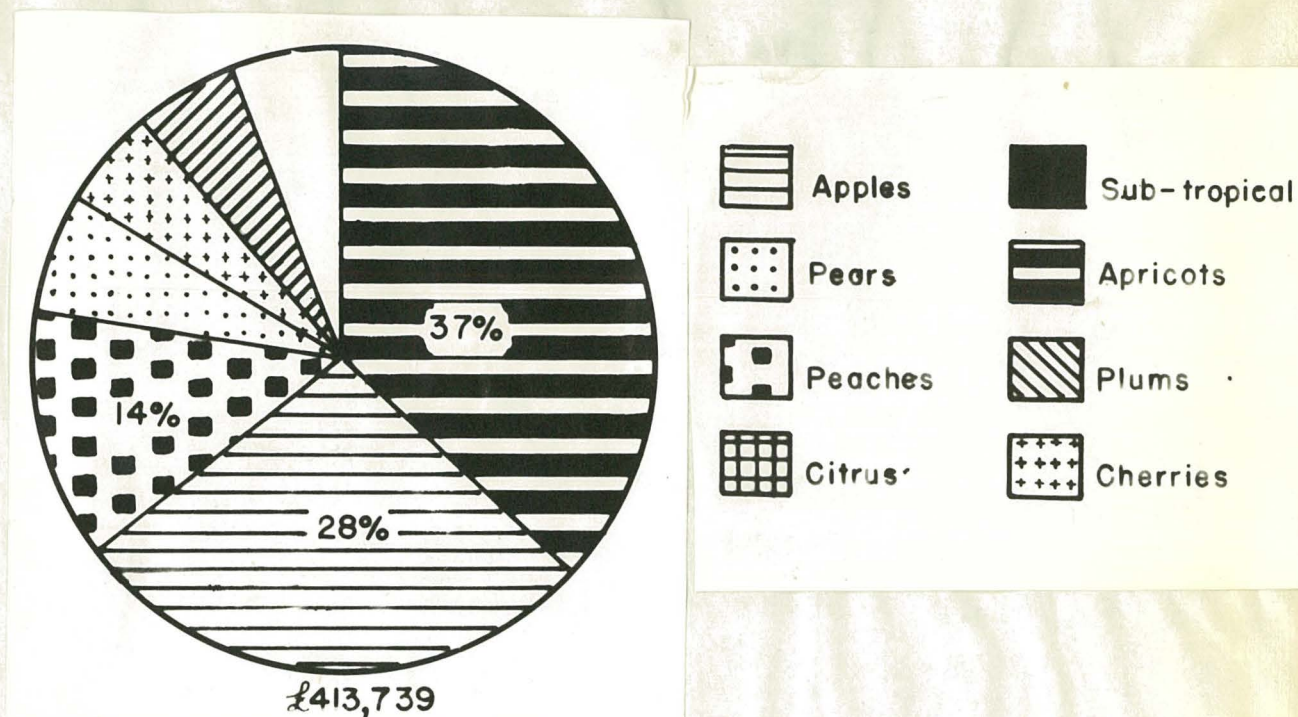
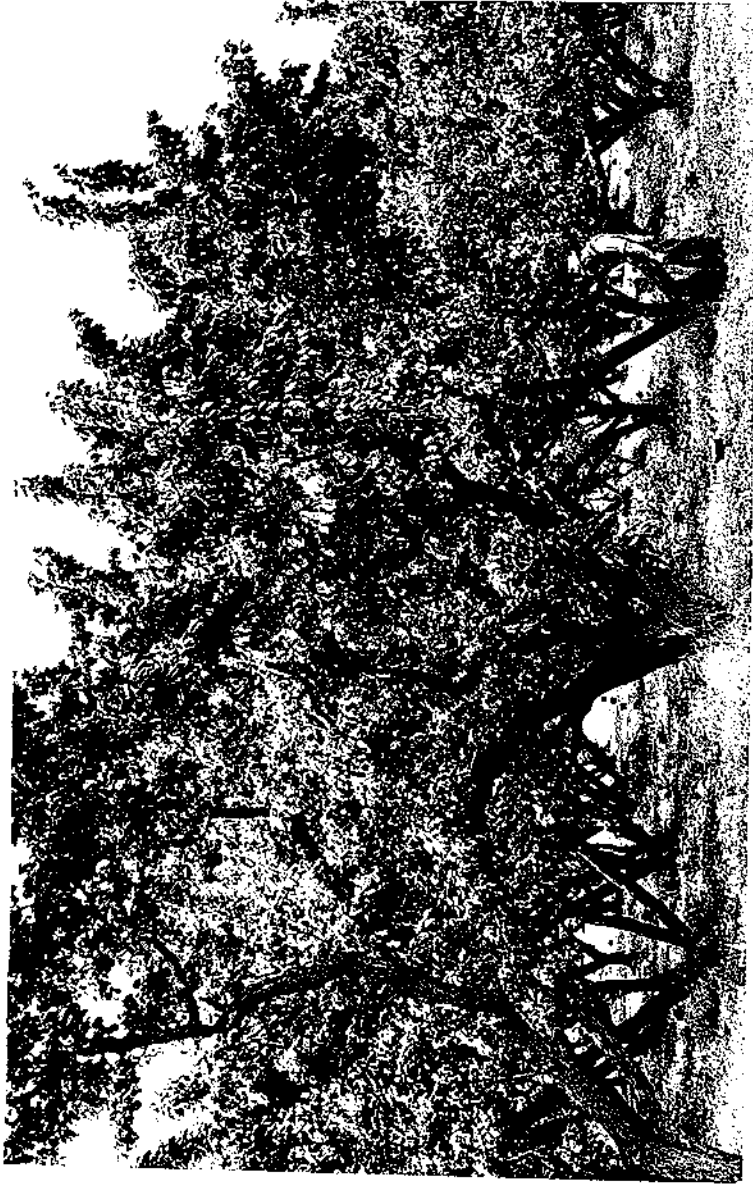


FIG. 22 VALUE OF ORCHARD PRODUCTION IN CENTRAL OTAGO.

Apricots are the most popular type of stone fruit grown and this region contributes 92 per cent of the Dominion's production. Practically every orchard produces some apricots, but the greater part of the district's production is contributed by a few orchards with over 20 acres devoted to this fruit.

Requiring little attention in this region, where the wide variation between summer and winter temperatures reduces fungoid diseases to a minimum, the apricot is the most important fruit in the orchardist's economy.

Although apples are the second most important fruit grown,



PLANT XVI. SPRUCE TREES.

solvent trees carrying their heavy cover of spring foliage. The frost sets still remain in the center, while the fruit is forming.

(Photo: National Academy of Sciences.)



nowhere else, apart from the Northern Sub-Tropical Fruit Region, do they contribute such a small part to the total value of production. Nor are they as important in the orchard landscape as their value suggests, for the greater part of the production comes from the pocketed areas of speculatively planted orchard land at Riponvale and Ettric. In both places water for irrigation is not readily available and the trees are small, usually less than 10 feet tall, gnarled, with their bark burnt black by the summer sun. Average production of 200 cases per acre is one of the lowest district averages in the Dominion. Similarly, pears are not grown under near optimum conditions in this region, as late frost damage so mutilates the fruit that they are reduced to a second grade.<sup>22</sup>

Peaches and apricots, rather than apples and apricots, is the more common tree association on Central Otago orchards. Together with plums and cherries they give a balance to the season's operations and make harvesting with the minimum permanent labour force possible.

Although only third as a peach producing district, Central Otago is particularly noted for the number of varieties produced. The Golden Queen peach, which predominates in other districts, here only accounts for 8% of the peach production (see Figure 7).

Insignificant though they may be in the total value of orchard production, Central Otago possesses one-half of the Dominion's

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22. Pip fruit are able to stand up to 6°F. of frost during blossom and are seldom protected by fire pots. However, although the crop may not be destroyed, a severe frost during the critical blossom period may curtail the growth of apples and malform the normal pear.



PLANT VIII. APPLE TREES NEAR TONGUE.

Apple trees in this region are often not irrigated. They are small and gnarled, with their bark burnt black by the copper can.

cherry trees and produces three-quarters of the Dominion's crop. Because cherry blocks need to be covered by vine-netting to protect the ripening fruit from the birds, most cherry blocks are less than an acre in extent. These small, netted enclosures are a common feature of Central Otago orchards and one which does not occur to the same extent elsewhere in New Zealand.

Thus, in comparison with other orcharding regions, Central Otago has a tree association peculiar unto itself, which finds its only counterpart in the sun-drenched valleys overlooking Christchurch. Nowhere else are stone fruit so important in the orchard economy, and yet it cannot be claimed that such an association is solely in response to the particular physical conditions, for nowhere else has man been compelled to do more to make an area suitable for commercial orcharding.

Irrigation is the life-blood of the region and had not the easily-converted sluice races been available it is doubtful whether the lavish supply of sunshine would have been sufficient to encourage development.<sup>23</sup>

The actual rainfall is nowhere more than 17 inches per annum, barely enough to support the sparest grassland. The greater proportion of this total falls in short-lived torrential thunder-storms during summer and is of little use to fruit trees.

Most of the water for irrigation comes from small, privately-owned water races with two major schemes in the Fraser and Manuherikia

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23. See Figure 31 for the soil moisture deficit in this region.



PLANT AVIARY. GUNWAY TO THE WESTERN AVIARY, CALIFORNIA.  
PLANT AVIARY, GUNWAY TO THE WESTERN AVIARY, CALIFORNIA. PLANT AVIARY, GUNWAY TO THE WESTERN AVIARY, CALIFORNIA. PLANT AVIARY, GUNWAY TO THE WESTERN AVIARY, CALIFORNIA.

(Source: National Publicity Bureau.)

Valleys. Up to the present time, little water has been drawn from the Clutha River, as the depth of the river below the surrounding country has made pumping out of the question. With the availability of hydro-electric power from the recently completed Roxburgh Dam, this could change if the demand warranted it.

Once on the orchard the water is distributed by one of three methods—the furrow system, border dyke system or by wild flooding. To a certain extent all three methods result in a loss of valuable top-soil in an area where soils are generally low in humus content. In order to check this loss there has been a marked increase over the last five years of the number of permanently grassed orchards. At least one-fifth of the orchards at Alexandra have already been grassed and this proportion will gradually increase as more orchardists realize the folly of clean cultivation.

As if to offset the disadvantage of a meagre rainfall, the correspondingly low relative humidity, and wide seasonal range of temperature retards the development of fungous disease and insect pests. Brown rot and black spot are not nearly as prevalent as in more northerly districts and the spraying programme is less intensive and more elastic.<sup>24</sup>

Birds, however, are a much greater pest. There is a continual banging of carbide guns during summer, and practically every stone fruit grower uses some device in an attempt to protect his

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24. Apples receive only 8 sprays between November and April, whereas in Nelson they receive 14 and often more.



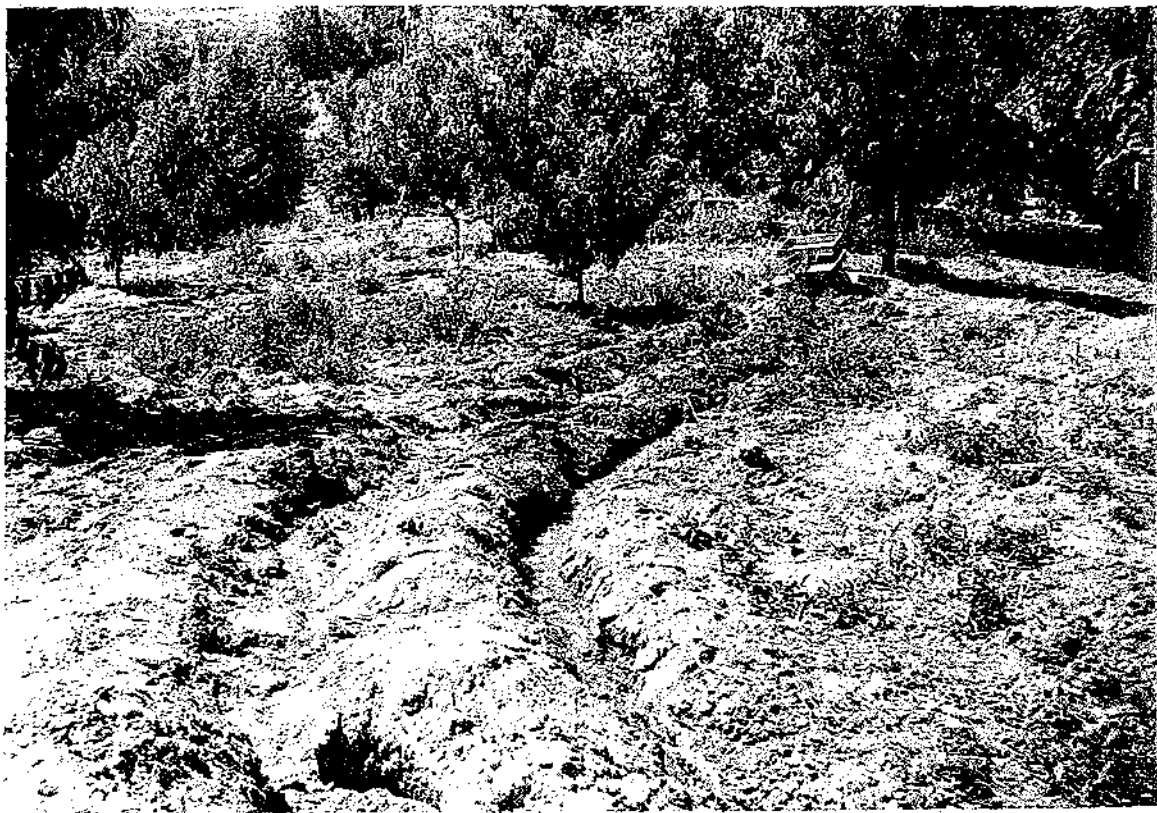


PLATE XIX. FURROW IRRIGATION.

In furrow irrigation, the water is led from the water irrigation channels by furrows dug with a shovel. The danger of these furrows breaking and causing erosion is always present.

ripening fruit. The caged cherry blocks are an obvious example of this.

To prevent damage from late spring frosts pails of oil are placed at regular intervals through the orchards. When the temperature falls below the critical point, depending on the stage of blossoming, the pails of oil are lit and the heat generated minimizes the danger. The liability to damage of this nature is twice as great in this orcharding region than in any other in the Dominion and one burn may cost the orchardist as much as £150. No orchards can be described as completely free from late frost damage. However, those in the Cromwell Gorge and some in more elevated situations where the natural air movement restricts frosting, are virtually frost free.

In general, these effects of climate make orchard practice more complex in Central Otago than is the case in other commercial orcharding regions. For instance, seldom are there fewer than two permanent employees on each holding and where there are, the owner operator is generally a part-time orchardist, working out and engaging seasonal workers for harvesting, pruning and frost fighting.<sup>25</sup>

In all 450 persons are permanently employed on orchards in this region and seasonal labour is drawn chiefly from within the region, though at least 20 per cent of the orchardists provide accommodation for their seasonal workers. As a region with a low density of non-agricultural population, Central Otago is fortunate in that the busiest period of the harvest season coincides with the school-

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25. Twenty-five per cent of the orchards registered at Alexandra are part-time operated.

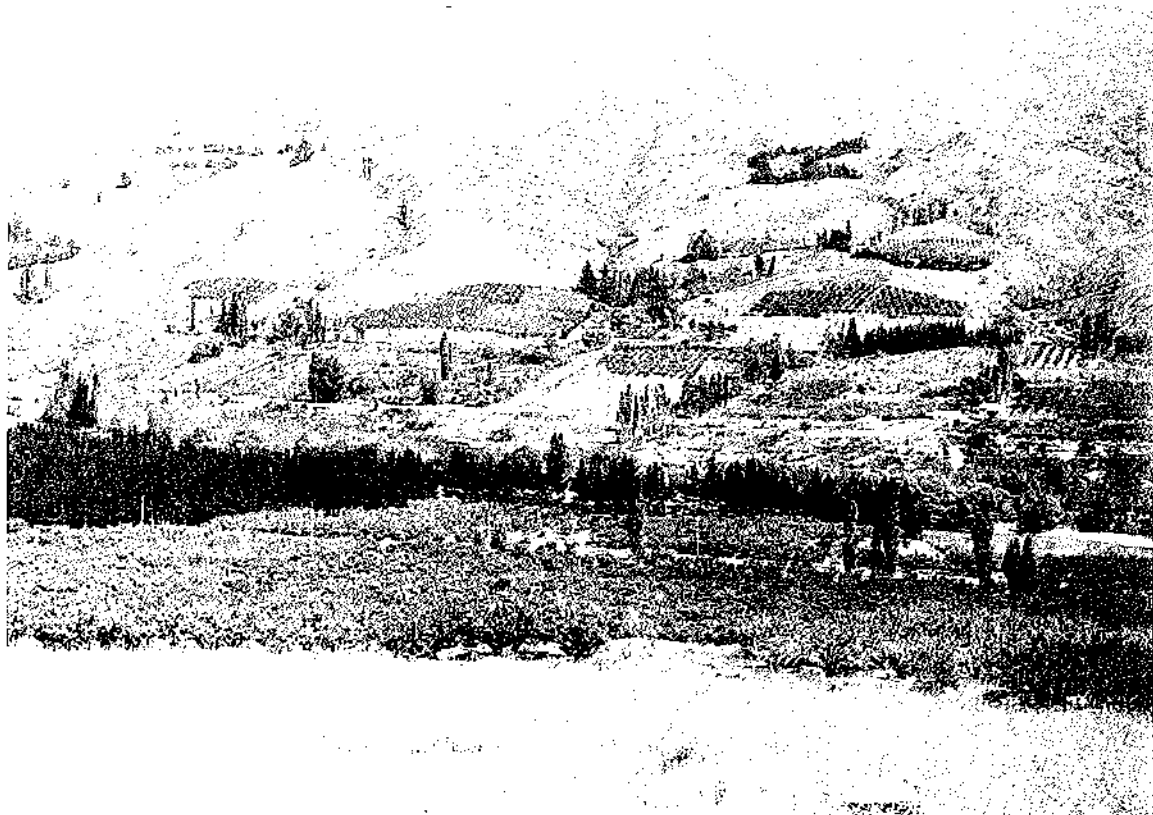


PLATE XX. FARMER'S HOME, NEBRASKA.

Orchards near Fairbury are closely confined to the Clutha River, which is shown in the centre of this plate. Orchards situated higher up the hillside have an advantage in that natural air movement restricts frosting.

holidays, so that 30 per cent of the seasonal workers are women and school children.

In the degree of mechanization this region is far behind the rest of the Dominion. Cultivators rather than tractors are used on the small holdings whilst horse-drawn implements make their only appearance on New Zealand orchards. Diversification plus the traditional reluctance for rapid change, which comes with properties being passed on from father to son, largely account for the low degree of mechanization.<sup>26</sup>

#### Disposal of Crop.

Nothing presents a greater problem for the Central Otago orchardist than the disposal of the stone fruit crop. Handicapped by distance from the North Island markets, growers are faced by constantly rising transport costs and inefficient service.

Rail is still the most popular means of transport, though air transport has become increasingly important for fruit such as cherries and apricots whose value by weight is sufficiently great to bear the additional cost of conveyance.<sup>27</sup>

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- 26. Less than one-tenth of the orchards in this region operate mechanical blast sprayers and more orchards still use the antiquated pipe system for spraying than in any other region. This of course must also be related to the relative unimportance of spraying in this region.
  - 27. With the season still incomplete, at the end of February 1956 a total of 5,600 tons of fruit had been sent from Central Otago to outside markets by rail and 100 tons by air.

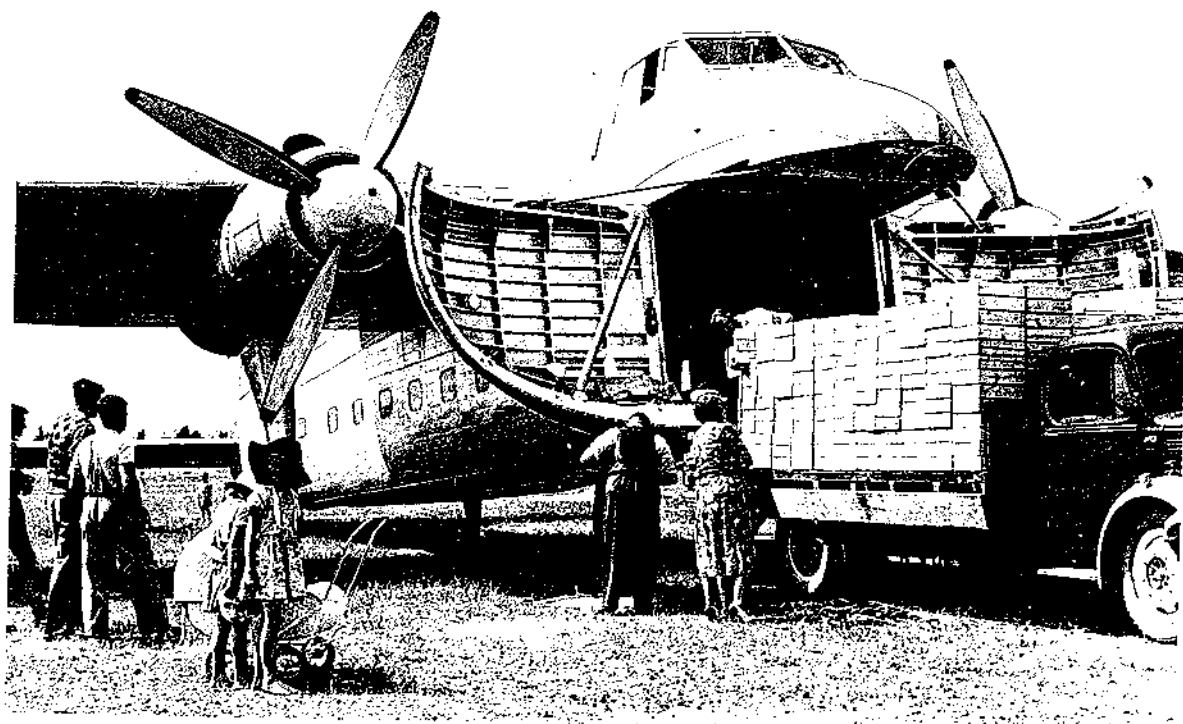


FIGURE 1. LADDER UNLOADED TO THE BOMBING AIR STRIKE.

(photo: J.J. Shepherd.)

In order to guarantee a market for a certain percentage of the fruit crop, the private order trade has been fostered in this region. At least 20 per cent of the apple crop is sold through this avenue and about the same proportion of the stone fruit crop.

A further step to ensure success on the auction market is the preshipment cooling of fruit. This enables fruit picked in temperatures between 80° and 100° F. to maintain its texture for a longer period. Results of such cooling have been so successful that more than a third of the growers have installed small cooling sheds on their properties.

The three fruit processing factories, one at Roxburgh and two in Dunedin, which receive fruit from this region, are principally interested in jam making and fruit pulp processing, as opposed to the canning oriented factories of Hawke's Bay. The result of this influence is to be seen in the varietal distribution maps (Figures 7 and 8). Firstly Golden Queen peaches are of minor importance in this region, and secondly, English plums, which are preferred for jam making, account for 53 per cent of the plum trees.

Even so, processors utilize only 10 per cent of the total fruit crop, a proportion which could well be increased. This would benefit orcharding in this region by creating a more stable market.

Conclusion.

Aspects of transport and marketing emphasize the precarious position of the industry in this region, faced as it is with the increasing competition from districts now more favourably situated in respect to the major consuming areas. Yet this is an orcharding region with a physical environment peculiar unto itself and it seems probable that this advantage will become more significant with the growing specialization in apricot and cherry culture.

Stone fruits dominate the typical orchard holding, and successful production is in no small way dependant upon the glistening stream of irrigation water, the greasy fire pot, and the orchard cool store.

### THE AUCKLAND MIXED FRUIT REGION

Situated adjacent to and within New Zealand's largest metropolitan area, the Auckland Mixed Fruit Region is oriented to supply this market. A great diversity of fruit is grown and fruit which would otherwise find difficulty in competing with the quality produce from southern districts, here finds a ready sale through roadside stalls.

At least 80 per cent of the commercial orchards in this region are located to the west of the city at Henderson and Oratia (see Figure 23). Minor concentrations occur at Huapai and Albany to the north. With 419 holdings, Auckland has more commercial orchards than any other region, although in area occupied, it holds only third place. Here is 10 per cent of the Dominion's orchard acreage and the region produces 12 per cent of the Dominion production by value.

Auckland's orchards are small, closely interplanted and older than those in other regions.

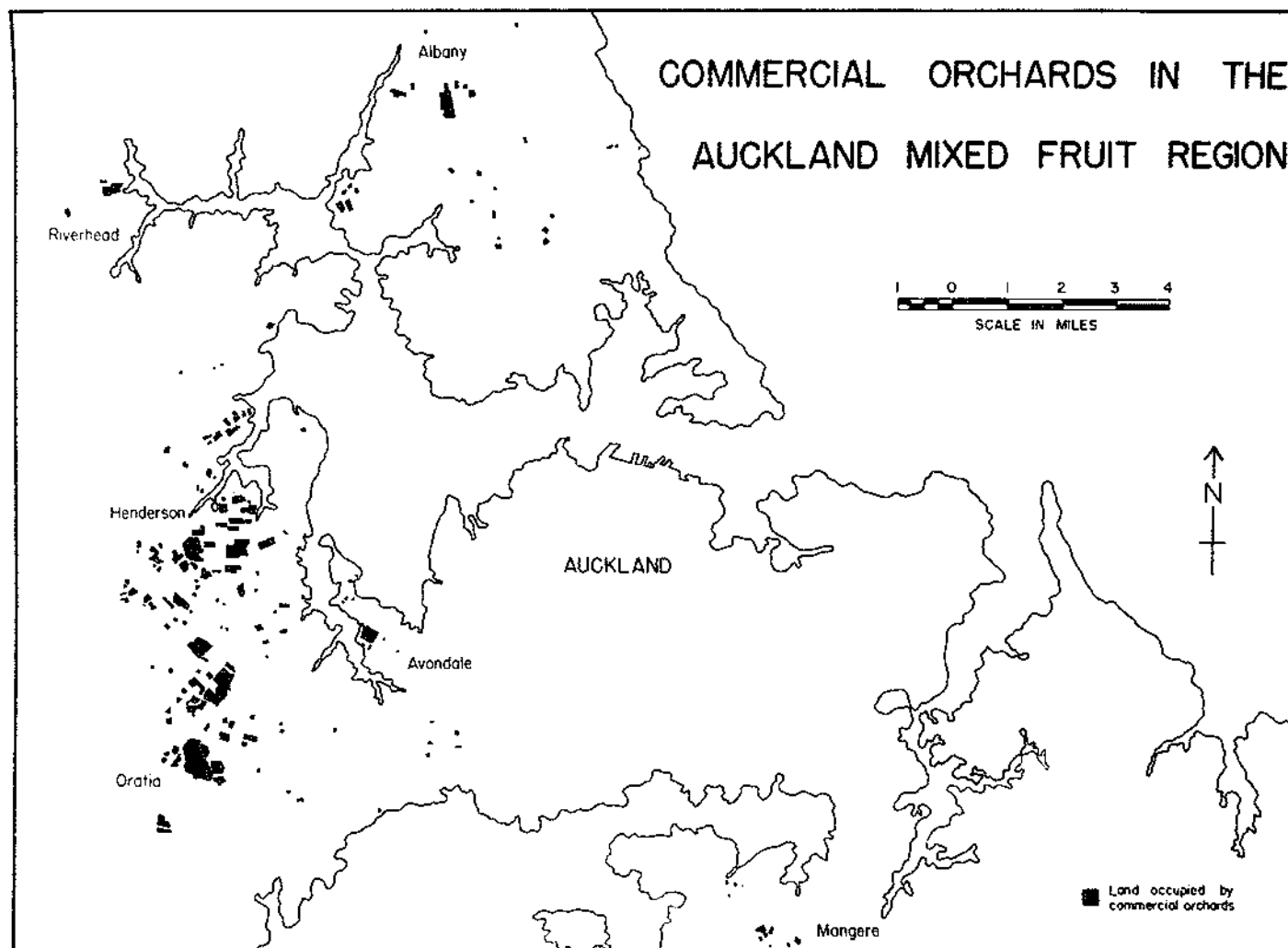
The development of orcharding in Auckland began in 1838 with the planting of orchards at Birkenhead. During the next thirty years the Auckland Province easily led the Dominion in the production of fruit. However, the uncontrolled ravages of codling moth and black spot between 1870 and 1900 virtually eliminated orcharding in this area. It was not until legislation compelling disease control and more effective sprays were introduced after 1903, that orcharding



Figure 23. COMMERCIAL ORCHARDS IN THE ANGELES

SIXTH FRUIT GROWING.

Most of the orchards are concentrated  
to the west of the city at Van Nuys  
and Glendale.



was re-established.

Several speculative ventures attempted at Huapai and Tinopai, near the Kaipara Harbour, also failed and it was not until the Dalmatian settlers began to plant trees at Henderson and Oratia that orcharding found firm footing.

In the years immediately following World War I many Dalmatian people emigrated to New Zealand. Finding a language difficulty, they preferred to settle in communities, one of the largest of which was in the Henderson-Oratia district. During the depression years of 1929-32 many of these people, who were unable to obtain other employment, helped to clear land on the promise that they would eventually be given small sections suitable for orcharding. Trees were planted, but it was not until World War II, when record prices were paid for stone fruit and wine, that this area really emerged from a partially subsistence economy.

Today pip fruit growing offers better prospects than does stone fruit, and a gradual change is taking place. The market for wine has also declined since the war. However, the many beautiful homes on the small orchards testify to the prosperity of this short period.

Stone fruit are still important in the orchard economy, but 52 per cent of the orchard acreage is now occupied by pip fruit. Pip fruit are also the major contributor to the region's total value of production, with apples by far the most important.

PLATE XVII. HARVESTING APPLES NEAR AUGHLA.

Apples are the most important fruit grown in this region. The grower here is not using the modern bulk harvesting technique as shown for Nelson. Note the crawler tractor, which is more suited for the steeply sloping land at Gratie.

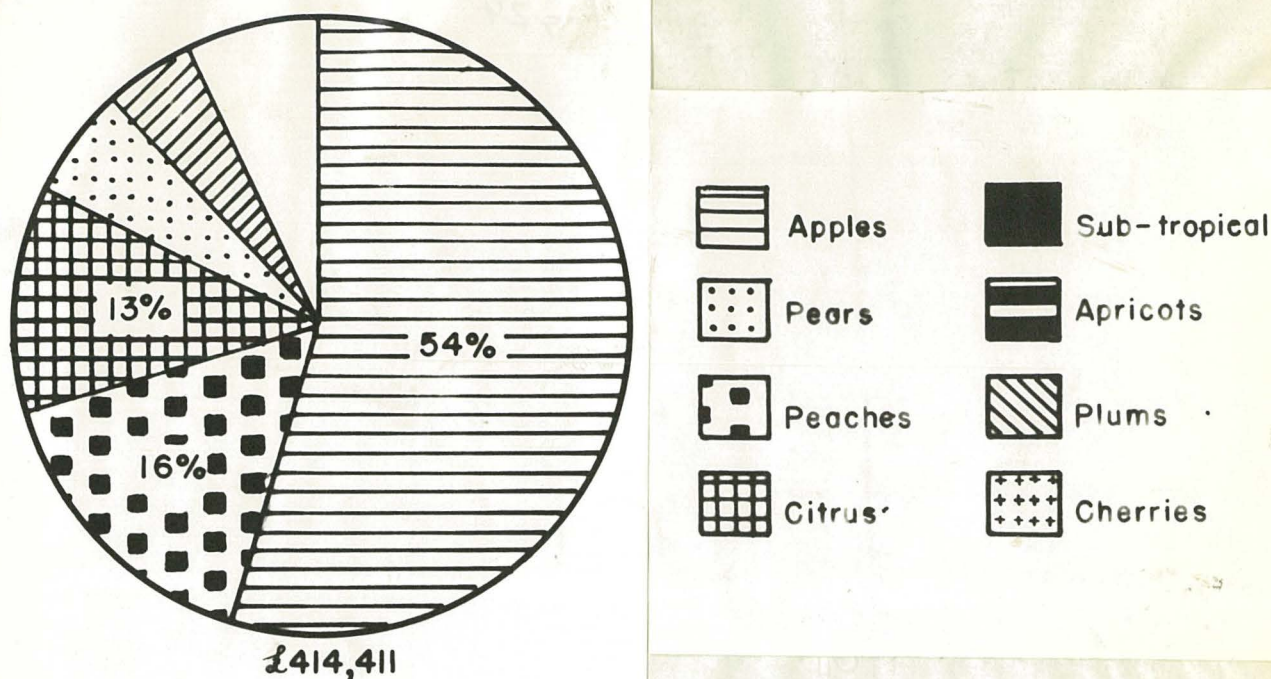


FIG. 24 VALUE OF ORCHARD PRODUCTION  
IN AUCKLAND

Apples are grown on 90 per cent of the orchards, where they are generally the most important crop. Compared with Nelson and Hawke's Bay, techniques of management vary greatly. Specialization is virtually unknown, and individual apple trees are separated by peaches and plums, planted irregularly between them to give an untidy appearance to the orchard holdings. A vast range of varieties are grown and Granny Smith is the only one of the five major varieties grown in the Dominion, to gain prominence (see Figure 4).

The significance of peaches in the orchard economy of this region is largely due to continued production from trees planted during World War II. Many of these trees have now outlived their most



PLATE XXIII. INTERPLANTED ORCHARDS.

Orchards near Auckland are essentially mixed. In this orchard, peaches have been planted between young apple trees. The peaches will be removed as the apple trees become larger.



productive life and are gradually being removed as they interfere with the management of the apple and citrus trees.

The attractive and relatively disease-resistant Paragon peach occupies 28 per cent of the peach acreage and it is likely that this proportion will increase as the difficulty in controlling brown rot and Phytophthora,<sup>x</sup> as well as the growing competition from Hawke's Bay, reduce the production from Golden Queen and Wiggins trees.

Citrus acreage is also declining. Auckland is second to the Bay of Plenty in citrus production, but if the removal of lemon trees continues, it will soon fall behind both Kerikeri and Gisborne, both of whom are rapidly extending their sweet orange acreage (see Figure 9).

A further reflection of the market orientation of orcharding in this region is to be seen in the relative significance of plums in the total value of production. Plums, the Japanese eating variety in particular, can be tree-ripened in this region and sold to the consumer without deterioration resulting from long delays during transit (see Figure 8).

With citrus, stone and pip fruit all present in this region, and at times all occurring on the one small orchard, no greater diversity of orchard landscape is to be found in New Zealand. Interplanting in response to market demands is common, so that the use of mechanical aids is difficult on the crowded orchards. Consequently, old and new techniques stand side by side. Where there is sufficient spacing between the trees, automatic blast sprayers are

PLATE XXIV. SPRAYING METHODS - OLD AND NEW.

The upper photograph shows spraying by hand, while the lower photograph shows an adapted blast sprayer in operation. The latter is a great time saver, but hand spraying is enforced by the crowded nature of many of the holdings.







PLANT VARY. BROWN HILL. PLANTING.

The influence of Brown Hill in 1900-1901  
in areas with a high altitude. It is  
it is certainly not on the ground.

used, but on two-thirds of the properties hand spraying still survives.

Frequent spraying of the trees is essential, for this region is subject to attacks from all the bacterial and insect pests which are troublesome to New Zealand orchardists. There is no prolonged period of winter cold to kill the hibernating insects, so that even after spraying at intervals of ten days during the growing season, a high incidence of disease is not uncommon. Black spot, silver leaf, mildew, and stone fruit blast are but a few of the more important diseases with which the Auckland orchardist must contend.

Together with the ravages of disease, damage from gale force winds and accelerated soil erosion is always likely (see Figure 33). Fifty years ago uprooted trees and windfall crops were common occurrences and the breaks of distorted radiata pine (Pinus radiata) which surround and subdivide the orchards are evidence of attempts that were made to avoid this damage.

Accelerated soil erosion is a problem on the steeply sloping land near Henderson and Oratia. In this area the cultivation of the heavy, block structured clay soils has resulted in the loss of the finely textured top soil after heavy rain. On such slopes cultivation is best reduced to a minimum and several orchardists have successfully adopted the Nelson practice of permanently grassing the land between the trees.<sup>28</sup>

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28. Pew, H.A. 'Grassing Down of Orchards in the Auckland District.' N.Z. Journ. Agric., Vol. 94, No. 1, 1957. pp. 61-65

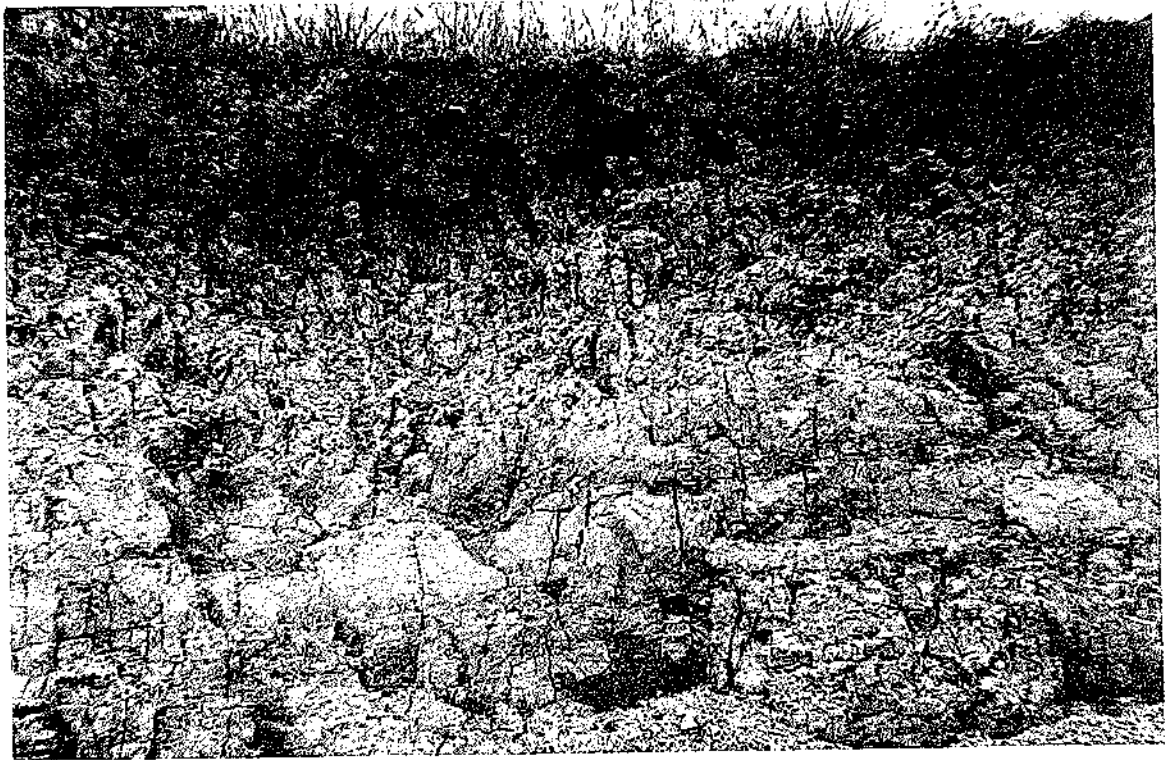


PLATE XXVI. A CUTTING OF THE WAIKANA CLAY & S.

This soil type predominates on the steeply  
sloping land near Henderson and Grati.

Such problems as accelerated soil erosion, wind damage and disease control have been overcome, but only after increased financial outlay. As such, they do influence the character of orcharding in this region and reduce the advantage of proximity to market.

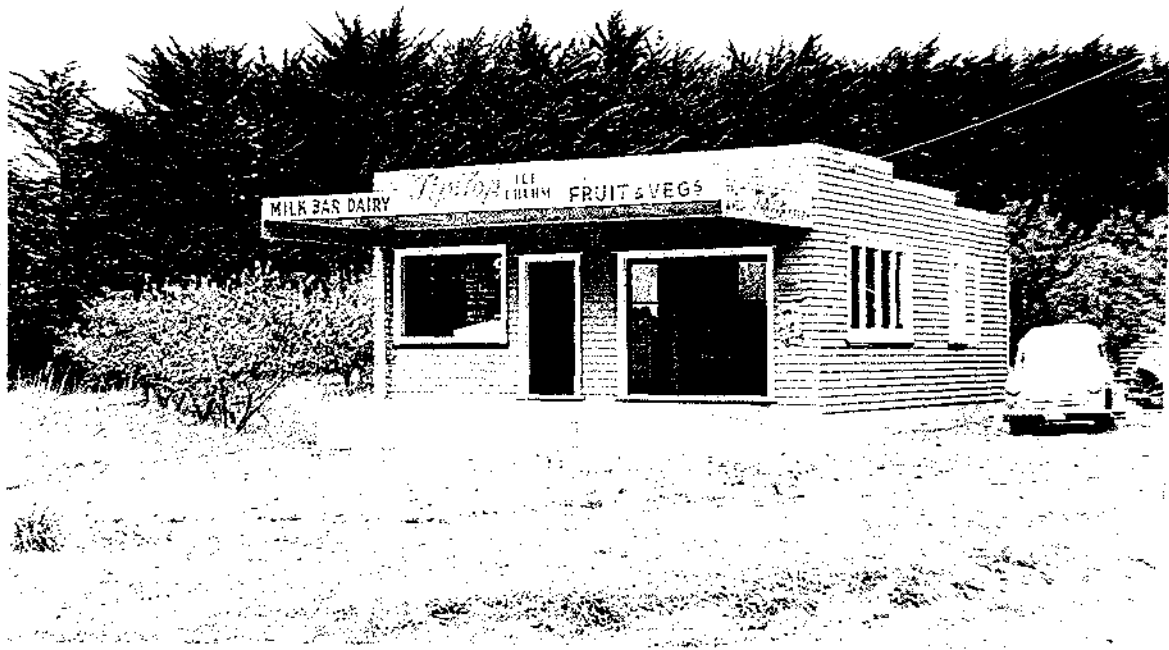
The usual orchard machinery--grading tables, tractors and packing equipment--are used, but as a generalization it may be said that the methods used on the small, closely interplanted Auckland orchards are more intensive in regard to labour and less intensive in the application of capital, than is usual in New Zealand. This of course is a direct result of the lack of specialization, further evidence of which is to be seen in the methods by which the fruit crop is sold.

Apart from some citrus, all fruit produced in this region is consumed within the Auckland city and environs. The means of disposal are varied and include the city markets, the Apple and Pear Marketing Board, and the four fruit processing factories. But perhaps the single most important method is the roadside stall.

Orchards near Auckland, often hidden as they are by shelter-belts, can easily be recognised by their roadside signs and makeshift stalls. At least a quarter of the apple crop and probably half the total fruit crop from this region reaches the consumer through such private trading. Indeed, so great is the dependence of orcharding in this area upon the roadside sale of fruit, that it is doubtful if it could survive should such private trading ever be curtailed.

PLATE XXVII. METHODS OF DISPOSAL FOR THE AUSTRALIAN  
FRUIT CROP.

Two important methods of disposal in this region are the orchard sale of fruit and sale through the city market. The upper photograph shows an orchard shop, somewhat larger than the usual, whilst the lower shows a typical scene in the city markets.





Conclusion:

The character of commercial orcharding near Auckland is indeed mixed and finds its only counterpart in the orchards near Christchurch. In this region every kind of fruit grown in New Zealand, with the exception of cherries and apricots, may be found on the small, generally Dalmatian-owned holdings. To further complicate the pattern grapes and vegetables may be grown commercially on the orchards. Holdings are small, untidily laid out and dependant on roadside sales to dispose of a large proportion of the crop. The true raison d'etre for orcharding in this region is, in fact, its proximity to a large urban market, and the preference that the New Zealand housewife shows for orchard fresh fruit, although it is often of lower quality than that purchased through the marketing organizations.

The future of this area is difficult to predict. Late last century orcharding in this region witnessed a decline associated with disease infestation and a re-occurrence of this is always imminent where there are a large number of old and neglected orchards. Extension of housing has reduced the orchard acreage near Henderson, but so long as difficulties of transport result in higher prices and delays for fruit grown in regions better suited physically for orchard production, produce from Auckland orchards is assured of a demand from the local market.



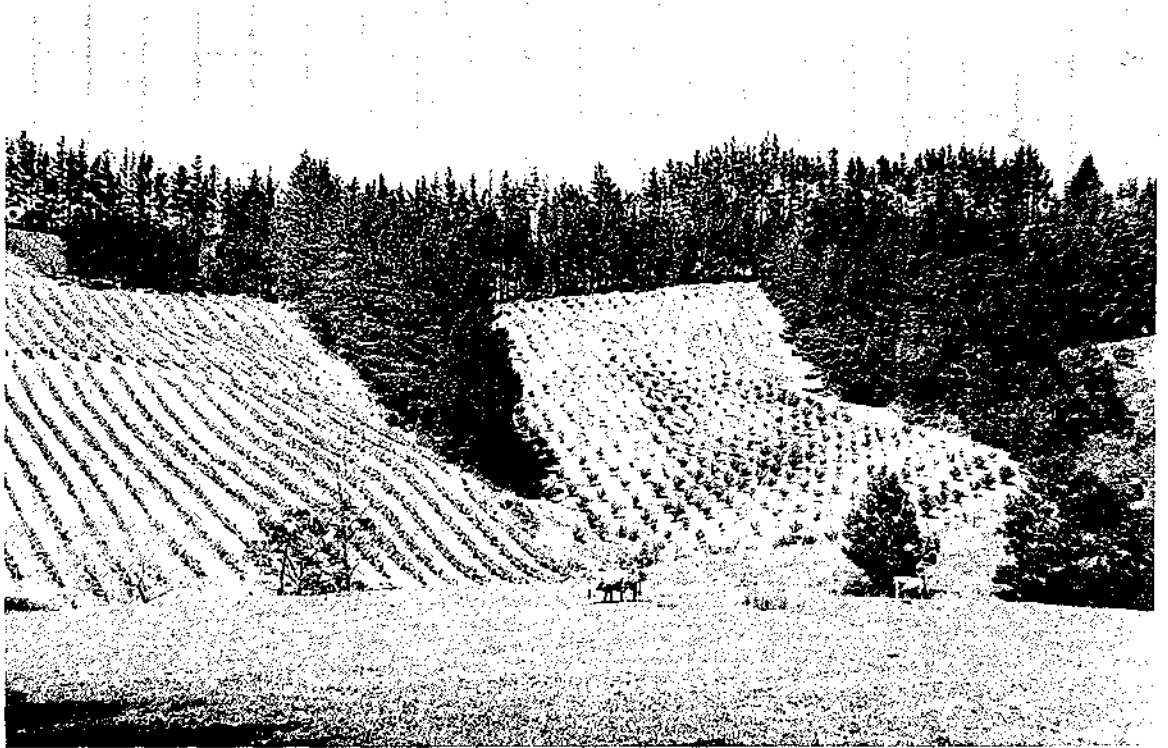


PLATE XXVIII. SUBDIVISION OF LANDS.

The road runs through the centre of this orchard near Henderson in the first stage in the subdivision of the land for housing.

PLATE XXIX. DALMATIAN HOLDINGS.

Dalmatian holdings can be distinguished by the presence of grapes. In the upper photograph grapes are grown for commercial viticulture, whilst in the lower, grapes are grown for domestic wine.



### THE NORTHERN SUB-TROPICAL FRUIT REGION

Although of only minor importance by total value of production the Northern Sub-Tropical Fruit Region is easily distinguished from other commercial orcharding regions in New Zealand. It is on these sheltered, frost-free pockets of the eastern littoral of the North Island that 70 per cent of the citrus fruit and 80 per cent of the sub-tropical fruit is produced.

Apart from the Gisborne area, pip and stone fruit do not enter into the personality of commercial orcharding in this region and the dark evergreen foliage of the citrus groves, together with the tangle of closely planted sub-tropical fruit, is a strong contrast to the regularly spaced deciduous trees of other fruit-growing districts.

Kerikeri, situated at the head of the Kerikeri Inlet in the picturesque Bay of Islands, is the most northerly of the three districts included in this region. Originally part of a sheep run, Kerikeri owes its development as a fruit-growing district to the activities of the North Auckland Land Development Company which began to subdivide and plant orchard blocks in 1927. Orchards have been planted on the slopes of the undulating land, here characterised by broad, flat-topped ridges sloping down to tidal inlets, rivers and small streams.

Citrus growing has always been the primary orchard activity in this district and although slightly modified by the planting of

Figure 25. COMMERCIAL/INDUSTRIAL ZONE, REGION 1  
SUB-TROPICAL WET/ WET REGION

The three fast-growing areas placed in  
this region are located on coastal  
areas of the Auckland Province.

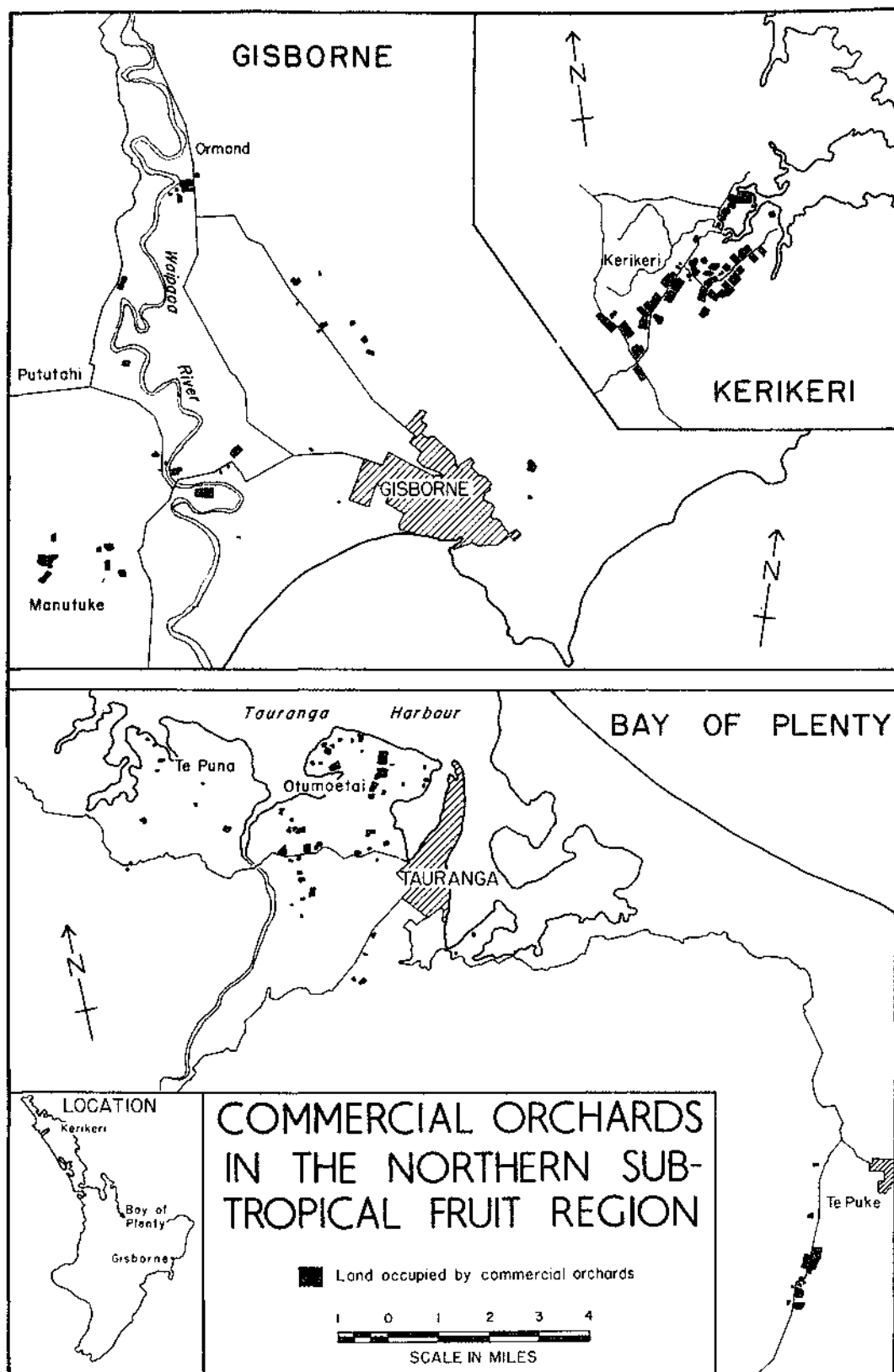




PLATE XXX. CITRUS GROVES.

The dark, evergreen foliage of the citrus groves is a distinguishing feature of orchard landscape in this region. This photo shows grove fruit groves near Laurens.

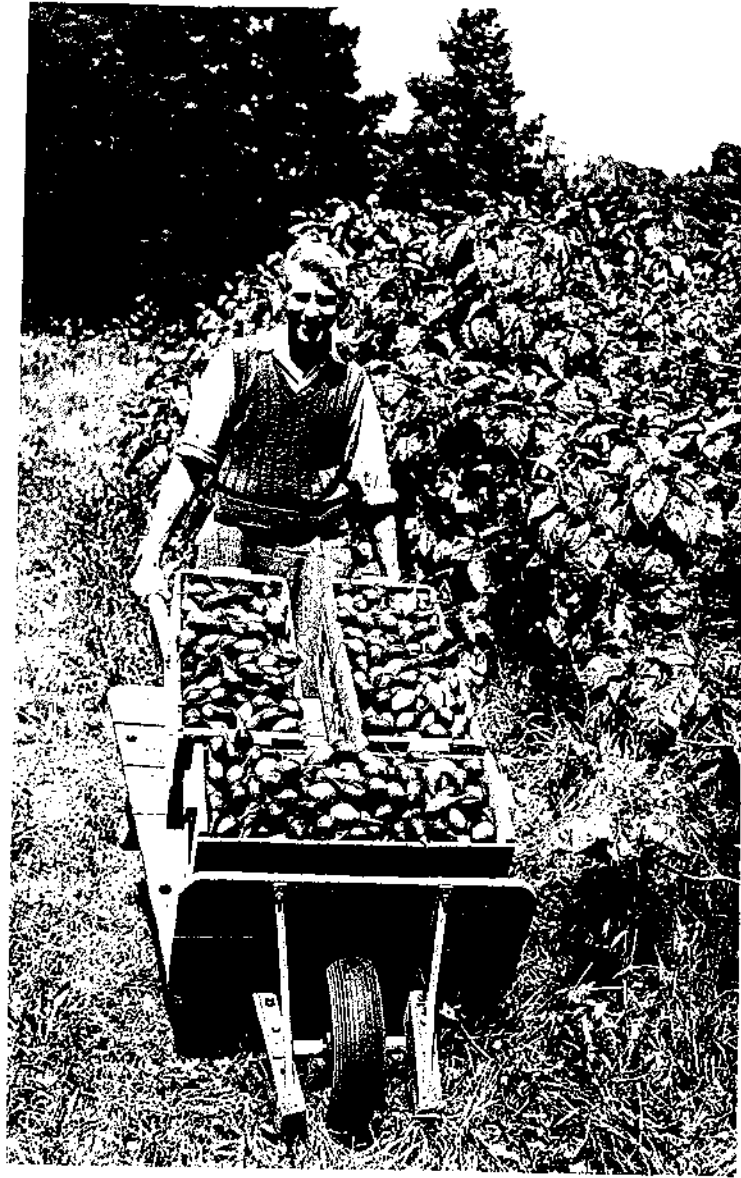


PLATE XXII. SILKIN ORCHARD, NE. AMIRAL.

The trees here are more widely spaced than those near Tauranga. Sheep are grazed on some orchards, although on most orchards the grass is mown. Bushy Ulmus salicifolius trees are commonly used for shelter in this district.

(Photo: National Publicity Studio.)





POTATO SMALL. PRICE TRADING AT A STRAIGHT DOLLAR.

(Photo: National Publicity Studios.)

tree tomatoes and Chinese gooseberries during the last decade, the rapid expansion of sweet orange plantings in the last five years has maintained this dominance.

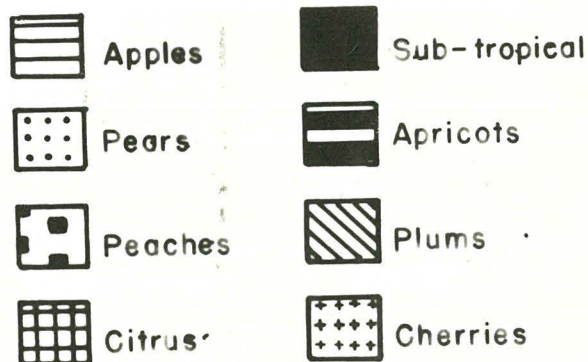
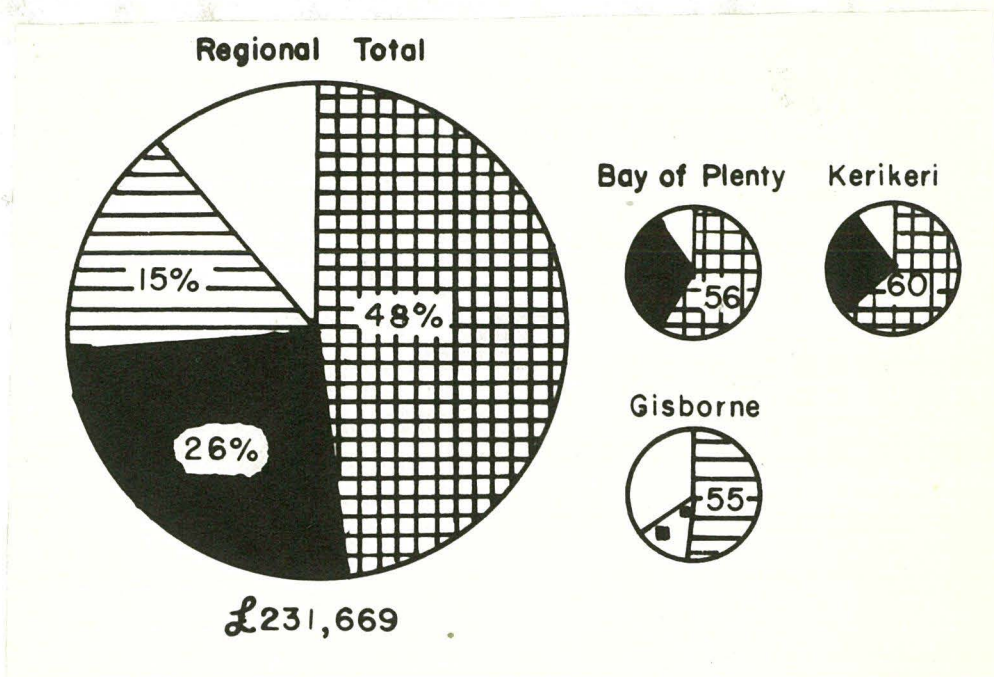


FIG. 26 VALUE OF ORCHARD PRODUCTION IN THE NORTHERN SUB-TROPICAL FRUIT REGION.

The Bay of Plenty, the major fruit-growing district in this region, offers many contrasts to Kerikeri, for with a heavier rainfall it is more suited to sub-tropical fruit production. Citrus

still represents more than half the total value of production, but the significance of this crop is declining as the result of a rapid expansion of the acreage under sub-tropical fruit.

Two concentrations of orchard holdings are indicated on Figure 25, one to the north of Tauranga and the other near Te Puke where land was subdivided for orchards under a post-war rehabilitation scheme. It is from this latter area that the increased production of sub-tropical fruit is coming. Near Otumoetai lemons and grape-fruit still predominate.

By value of production, the scattered orchards on the Poverty Bay Plains hardly warrant inclusion within this sub-tropical fruit region, as more than 60 per cent of the orchard production is accounted for by apples. Justification, however, lies in the many groves of citrus trees as yet not in full production.

The distinguishing feature of the tree association in the Northern Sub-Tropical Fruit Region is the predominance of citrus and sub-tropical fruit. Both of these fruit are liable to damage by even the slightest frost and are limited in their distribution to the humid coastal districts of the Auckland Province. Even so, none of the three fruit-growing districts within this region can be described as completely frost-free and it is usual to find the more successful orchards occupying the most favourable situations.

Te Puke, for instance, owes its comparative freedom from frost to the sloping nature of the land and also to the excellent air drainage provided by the deeply entrenched water-courses which cut

PEOPLE KATZ. SUTHER BRANDS, OLIVE & IRMA DAVIS GA.

through on both sides of the orchard area.

Although the most successful orchards tend to specialize, the typical orchard holdings are mixed. Fifteen years ago commercial orchards in this region were composed solely of citrus trees, but orchardists have effected crop diversification by marketing sub-tropical fruit. These fast-growing vines and herbaceous shrubs are ideally suited for interplanting between citrus blocks while old and unsuitable citrus varieties are eliminated. At least one half of the total tree-tomatoes are planted in such manner, whilst another favoured situation is on headlands adjacent to shelter belts.

To date district specialization has been negligible, but it is now becoming increasingly apparent. The Bay of Plenty dominates the lemon production whilst Kerikeri specializes in sweet oranges. In the case of sub-tropical fruit, the Bay of Plenty is by far the most important district, but this dominance comes particularly from Chinese gooseberry production for it is equalled by Kerikeri in tree-tomato production.

Methods used vary considerably, but are characterised by the intensive utilization of small orchards, a low degree of mechanization and contract orchard maintenance.

The average size of holdings is 4 acres, almost half that of the Central Otago average. Many growers are part-time orchardists, working away from their property after the harvest season and leaving the spraying and cultivation to contractors. Other orchardists are retired persons relying mainly on income other than that provided by



their orchards. Nevertheless, at least 50 per cent of the holdings are fully economic enterprises and it is from this section that the majority of the orchard produce comes.

Comparatively speaking, citrus and sub-tropical fruit require a lower application of labour per acre than is usual on New Zealand orchards. Only four or five spray applications are required during the year, and harvesting of any one variety extends over a two to three month period. Five to six acres are all that one man can efficiently manage and proportionate to permanent employees, there are few seasonal workers. Harvesting is completed by the owner, often with the assistance of his family, and only on the larger orchards is casual labour recruited from local sources.

Costly grading and packing equipment is unnecessary on citrus orchards, as all citrus fruit except New Zealand grapefruit are prepared for marketing by the government sponsored Citrus Packing Corporation. Fruit is packed in loose cases on the orchard and forwarded to the central packing shed. With lemons the reject fruit is then sent to the Tauranga factory for processing into juice extract and peel.

New Zealand grapefruit and sub-tropical fruit are marketed individually by the grower. Consequently prices are not always satisfactory as some markets are over supplied as the result of unequal consignments of fruit.

Private order and roadside sales are important in citrus growing areas, while some degree of stability has been given to the



PLANT YAKIV. CHINESE GOOSEBERRY VINE NEAR CANYON.

The Chinese gooseberry is a vine and is trained over an oval cage. The fruit is picked from the inside.

sub-tropical fruit market by export shipments. A total of 24 tons of Chinese gooseberries together with a trial shipment of tree tomatoes were exported in almost equal quantities to Britain and Australia in 1954. Prices have been satisfactory and the growers concerned at Te Puke consider that the future prospects of this trade are sound.

However, within the Dominion the marketing and distribution of sub-tropical fruit could be improved. Like stone fruit marketing, more co-operation between growers and an extensive advertising scheme would be of considerable benefit, but there still remains the greatest problem of all, that of transporting the fruit to markets.

Perishable fruit must be sold as soon as possible after picking, but the chaos of present transport system has made this increasingly difficult and extremely costly. The result is that the consumer accepts a poor quality fruit, produced near the city markets, in areas not really suited to the production of first grade fruit.

Located on isolated pockets in the northern part of the Dominion, this region suffers severely from transport problems, as the major sub-tropical and citrus markets are located outside the Auckland Province, in areas where domestic production is impossible.

As a result, climate is not as significant in the siting of citrus and sub-tropical orchards as it might have been. Gisborne for instance, is not nearly as suited to citrus culture as is



Korihari, but because of a relatively cheap, reliable, coastal shipping service to South Island cities, the citrus acreage has increased rapidly during the last five years.<sup>29</sup>

Air transport offers some opportunity, but to get it in too costly. In all events, some attempt should be made to improve the existing transport system for the benefit of grower and consumer alike.

#### Conclusion:

Low production costs, low disease and pest problems, and paying returns have all contributed to the growth of citrus and sub-tropical fruitgrowing in this, the youngest commercial orcharding region in New Zealand. To a certain degree this growth is still reflected in the many part-time operated properties, and the low degree of mechanization. The tree association is not yet permanent and fluctuates in response to profit margins. However, given the opportunity, this region can produce citrus and sub-tropical fruit equal in quality to that produced anywhere else in the world and it appears that it will develop along this course, provided that new disease and insect pests do not make orcharding uneconomic.

Like so often elsewhere in the Dominion, this is a region closely interrelated with the elements of climate; with frost, with humidity and the liability to gale damage, but at the same time the

29. Five-sixths of the total citrus trees registered in Gisborne in 1953, comprising a total area of more than 60 acres, was occupied by trees under 5 years of age.

difficulty in transporting fruit to markets is significantly influencing the distribution of orchard production.

### BLenheim - CHRISTCHURCH MIXED FRUIT REGION

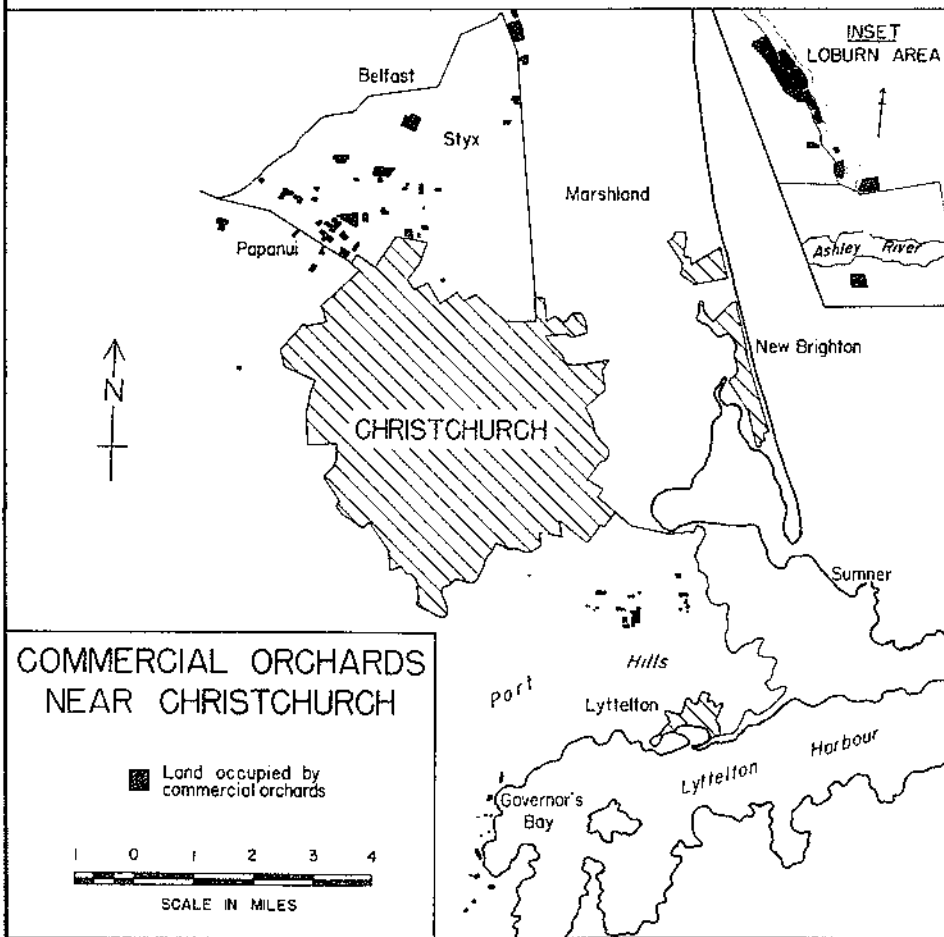
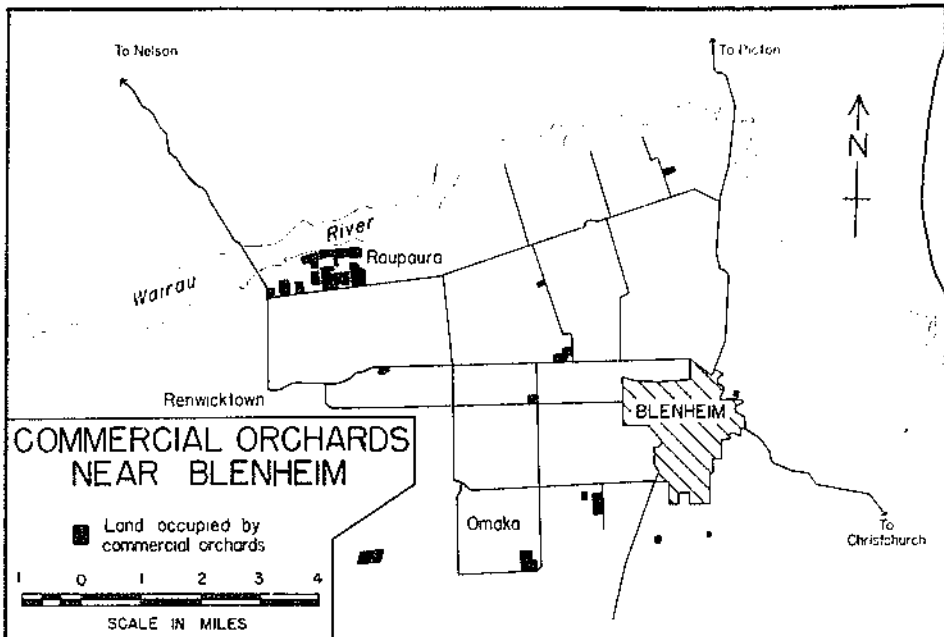
Dissimilar though commercial orcharding in Blenheim and Christchurch may be, there is sufficient unity of tree association and methods used to justify their generalization into one region. Apples represent more than 75 per cent of the value of production in both districts with the remainder contributed by a variety of stone fruit. Blenheim, for instance, is noted for cherry production and Christchurch for apricots and Japanese plums.

In comparison with other commercial orcharding regions in the South Island, this region is of minor importance. The total value of orchard production amounts to just over £226,500, which is only one-fifth of the production of the Nelson region and one-half that of Central Otago. Indeed, there is little visual manifestation of an orcharding industry in this dispersed region. There are no compact areas of high rural population, no continuous grid of shelter-belt and inset orchard, and no specialized fruit processing units.

Both districts lie to leeward of mountain ranges so that the annual precipitation is no more than 26 inches and is coupled with high temperatures during summer and the likelihood of hail and gale damage. Hail damage is a more frequent occurrence here than in any other orcharding region and the dark green shelter belt is a regular feature of the orchard landscape (see Figure 33).

Concentration of orchard holdings, apart from those at Raupara and Loburn, is altogether absent and variety rather than

Figure 27. COMMERCIAL PARCHMENT AND PAPER REPAIRS  
ORIGINATOR'S STATEMENT OF WORK



**BLENHEIM - CHRISTCHURCH MIXED  
FRUIT REGION**

uniformity is typical of the individual holdings. Apples are in fact the only frequently recurring element of the tree association.

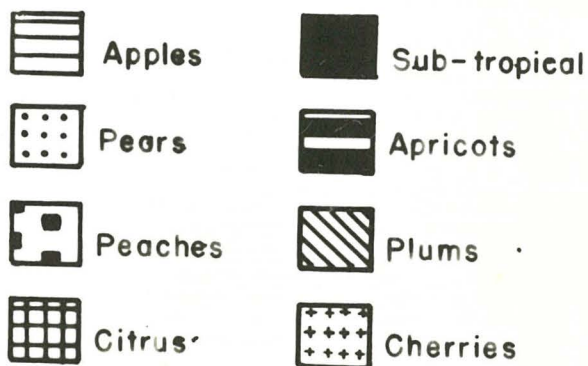
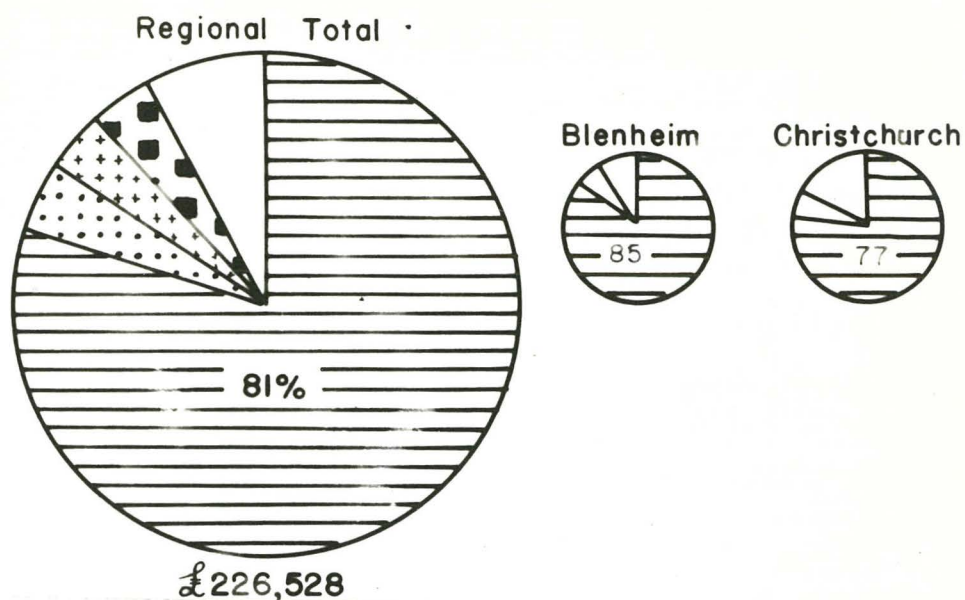


FIG. 28 VALUE OF ORCHARD PRODUCTION IN THE BLENNHEIM-CHRISTCHURCH REGION.

This predominance of apples is primarily the result of the speculative planting boom which took place between 1912-1916. At least two-thirds of the orchards at Blenheim and all those at Leburn had their origin in this manner. On all of these orchards, apples

were the major fruit tree planted.

As is typical of this development, a decline of acreage has since taken place and where the orchards have not disappeared their original character has been transformed by replacing pip fruit with stone fruit trees. It is this practice, which makes orcharding in this region so atypical of the uniformity generally associated with speculatively planted orchard land.

Near Christchurch, where the incidence of speculatively planted holdings is lower, even greater diversity is to be found. Most orchards in this area have been planted to meet the demands of a growing local fresh fruit market. Accordingly the harvest season usually begins with cherries and plums, followed by peaches and apricots and concluding with pip-fruit.

Apple growing in this region is very similar to that in Nelson with Sturmers and Jonathan varieties predominating. However, owing to the inability of some orchardists to irrigate their trees during the dry summer, average production is no more than 350 cases per acre, more than 200 cases below the Nelson average.

Stone fruit production, although only of minor importance, is fairly evenly distributed throughout the region with the only marked concentration in the Port Hills district near Christchurch. On the northward, sunny slopes of these valleys, and protected from the cold southerly wind, are planted 80 per cent of Christchurch's stone fruit trees. The soil is rich and well drained and the slopes of the valleys are sufficient to provide air drainage and relative

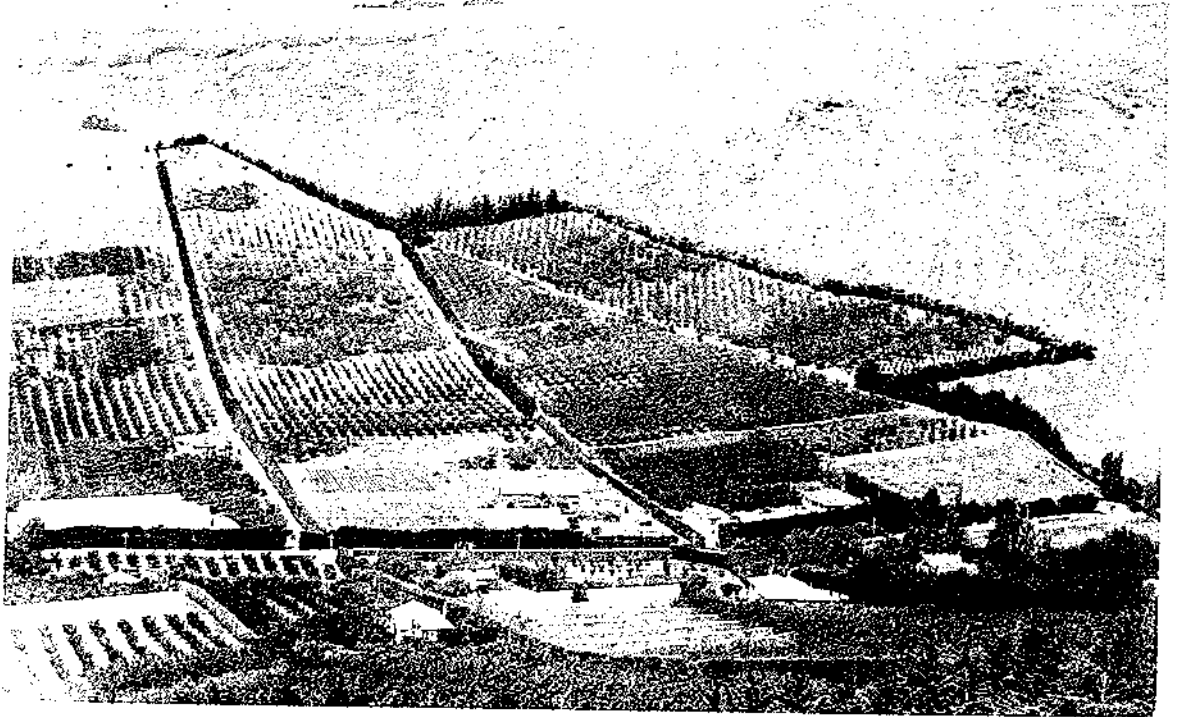


PLATE XXXV. TERRACE IN THE PORT HILLS.

Because of aspect and air drainage orchards in this area can produce stone fruit for the early market. The land is steeply sloping and the glass houses and netted cherry orchards enhance the intensive character of the holdings.



freedom from late spring frosts. Orchardring is here associated with early vegetable growing and flower culture on comparatively small areas of land; a combination which is not found elsewhere in New Zealand.

Like other mixed fruit regions, the methods used in this area are less intensive and at times almost antiquated. An automatic blast sprayer on one property may be alongside another using the stationary pipe system, for spraying, while bulk harvesting of fruit and permanent grassing in the orchard are unknown.

On account of the lower humidity the incidence of disease in this region is lower than in Nelson. In pip fruit for instance, the most damaging insect pests is the red mite, which thrives under the hot dusty condition of orchards walled in by rows of radiata pine and Lombardy poplar.

Of far greater consequence is the damage from climatic elements. Gusty north-westerns in February and March may literally tear the trees out, while intense heat in enclosed orchards scald the skin of the fruit, and occasional hail-storms tear jagged pieces out of the ripening fruit.

As can be appreciated the Blenheim-Christchurch region is not ideally suited to commercial orchard practice and owes its origin to speculative planting and location close to an expanding fresh-fruit market. Even today, all the fruit produced is sold locally and none is exported. Gate sales of all fruit, and apples in particular, are an important means of disposal. More than half the



PHOTO LXVI. WIND DAMAGE.

This heavily laden tree in a Blenheim orchard has been uprooted by the wind.

growers near Christchurch dispose of all their crop through orchard gate sales and most others sell their commercial or second grade fruit in this manner. For this reason small, privately owned cool-stores are common. A percentage of the crop is stored in these rooms and sold during the winter when prices are higher.

The future of fruitgrowing in this region will of course depend on the success that local growers have in competing with the physically favoured districts who experience difficulty in transporting their fruit to the markets.

An additional threat is the expanding urban area which is fast encroaching on the orchard-land surrounding Christchurch.

Blenheim is not similarly threatened, and is dependant to a larger degree on pip fruit production for which there is a guaranteed market through the Apple and Pear Marketing Board.

In general, diversity is the keynote of the geographic personality of this region. Yet amid this diversity there is a certain similarity: namely the dominance of apple growing, irrigation and orchard shelter, which even though it does not bind the two areas closely together, does provide sufficient contrast with other orcharding regions to warrant the generalization into one geographic unit for the purposes of discussion.

P A R T   I I

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## Chapter I:

FACTORS AFFECTING THE LOCATION OF COMMERCIAL ORCHARDING

Commercial orcharding regions are found in either of two situations (see Figure 12): In Auckland and Christchurch they are located adjacent to large urban markets and in Nelson, Hawke's Bay, Central Otago and the Northern Sub-tropical Fruit Region, in areas with some favourable physical attribute. This illustrates two of the factors of location, the market and physical advantage, which are further complicated by individual choice. Olmstead states that the evolution of orchard and vineyard areas has occurred in the United States where one of three conditions existed:

"(1) advantageous location with respect to market, (2) advantage with respect to natural growing conditions, especially climate, and (3) a particular desire to specialize in orchard and vineyard enterprise."<sup>30</sup>

In the 1880's orcharding in New Zealand was significantly market oriented. (see Figure 29). From as early as 1838 commercial orchards were planted near Auckland, and many of the new soldier-settlers in the Waikato chose orcharding as a means of livelihood. But the local market could not consume all the fruit produced. Orchards were abandoned and the ravages of disease, which began in the neglected orchards, soon destroyed what had been a substantial orchard industry in the Auckland Province.

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30. Clarence W. Olmstead: 'American Orchard and Vineyard Regions.', Econ. Geog., Vol. 32, No. 3, 1956, pp. 129-236.

Figure 10. ADJUSTMENT OF CROPLAND LAND USE  
1916-1936.

In 1916, croplands were more widely distributed than they are today. By 1936 there had been a great decrease of cropland land and a significant concentration into specific areas. Since 1936 there has been a gradual reduction of acreage in all areas except Lake's Bay.

# ACREAGE OF ORCHARD LAND BY COUNTIES

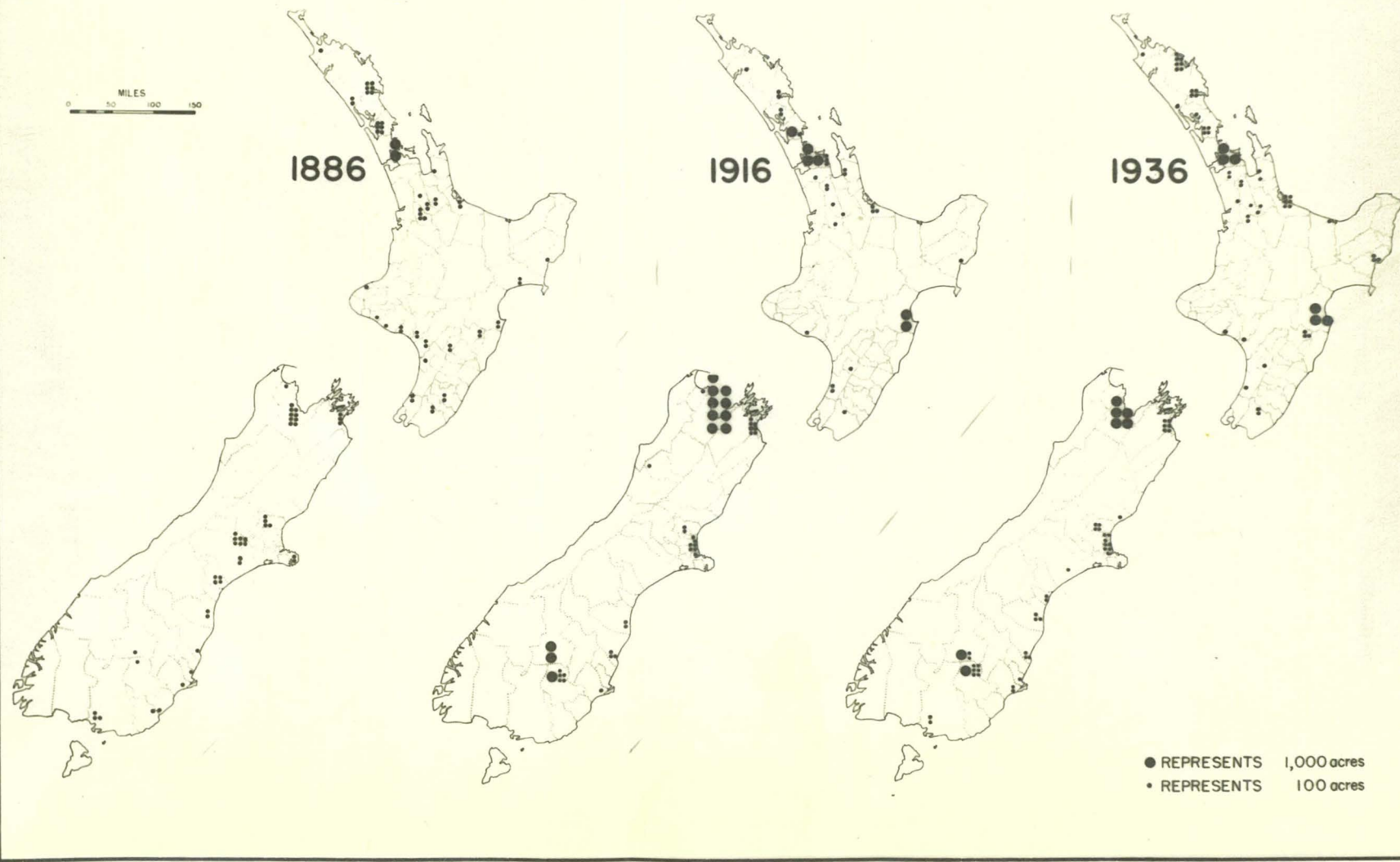
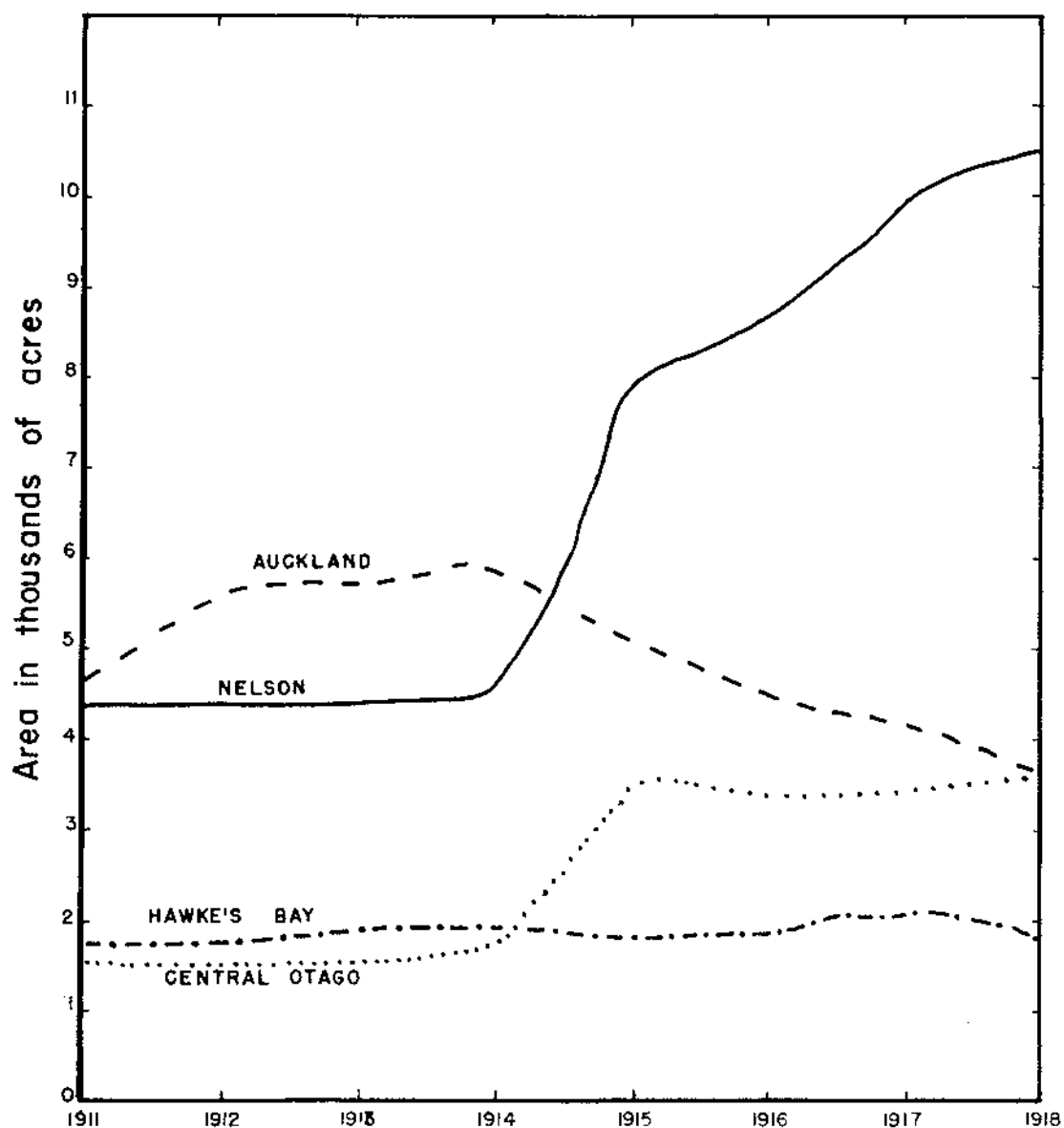


Figure 30. ACRES OF ORCHARDS PLANTED, 1911-18.

Orchard acreage expanded rapidly between 1911 and 1918. Expansion was greatest in Nelson, while acreage in Auckland reached an early peak and had begun to decline by 1914.



# ACREAGE OF ORCHARD LAND 1911 - 18



Christchurch and Dunedin in the South Island also had their tributary orcharding areas. Being less humid than the Auckland Province, disease was not as great a problem. Production increased and the demand for fruit by the more populous South Island in the 1880's led to the conversion of many of the old sluicing races in Central Otago into irrigation ditches supplying the new stone fruit orchards. There was an area climatically similar to California and many of the miners who had been to the gold rushes in California became horticulturalists as the gold began to be worked out.

The situation in 1886 was that a substantial yet declining orchard acreage existed in the Auckland Province and a scattering of orchards were found in the Wellington Province, Taranaki and the east coast of the South Island. There was still a definite market factor in location, which in the next 30 years was to decline in favour of areas with a favourable physical environment.

Following the successful shipments of apples to the United Kingdom in 1908, speculative land companies began to plant land in apples for the purposes of subdivision. Rapid expansion followed in areas of low humidity and high intensities of insolation. Ravoc caused by disease in humid districts influenced this decision and the comparison, for advertising purposes, was drawn with the profitable orchards in Tasmania. The acreage of orchard land increased in all districts but a phenomenal increase was made in Nelson (see Figure 30).

By 1916 the pattern of orcharding had vastly changed from that in 1886 and Nelson had emerged as the premier orcharding district.

During the next 20 years the actual acreage of orchard land was to decrease and there was a further concentration into specific orcharding areas.

In this boom period of planting many hundreds of acres of poorly situated land were planted and many individuals, who through lack of knowledge, or of capital, were quite unsuitable, became involved.

World War I destroyed the hopes of some, but others learnt by experience the fallacy of a promised retirement in a congenial climate with a secure income from apples. Many abandoned their orchards, whilst others struggled on for the better times which have only come in the last fifteen years.<sup>31</sup>

By 1936 the concentration into the regions recognised in Figure 12 is apparent, but the outstanding feature is the marked reduction in orchard acreage.<sup>32</sup> Hawke's Bay, the only area in which speculative planting did not take place, is the only area which has expanded. Apart from Auckland, orcharding is now found in areas with a favourable physical environment, rather than near the market centres.

The speculative planting ventures aimed to inaugurate a pip fruit export trade and in this they were successful. More than one million bushels of apples are exported annually and the recent

31. Between 1925-56 the number of apple trees has declined by 54 per cent and that of pears by 45 per cent.

32. See Figure 1 for an indication of the further reduction which has taken place in the last twenty years.

prosperity of orcharding in this country is closely linked with the success of this venture. Pip fruit growing is orientated towards supplying this external market and where such great distances are involved, local variation in transport cost are insignificant. Comparatively, costs of production are more important in economic competition and there is a definite advantage in locating orchards in areas suited physically to fruit production, rather than those near urban markets.<sup>33</sup>

However, stone and citrus fruit do not supply an external market and of the six orcharding regions, only Nelson and Hawke's Bay can be said to be orientated towards the export market. In the other four regions the market factor cannot be neglected, but as it is closely connected with transport costs it would be convenient to consider it in the next chapter.

In respect to commercial orcharding in New Zealand, all three locational factors--market and physical advantage and a recognition of the opportunity afforded by these conditions--have been important in the development. That the two foremost regions, Nelson and Hawke's Bay, do have favourable climatic advantages as well as a permissive market location ought to be noted, for it is likely that in the future, commercial orcharding will further concentrate in these two regions.

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33. Here again there is evidence of the political factor contradicting economic theory in New Zealand's agriculture. Growers in Auckland and Central Otago are paid a cost of production bonus in order that they may compete with Nelson and Hawke's Bay.

## Chapter II:

FACTORS INFLUENCING THE REGIONAL VARIETY OF COMMERCIAL ORCHARDING

Given the present distribution of orcharding there are several elements, both physical and cultural, which profoundly influence the character of orcharding as it differs from place to place. Historical development, as considered in the last chapter, is in itself an important factor, but in this chapter such elements as climate, soils, and transport are considered in more detail than was possible in the regional studies.

CLIMATEAvailable Soil Moisture (see Figure 31):

In all orcharding areas except Kerikeri the moisture demand of the trees exceeds the supply during summer, but in Auckland, Taureanga and Welson this demand is met by soil storage moisture. Moisture deficits are recorded in other areas and irrigation is advisable.

A plentiful supply of moisture is needed by all trees when the fruit is forming and fruit of inferior size results if this supply is reduced. Central Otago, with a moisture deficit of eight months duration, is the only region where irrigation might be described as the life-blood of the district, though orchards at Loburn in North Canterbury are in serious danger of disappearing unless a satisfactory source of irrigation water can be tapped. Providing irrigation water

Figure 31. AVAILABLE SOIL MOISTURE IN  
SECHURUNG AREAS.

Central Otago, Christchurch,  
Dunedin, Hawke's Bay and Otago  
are areas where there is a deficit  
of soil moisture during part of the  
growing season. The deficit is  
greatest in Central Otago.

# AVAILABLE SOIL MOISTURE IN ORCHARDING AREAS

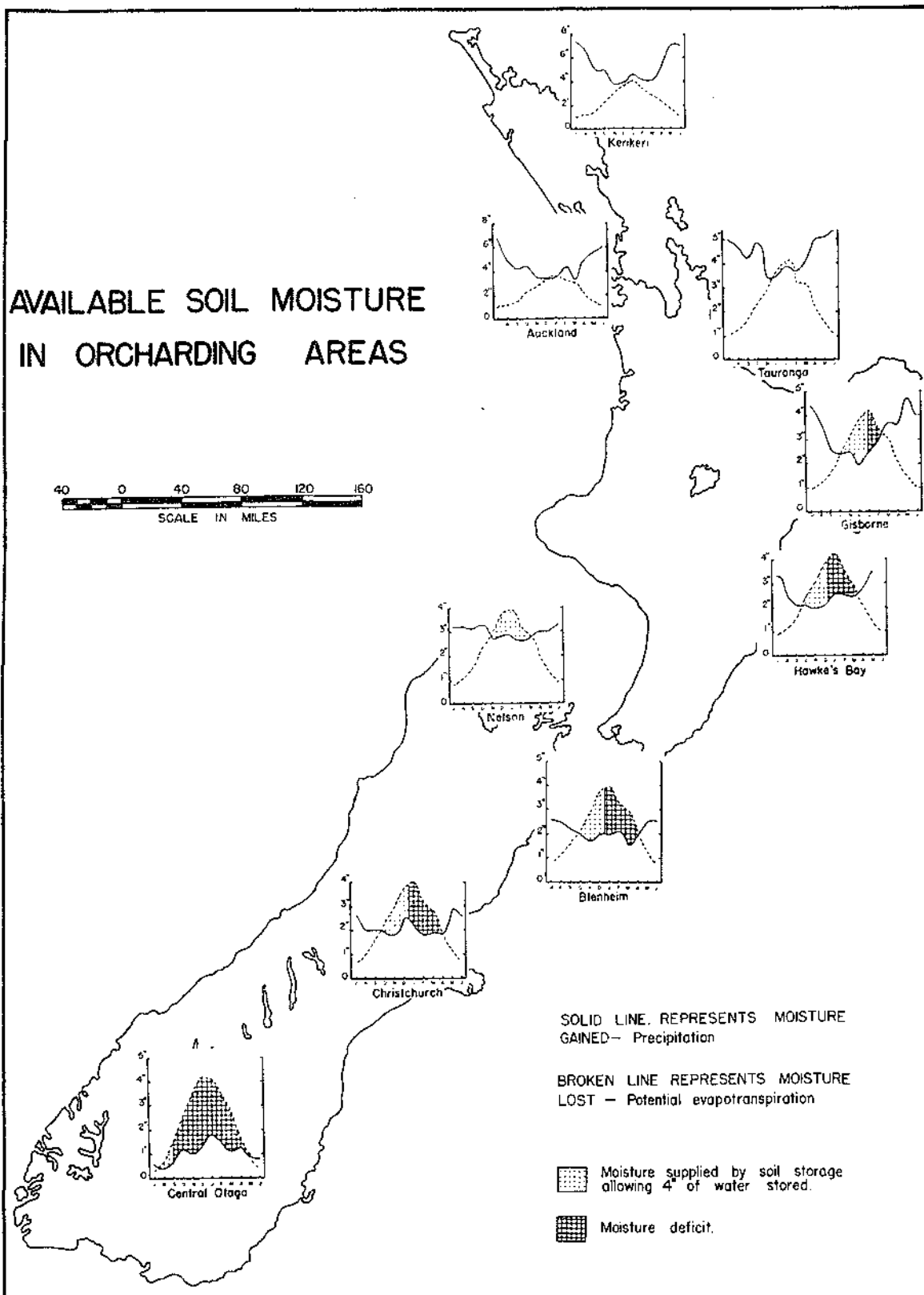
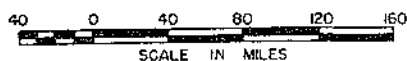


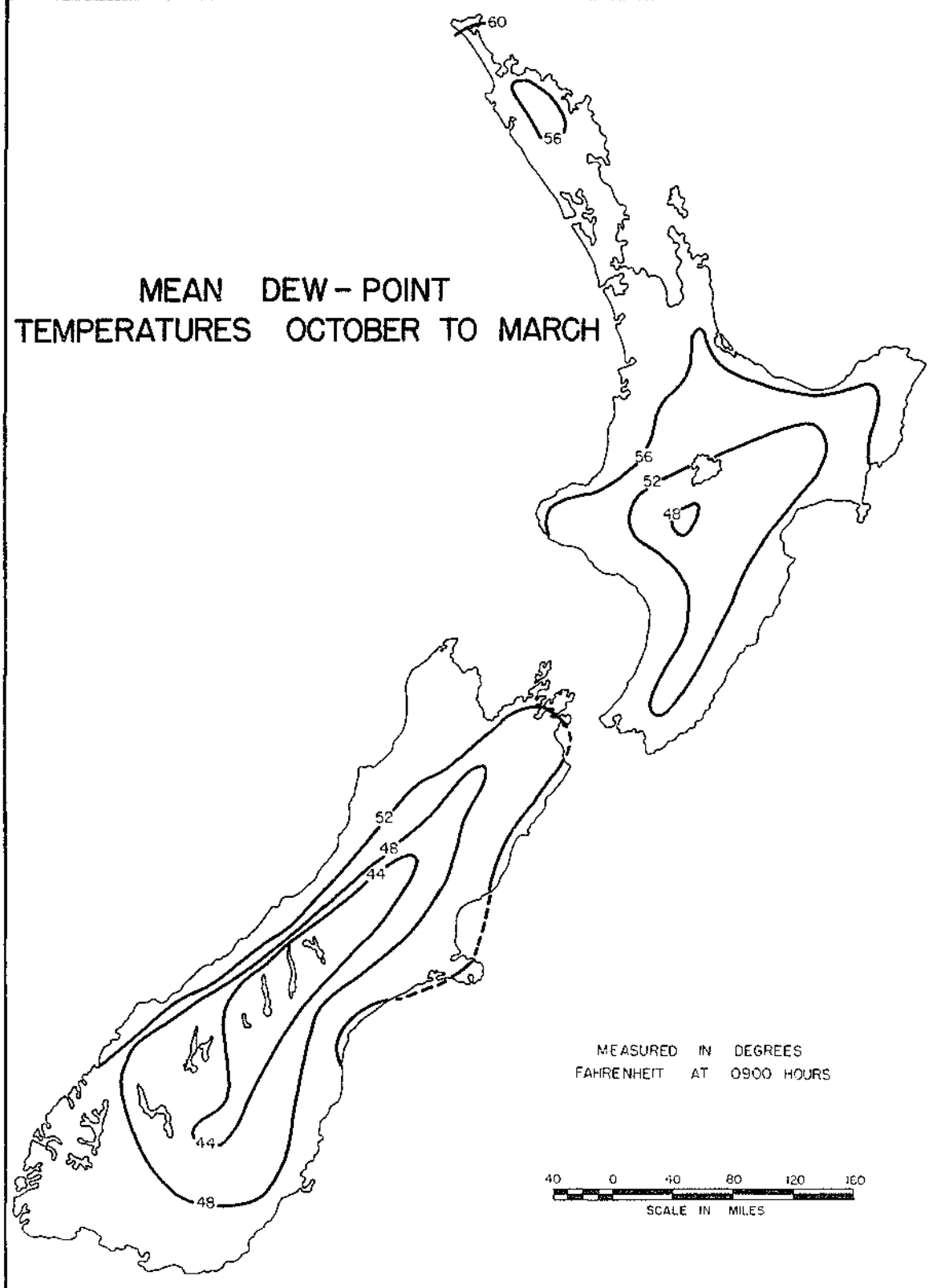
Figure 32. MEAN DEW-POINT TEMPERATURES  
OCTOBER TO MARCH.

The atmosphere in areas with high dew-point temperatures has a high moisture content. Orcharding areas are more humid in the north than they are in the south.

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MEAN DEW - POINT  
TEMPERATURES OCTOBER TO MARCH



is a costly problem and Hawke's Bay has a decided advantage in that artesian water is available.

#### Humidity:

The moisture content of the air—humidity— affects the incidence of fruit tree disease. The life cycles of both fungoid and bacterial diseases are accelerated in moist humid areas and the liability to crop damage is increased.

Figure 32 shows the temperature at which dew will form during the growing season and is used as an indicator of the amount of moisture in the air. The northern part of New Zealand is obviously the more humid and in this area the cost of fruit production rises sharply on account of the difficulty in controlling insect pests and disease.

Both Nelson and Hawke's Bay have a comparatively humid climate and regular spraying during the growing season is essential. Central Otago is the only region where the low humidity restricts disease.

#### Temperature:

As no place is too hot for the growing of temperate fruits in New Zealand, it is the lower temperature which influences the distribution of fruit trees. Citrus fruit prefer the frost-free littoral of the Auckland Province whereas apricots and cherries appear to thrive in those regions where the more rigorous winter enforces a definite period of tree dormancy.

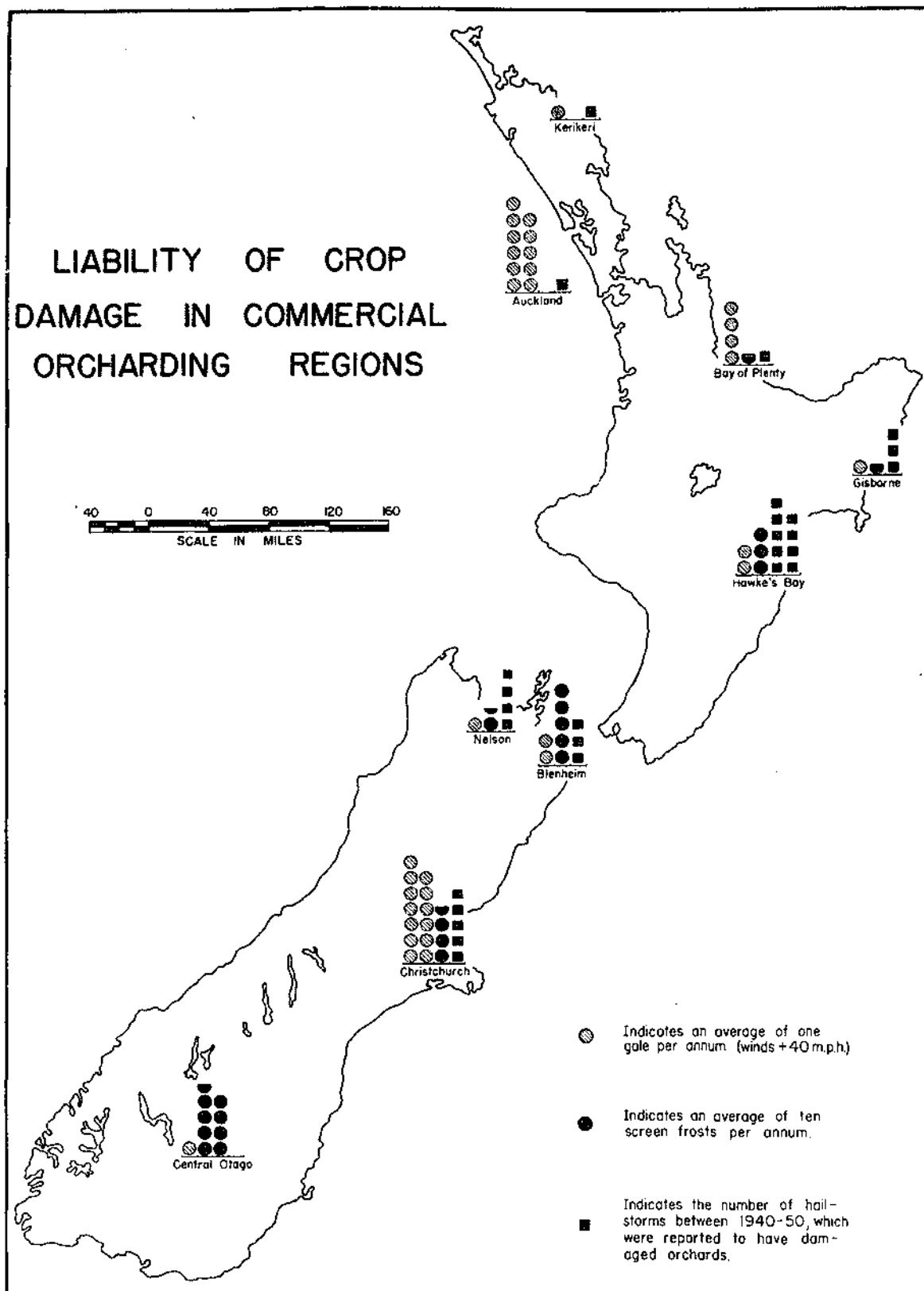
Figure 33 indicates the division between these regions

Figure 32. MAXIMUM OF CLAY DAMAGE IN  
COMMERCIAL WAREHOUSES SERVING.

Liability to wind damage is greatest in Auckland and Christchurch. Hail is important in Hawke's Bay, whilst damage from late spring frosts is more likely in Central Otago, Christchurch, Glenelg and Hawke's Bay. Apart from hail, Tolson is liable to little damage.

# LIABILITY OF CROP DAMAGE IN COMMERCIAL ORCHARDING REGIONS

40 0 40 80 120 160  
SCALE IN MILES



○ Indicates an average of one gale per annum (winds +40 m.p.h.)

● Indicates an average of ten screen frosts per annum.

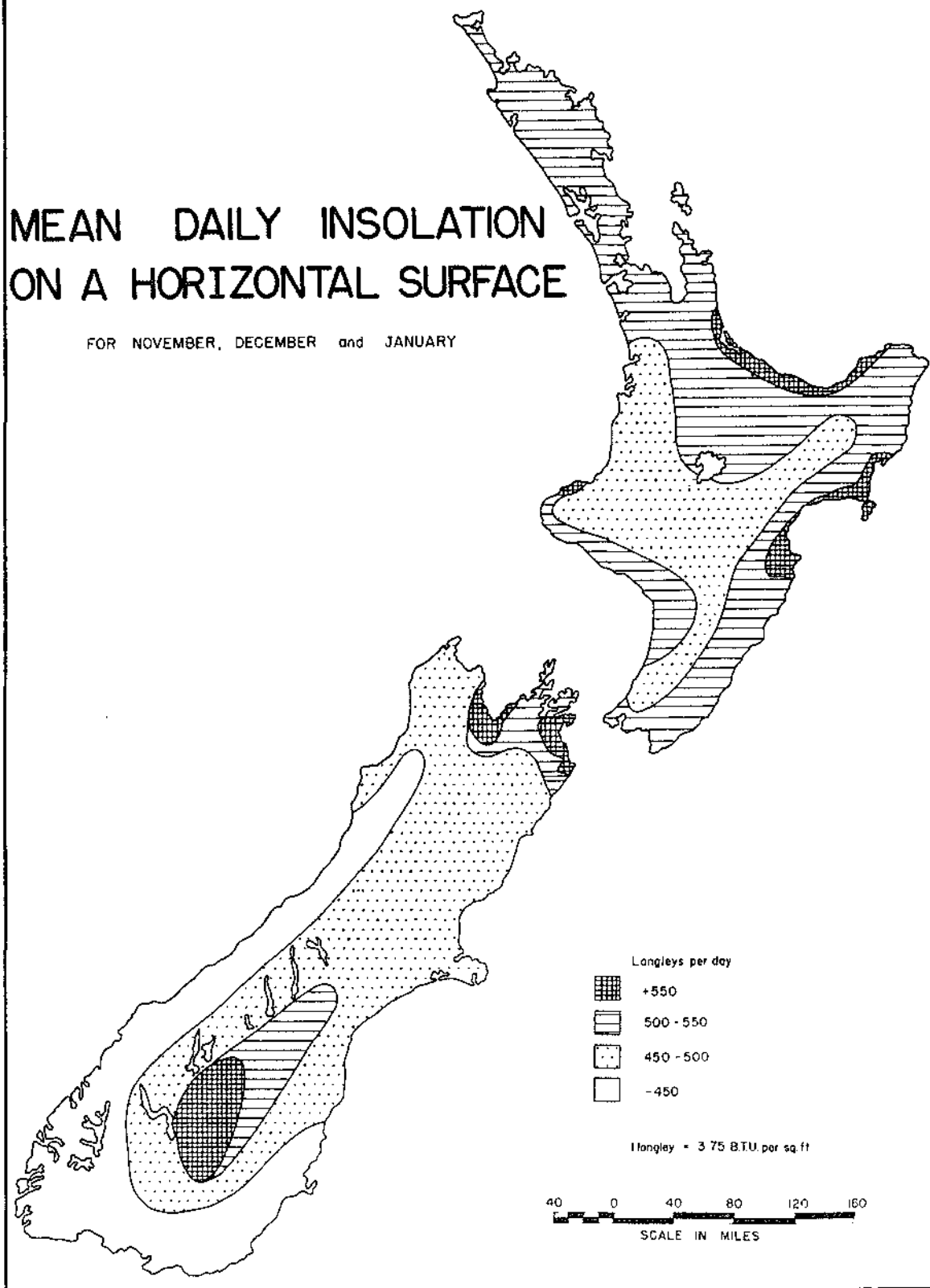
■ Indicates the number of hailstorms between 1940-50, which were reported to have damaged orchards.

Figure 34. MEAN DAILY INSOLATION ON A  
HORIZONTAL SURFACE.

There is a general correlation between the distribution of orcharding areas and high intensities of insolation during the growing season.

# MEAN DAILY INSOLATION ON A HORIZONTAL SURFACE

FOR NOVEMBER, DECEMBER and JANUARY



having more and those having less than fifteen screen frosts annually. It is significant that Hastings, Blenheim, Christchurch and Central Otago fall into the first category. All four have screen frosts recorded in September and October thus necessitating expenditure on frost-fighting equipment.

Insolation (see Figure 34):

The location of orcharding areas in places with high annual totals of bright sunshine has long been recognised. Now that the calculation of insolation—the actual solar radiation which reaches the surface of the earth—is possible, a similar correlation is found.<sup>34</sup>

Apart from aiding the formation of the bright and attractive colour in fruit, insolation does not appear to influence the fruit trees. It would appear then that the correlation which exists between orcharding areas and insolation is the result of early settlers identifying areas possessing long hours of sunshine with successful fruit-growing areas overseas, rather than peculiar physiological influence.

Gales (see Figure 33):

The liability of damage from winds exceeding 40 miles per hour is greatest when the trees are heavily laden with fruit and in all regions except Nelson and Central Otago the provision of orchard shelter is a necessity. The danger is greatest in Christchurch and Auckland, but severe damage is not uncommon in Blenheim and Hawke's Bay.

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34. See J.F. Gabites, 'A Preliminary Estimate of the Daily Insolation in New Zealand.' N.Z. Met. Service Circular Note, 71.

Hail:

Maps showing the frequency of hail are of little use to a study of orcharding, for hail storms only damage fruit trees when the fruit is almost ripe. <sup>Quite wrong.</sup> In an attempt to estimate the significance of this damage the actual newspaper reports of hail damage to orchard properties are recorded in Figure 33. Frequency of hail storms in New Zealand increases on the whole from north to south, but areas exposed to the south-westerly winds are more likely to receive hail than those to the east of the ranges. Though protected in this manner, certain eastern districts are prone to less regular hail storms of exceptional severity, which tend to follow definite narrow tracks. The fruitgrowing areas at Hastings and Christchurch lie in paths usually followed by these storms and as a result have lost as much as half of their total fruit crop through hail damage.

Orchardists have devised no method of averting this damage, but the setback is likely to be for one season only and there is no danger in any of New Zealand's fruitgrowing regions of orcharding becoming eliminated on account of regular hail damage.

SOILS

There is no one soil type which might be described as most suited to fruitgrowing in New Zealand. Fruit trees are grown on soil types ranging from the grey sandy soils of the alluvial piedmonts in Central Otago to the most fertile, yellow-brown loam soils of Hawke's Bay and Gisborne. The most commonly used soils are the heavy clay



loams and although greatest production is achieved on recent river alluvials, best flavour and superior storage qualities are obtained on these heavier clay soils.

Climate and soils are the two physical elements which influence the distribution and character of commercial orcharding in New Zealand. In comparison, slope and aspect are of only local significance. Climate has presented many problems, but man, aided by his growing technical knowledge, has been able to overcome them. In the north disease control is a problem; in the south it is frequency and degree of frosting. Each region has its own problems and their solution gives rise to the great diversity of methods used on New Zealand orchards. Similarly, the impact of cultural elements differs from area to area.

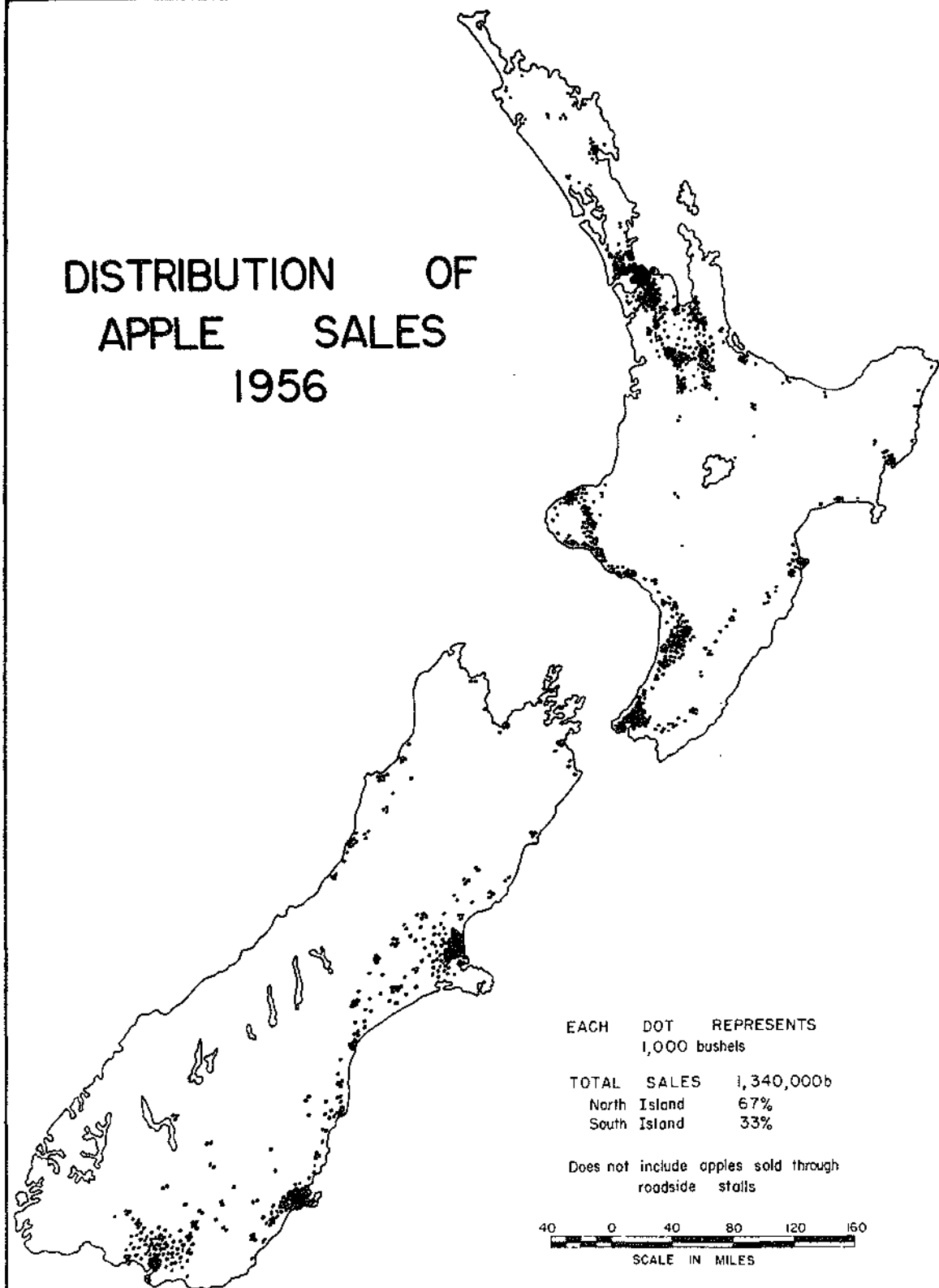
### MARKETS

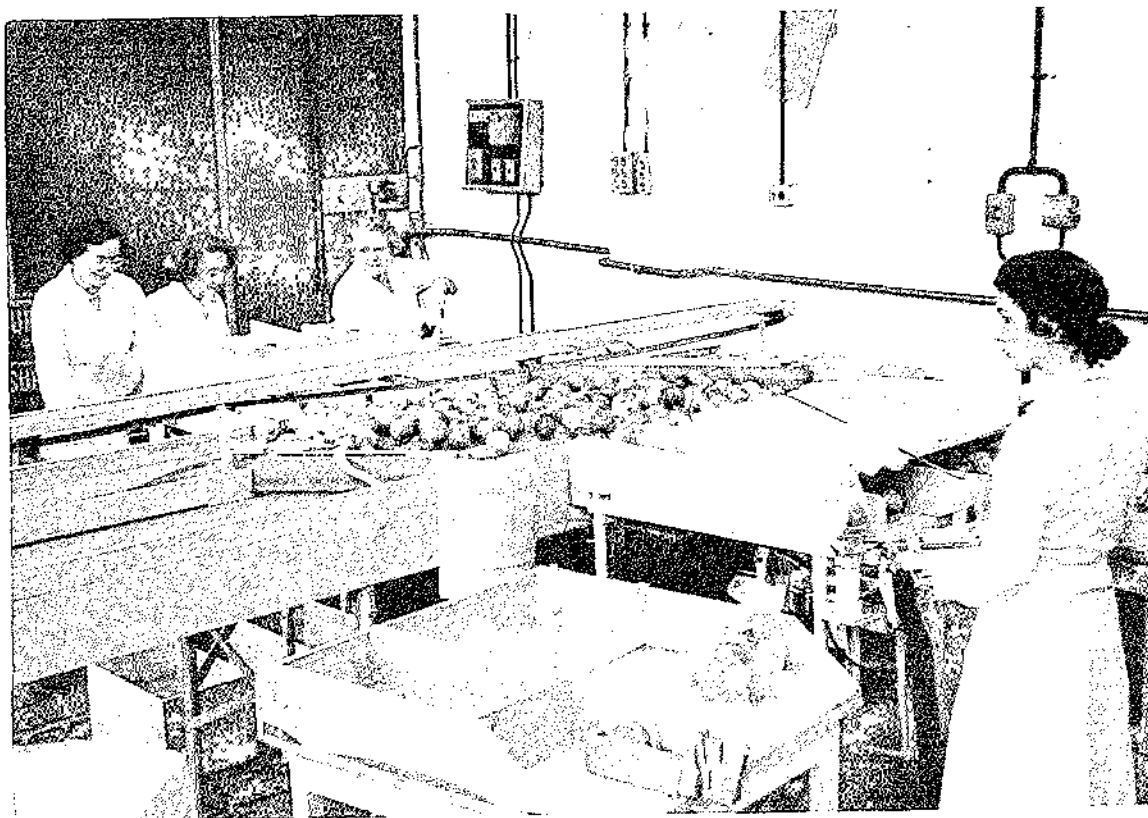
A market demand is essential for all agricultural crops and the nature of this market often dictates the crop association and the manner of sale. Taking apple sales as the indicator, Figure 36 is an attempt to delineate the intensity of fresh fruit requirements for the Dominion. The largest consuming area is in the Auckland Province followed by Wellington and Taranaki, but the major producing areas are in Hawke's Bay, Nelson and Central Otago. This immediately suggests a problem in transportation, which is especially important to the stone fruit grower who produces a highly perishable product.

the number of leaves on the  
leaves of the plant is  
this and indicates the distance which  
the leaves are from the ground.

Figure 35. Distribution of leaves on the plant, 1956.

# DISTRIBUTION OF APPLE SALES 1956





FLY'S KNIFE. BY OTHER APPL. IN FACTORY WORK  
 OF THE LOCAL FACTORY.

The transport of fruit in New Zealand is both costly and inefficient. It is for this reason that Auckland, where costs of fruit production are higher than in any other region, can compete with Central Otago, which is better suited climatically for the production of quality stone fruit. Similarly Kerikeri is facing strong competition from Gisborne in citrus production, for the latter has the advantage of cheap transport to South Island markets by coastal steamer. Factors such as these must of course influence both the comparative economic advantage of the orcharding regions as well as the crops grown. Air transport does offer possibilities but the net result of this influence has been that there is an increased tendency for regions situated far from the markets to specialize in crops high in value per unit of weight. Specialization in Central Otago on apricots and cherries provide an example of this trend.

#### FRUIT PROCESSING (see Figure 36)

Statistics for fruit and vegetable preserving are only available combined, but fruit processing is especially important in Hawke's Bay, Nelson, and Central Otago (including Dunedin). In each of these three areas a proportion of the fruit crop is grown specifically for processing into preserved fruit and jam. The large, company-operated orchards, planted to meet the needs of the progressive canning industry, are an integral part of the fruit industry in Hawke's Bay. In both this region and Central Otago the continued importance of stone fruit must be interpreted in the light of the

Figure 36. PERSONS EMPLOYED IN FRUIT AND  
VEGETABLE PRESERVING, 1946.

Fruit preserving is especially important in Hawke's Bay, Nelson and Dunedin. Hawke's Bay is by far the most important area.

# PERSONS EMPLOYED IN FRUIT AND VEGETABLE PRESERVING 1956

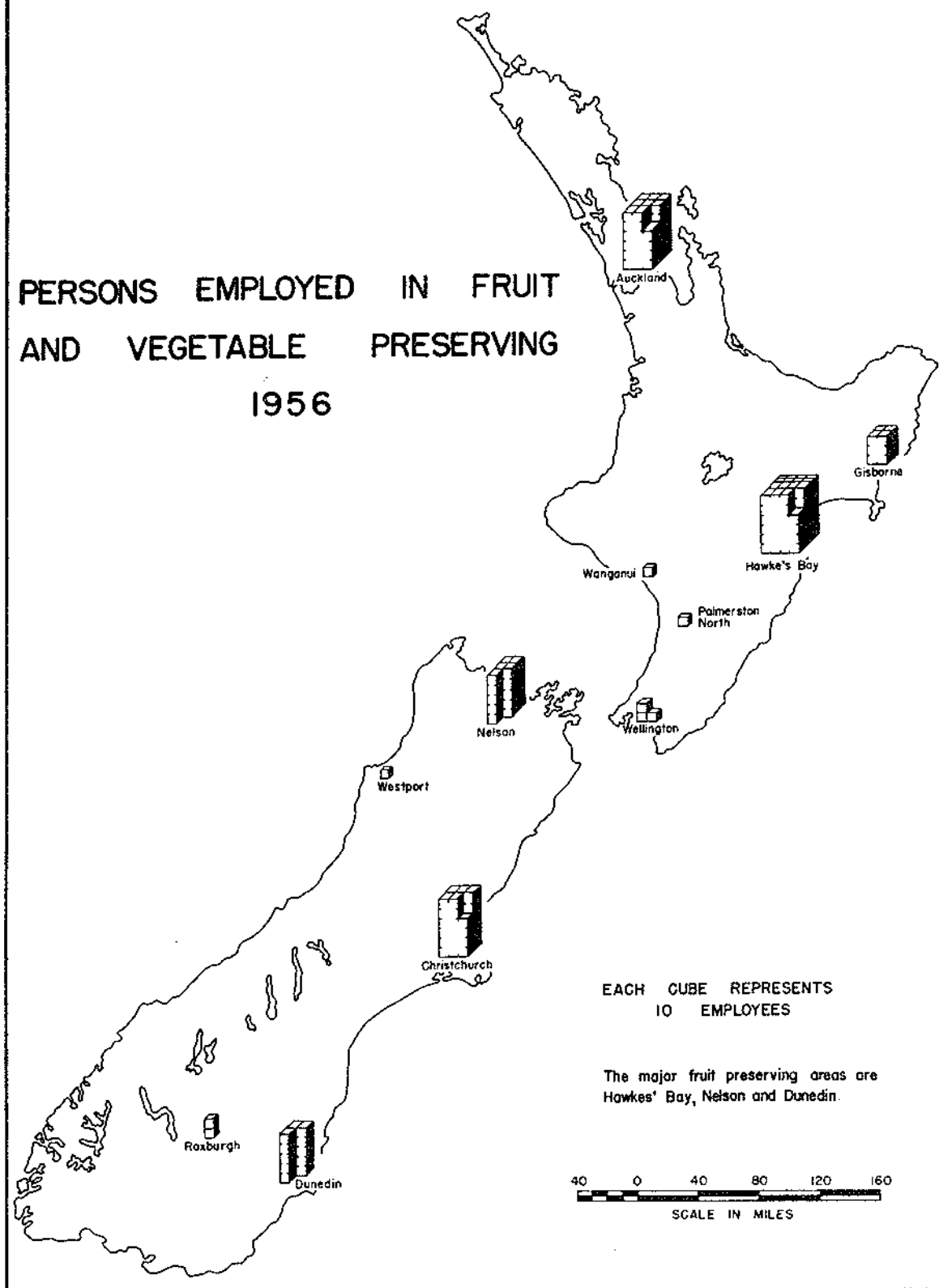
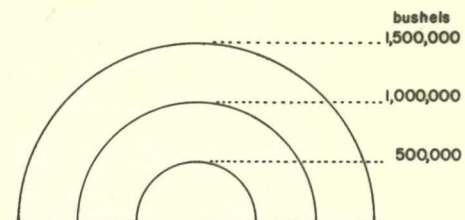
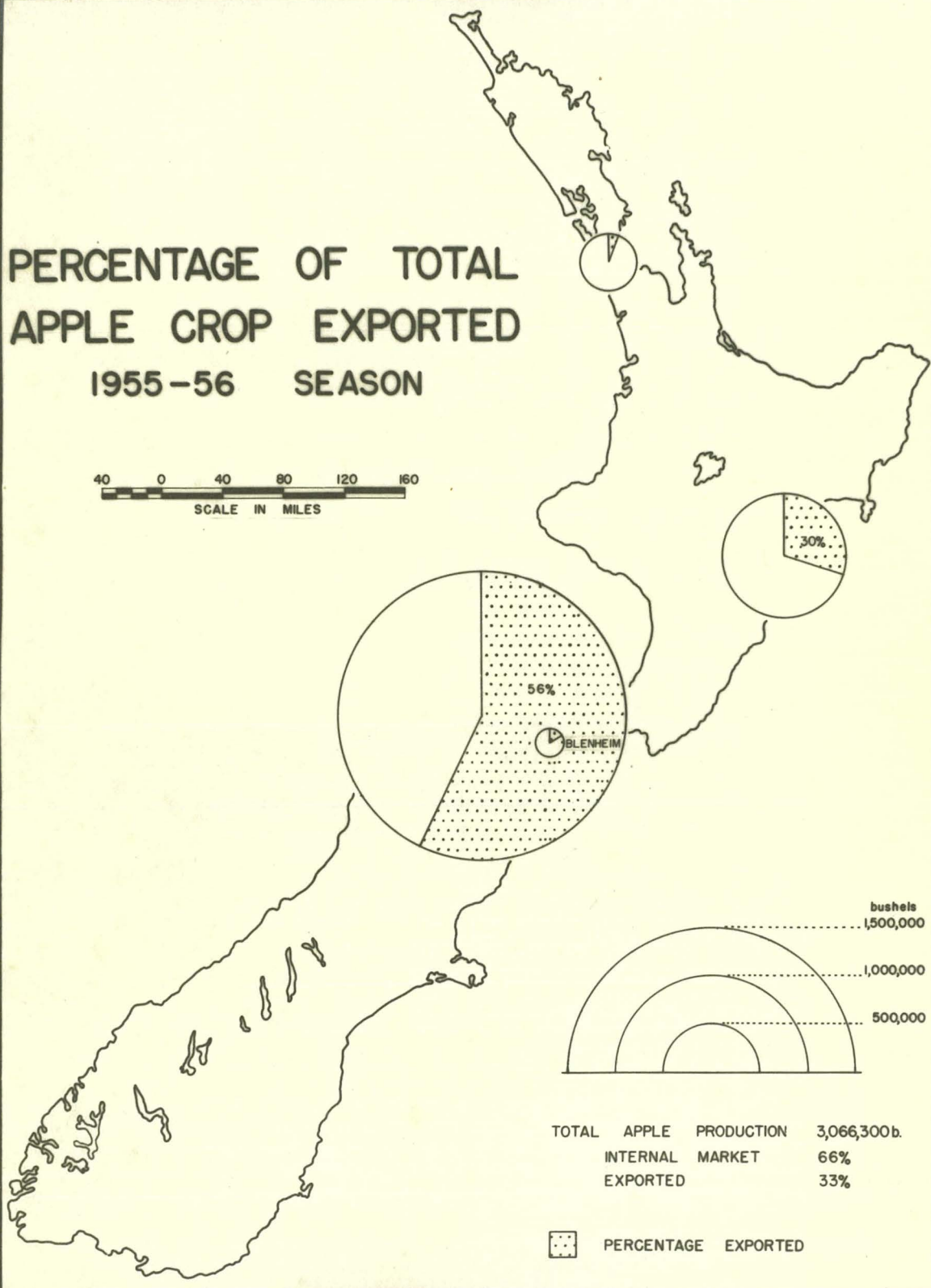
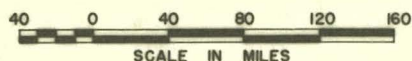


Figure 37. PERCENTAGE OF TOTAL APPLE CROP  
EXPORTED, 1955-56 SEASON.

Welson and Towke's Bay are signif-  
icantly orientated to this trade.



# PERCENTAGE OF TOTAL APPLE CROP EXPORTED 1955-56 SEASON



TOTAL	APPLE	PRODUCTION	3,066,300b.
	INTERNAL	MARKET	66%
	EXPORTED		33%

 PERCENTAGE EXPORTED

stability which canning has given to this section of the industry.

#### FRUIT EXPORTS (see Figure 37)

Apart from small shipments of pears and sub-tropical fruit, apples are the only fruit exported. More than one million bushels of apples, worth £1,750,000, were exported in the 1955-56 season. The majority of these came from Nelson and Hawke's Bay. In both of these regions apples were planted with a view to entering the export trade and the success of these schemes has resulted in a growing specialization of orcharding. Certain varieties are encouraged and as regular profits are guaranteed, the orchardist is devoting more and more care to his export apples. Methods used are changing with the desire to handle the crop more quickly and efficiently. Bulk handling, machine case-nailing, and reduced handling are but a few of the innovations which have been introduced with the growth of the export trade.

#### CONCLUSION

Climate, soils, and method of crop disposal are all factors which influence the character of orcharding in New Zealand. In a similar manner they are all factors which affect the potential of orcharding in the different regions. If the maps of this chapter were overlaid, the relative advantages and disadvantages of the different orcharding areas could be compared for the purpose of showing the

area most suited to commercial orcharding.

Orcharding in the Auckland Province has a very strong market advantage, but this is offset by the cost of producing the fruit in this humid, disease-prevalent area. Only citrus and sub-tropical fruit can be produced here more cheaply than elsewhere in the Dominion.

Central Otago, the southernmost orcharding region, is not troubled by ravages of disease, but is forced to protect the developing fruit from late spring frosts with costly frost fighting equipment. In addition, transport rates to northern markets are high.

Between these two and in part sharing in the advantages and disadvantages are Nelson and Hawke's Bay. Climatically Nelson appears more suited to orchard production, but the fertile clay loams of Hawke's Bay yield heavier crops per acre than do the heavy clay loams at Nelson. Both have tide-water locations which is an advantage for the export trade, but Hawke's Bay possesses better communications with the markets at Wellington and Auckland. This, together with the demand for stone fruit by the progressive fruit-canning industry, enables a better balanced, mixed orchard economy to operate in Hawke's Bay. This is an advantage over the specialized pip fruit economy of Nelson. Labour requirements are spread over a longer period and a mixed economy is better able to adjust to sudden fluctuations in market demand.

## CONCLUSION

With fresh fruit exports now yielding £1,750,000 annually, New Zealanders are fast becoming aware that there is a finely established orchard industry in this country. It is hoped that this thesis will provide a better knowledge of this new primary industry.

A full range of temperate and sub-tropical fruit are grown in different concentrations throughout the Dominion, but the apple is the basis of commercial enterprise. Apples are grown in every orcharding district and contribute 64 per cent of the Dominion's fruit production by value.

Conspicuous differences exist in the association of fruit grown and in the methods of production throughout the Dominion. These differences form the basis for the division of New Zealand into commercial orcharding regions. In each of the six regions recognised other uses of the land may occupy more area, but the impact of orcharding is functionally and visibly significant. Farmers in these areas think in terms of spray programmes, fruit harvest labour, fruit markets and frost hazards. In Nelson there is specialization in pip fruit growing for the export market, whilst in Hawke's Bay both pip and stone fruit are produced. Orchardling near Auckland is directed to supplying the adjacent urban market and Central Otago experiences great difficulty in transporting its fruit to the distant markets. These are some of the elements which distinguish the regions and it

is hoped that by comprehending the parts, the whole may be better understood.

Many factors, both cultural and physical, underly these differences. Early in the development of orcharding there existed a conspicuous market orientation, but this has decreased since 1900 and orchards have become increasingly concentrated in areas physically suited to commercial fruitgrowing. Orchards still persist adjacent to the market centres, but it is anticipated that within the foreseeable future, there will be a further concentration of orcharding into the physically favoured districts, especially Hawke's Bay. As the export market increases, the factor of local transport costs will decrease and those regions in which fruit can be grown at lowest cost will have a decided advantage.



## APPENDIX I

## COMMERCIAL ORCHARD PRODUCTION (1949-55 averaged)

Type	Kerikeri	Auckland	Hamilton	Bay of Plenty	Gisborne	Hawke's Bay	New Plymouth	Palmerston North	Wellington	Nelson	Blenheim	Christchurch	Timaru	Dunedin	Central Otago	TOTAL
<b>APPLES</b>																
bushels	3,640	300,180	40,770	8,070	35,812	749,700	860	10,980	26,610	1,372,510	113,570	129,800	10,850	8,320	153,557	2,965,229
value £	2,730	225,135	30,578	6,053	26,859	562,275	645	8,235	19,958	1,029,383	85,178	97,350	8,138	6,240	115,168	2,223,922
% of total value	4.9	54.3	67.6	4.9	50.2	63.2	62	78	91.4	87.3	85.1	77	63.7	91.3	27.8	64.4
<b>PEARS</b>																
bushels	1,240	44,700	6,365	2,920	4,408	188,000	370	1,400	2,490	140,910	2,720	14,920	2,680	390	36,395	449,908
value £	930	33,525	4,774	2,190	3,305	141,000	278	1,050	1,868	105,683	2,040	11,190	2,010	293	27,296	337,435
% of total value	1.7	8.	10.5	1.8	6.2	15.8	26.8	10.8	8.6	9.	2.	8.8	15.8	4.2	6.6	9.7
<b>PEACHES</b>																
bushels	975	91,000	8,400	900	13,000	191,300		1,300		46,020	7,000	4,200	800		78,100	442,995
value £	731	68,250	6,300	675	9,750	143,475		975		34,515	5,250	3,150	600		58,575	332,246
% of total value	1.3	16.4	13.9	0.5	18.2	16.1		4.2		2.9	5.2	2.5	4.7		14.2	9.6
<b>PLUMS</b>																
bushels	630	37,950	4,100	450	4,600	34,200	160	320		10,520	1,450	7,000	650	500	33,000	135,530
value £	378	22,770	2,460	270	2,760	20,520	96	192		6,312	870	4,200	390	300	19,800	81,318
% of total value	0.7	5.5	5.4	0.2	5.1	2.3	9.2	1.8		.5	.8	3.3	3.	4.3	4.7	2.3
<b>NECTARINES</b>																
bushels	50	550	50	400	1,500	16,100	20	100		1,250	600	1,000	120		16,500	38,240
value £	50	550	50	400	1,500	16,100	20	100		1,250	600	1,000	120		16,500	38,240
% of total value				0.3	2.8	1.8	2.	.9		.1	.6	.8	.9		4.	1.1
<b>APRICOTS</b>																
bushels			1,030		500	4,200				320	700	6,400	1,000		154,800	168,950
value £			1,030		500	4,200				320	700	6,400	1,000		154,800	168,950
% of total value			2.2		0.9	.5					.7	5.	7.8		37.4	4.9
<b>CHERRIES</b>																
bushels						1,100				700	2,700	1,600	250		10,800	17,150
value £						2,200				1,400	5,400	3,200	500		21,600	34,300
% of total value						.2				.1	5.4	2.5	3.9		5.2	1.0
<b>CITRUS</b>																
bushels	50,204	91,760		121,810	12,400											276,174
value £	33,250	54,330		70,254	7,880											165,714
% of total value	60.8	13.1		56.9	14.7											4.8
<b>SUB-TROPICAL</b>																
in tons	263	160		678	11											1,112
value £	16,596	9,851		43,702	906											71,055
% of total value	30.3	2.3		35.3	1.7											2.1
TOTAL	51,665	414,411	45,192	123,544	53,460	389,770	1,039	10,552	21,826	1,178,863	100,038	126,190	12,758	6,833	413,739	3,453,180



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### PERCENTAGE OF DOMINION PRODUCTION BY DISTRICTS

[illegible]

## APPENDIX III

STATEMENT OF COMMERCIAL ORCHARD LAND BY DISTRICTS, 1955

	Acreage	Holdings
Kerikeri	928	130
Auckland	2,314	419
Hamilton	126	45
Bay of Plenty	924	162
Gisborne	329	59
Hawke's Bay	3,076	360
New Plymouth	7	3
Palmerston North	101	26
Wellington	131	12
Helson	3,890	297
Blenheim	446	34
Christchurch	850	117
Timaru	209	25
Dunedin	54	12
Central Otago	2,848	301
TOTAL:	15,473	2,032



# APPENDIX V

## NUMBER OF SCREEN FROSTS RECORDED \*

Month	Kerikeri	Auckland	Tauranga	Gisborne	Hastings	Blenheim	Nelson	Christchurch	Alexandra	Roxburgh
Jan.										
Feb.										
Mar.						0.2			0.3	0.4
Apr.			0.1	0.1	0.4	0.8	0.1	0.7	0.3	2.0
May			0.7	0.4	3.6	5.6	0.4	3.7	13.4	5.4
Jun.	0.4		2.2	2.7	7.7	12.7	3.5	9.7	20.9	12.2
Jul.	0.6		3.2	2.5	9.5	13.9	5.2	10.9	24.1	16.2
Aug.	0.4		1.8	1.2	5.9	9.4	2.8	8.3	17.4	9.4
Sep.	0.3		0.6	0.1	3.8	3.5	0.6	2.4	7.5	5.3
Oct.	0.3		0.1	0.1	0.7	1.5	0.1	0.4	1.7	0.8
Nov.					0.1	0.4		0.1	0.2	
Dec.						0.1				
TOTAL	1.7		8.7	7.3	31.7	48.1	12.7	36.2	85.8	51.7
Av. date of 1st screen frost	28 July		15 June	11 June	10 May	27 April	7 June	28 April	20 April	-
Av. date of last screen frost	23 Aug.		16 Aug.	24 Aug.	28 Sep.	13 Oct.	26 Aug.	3 Oct.	23 Oct.	-

\* Screen frost is when temperature at 4 feet above ground falls below 31.9°F. (N.Z. Met. Service).

# APPENDIX VI

## NUMBER OF GALES RECORDED \*

Month	Kerikeri	Auckland	Whenuapai	Tauranga	Gisborne	Napier	Hastings	Nelson	Blenheim	Christchurch	Alexandra	Roxburgh
Jan.		1.0		0.3	0.5	0.6	0.2	0.2	0.3	1.3	0.4	0.4
Feb.	0.1	0.6	0.2	0.3	0.2	0.5	0.2	0.1	0.3	1.2	0.1	0.2
Mar.		0.8		0.5		0.2		0.1	0.3	0.8	0.1	0.2
Apr.		0.6		0.3	0.1	0.1	0.1	0.1	0.1	0.8		0.2
May	0.3	1.1		0.3	0.3	0.2	0.1			1.1	0.1	
Jun.		1.1	0.2	0.3			0.1	0.1	0.1	0.8	0.04	0.6
Jul.	0.1	1.2		0.2	0.1	0.3	0.1	0.1		0.5		
Aug.	0.1	1.2		0.5		0.6	0.1	0.2	0.2	0.9	0.1	0.2
Sep.		1.5		0.4	0.1	0.4	0.1	0.1	0.1	1.4	0.04	0.3
Oct.		1.1		0.6	0.1	0.5	0.1	0.1	0.4	1.7	0.2	0.2
Nov.		1.0		0.3		0.2	0.2	0.2	0.1	1.7	0.2	
Dec.	0.2	0.7		0.2	0.1	0.2	0.2	0.1	0.2	1.5	0.04	0.3
TOTAL FOR YEAR	0.8	11.9	0.4	4.2	1.5	3.8	1.5	1.4	2.1	13.7	0.8	2.4

\* A gale is recorded when the wind speed exceeds 40 m.p.h. (N.Z. Met. Service).

APPENDIX VIIPERSONS EMPLOYED IN FRUIT AND VEGETABLE PROCESSING

(at March 1, 1956.)\*

	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Units</u>
Auckland	294	235	529	15
Gisborne	64	57	121	1
Hawke's Bay	317	400	717	3
Wanganui	8	7	15	1
Palmerston North	6	3	9	1
Wellington	21	14	35	4
Nelson	162	91	253	6
Westport	4	10	14	1
Christchurch	168	174	342	6
Taunaru	5	6	11	1
Dunedin	81	90	171	5

\* These figures include quick freezing and sauce and pickle manufacturing.

(Dept. Labour and Employment, Wellington.)

# APPENDIX VIII

## SCIENTIFIC NAMES

Apple:	<u>Pyrus malus</u>
Apricot:	<u>Armeniaca vulgaris</u>
Cherry:	<u>Cerasus</u> spp.
Chinese gooseberry:	<u>Actinidia chinensis.</u>
Feijoa:	<u>Feijoa sellowiana</u>
Lemon:	<u>Citrus limonia</u>
Nectarine:	<u>Prunus persica</u>
Orange (sweet):	<u>Citrus aurantium</u>
Passionfruit:	<u>Passiflora edulis</u>
Peach:	<u>Prunus persica</u>
Pear:	<u>Pyrus communis</u>
Plum:	<u>Prunus communis</u>
Quince:	<u>Cydonia vulgaris</u>
Tree tomato:	<u>Cyphomandra betaceae</u>
 <u>Disease and Insects:</u>	
Black spot:	<u>Ventura inequalis</u>
Brown rot:	<u>Schlerotinia fructicola</u>
Codling moth:	<u>Cydia pomonella</u>
Leaf-roller caterpillar:	<u>Tortrix postvittana</u>
Phylloxera:	<u>Phylloxera vastatrix</u>
Powdery mildew:	<u>Podospheera leuhotricha</u>
Red mite:	<u>Paratetranychus pilosus</u>
Silver leaf:	<u>Stereum purpureum</u>

# APPENDIX IX

## NOTES ON MAPS.

### Figure:

- 1 and 2: Based on unpublished statistics supplied by the Horticultural Division, Department of Agriculture, Wellington.
- 3,6,9,10: Based on unpublished statistics supplied by the Horticultural Division, Wellington. They represent average production for the six seasons 1949-55 inclusive.
- 4,5,7,8: Based on the Official Survey of the Fruitgrowing Industry of New Zealand, J.H. Watt, Wellington, 1956.
- 11: Statistics for this map were calculated by multiplying production by average price per bushel or ton. The following were the average prices used:

Apples	at 15/- per bushel.
Pears	" 15/- " "
Peaches	" 15/- " "
Plums	" 12/- " "
Nectarines	" 20/- " "
Apricots	" 20/- " "
Cherries	" 40/- " "
Lemons	" 10/- " "
Grapefruit	" 12/6 " "
Sweet oranges	" 20/- " "
Tree tomatoes	" £50 " ton
Chinese gooseberries	" £112 " "
Passionfruit	" £83 " "
Feijoas	" £82 " "

Average prices for stone fruit were calculated by A.T.J. Watts, Stone Fruit Specialist, Department of Agriculture, Christchurch.

Figure:

- 13,17,21,  
23,25,27: Based on field work completed in 1956. Maps showing the generalized distribution of orchard holdings were available for Nelson, Hawke's Bay and Central Otago. These were used to indicate holdings not visited.
- 14: Landform categories were calculated within 1,000 yard squares.
- 19: Statistics supplied by T. Conway, Senior Horticultural Instructor, Hastings.
- 29: Statistics published in Statistics of the Dominion of New Zealand, Wellington.
- 30: Statistics published in the Append. Journ. House of Representatives (H 29), Wellington, 1919, pp. 29.
- 31: Computed from M.A. Taylor, Climates of New Zealand Pastures, Unpublished M.A. thesis, University of New Zealand, 1954, Appendix II.
- 32: Based on C.F. Seeley, Notes on Dew-Point Temperatures in New Zealand, N.Z. Meteorological Office, Series A, No. 10.
- 33: Based on statistics and reports provided by the N.Z. Meteorological Service, Wellington.
- 34: Based on J.F. Gaibtes, The Distribution of Insolation over New Zealand. N.Z. Meteorological Service Circular Note, No. 81.
- 35,37: Statistics supplied by Apple and Pear Marketing Board, Wellington.
- 36: Statistics supplied by Department of Census and Statistics, Wellington.

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