

1949
NEW ZEALAND

ROYAL COMMISSION
TO INQUIRE INTO AND REPORT UPON THE
SHEEP-FARMING INDUSTRY
IN NEW ZEALAND

(REPORT, MARCH, 1949)

*Presented to Both Houses of the General Assembly by Command of
His Excellency*

To His Excellency the Governor-General of New Zealand.

MAY IT PLEASE YOUR EXCELLENCY—

Your Excellency's Warrant of the 6th August, 1947, appointed us to be a Commission to study the sheep industry, and Your Excellency's Warrants of the 25th February, 1948, and the 4th August, 1948, extended the time within which we were to report to the 31st March, 1949. On the 5th April, 1948, and on the 2nd June, 1948, we presented interim reports. In respectful obedience to Your Excellency's command, we now present our final report.

When we assembled to consider the matters referred to us, and after hearing preliminary submissions on procedure, it became apparent to us that there was a considerable division of opinion even among experts on many of the questions raised. Moreover, this conflict of opinion extended not only to deductions and opinion derived from the established facts, but also to the very nature of those facts themselves. There was therefore no unchallenged premises of fact from which we could proceed to make deductions, and from which we could formulate conclusions and proposals.

Our first consideration therefore had to be to establish the facts. We could only do this by a comprehensive and exhaustive study at first hand of the sheep-farming lands of New Zealand. To this end we have travelled some 44,000 miles throughout the country, mainly through the remote and problem areas. We have held 130 sittings in seventy-seven different places. We have received formal evidence from 649 witnesses. In addition, we have examined orally, mostly on their own farms, or have met in informal discussions, a further 1,420 persons, making a total of 2,069 witnesses, of whom 2,027 were sheep-farmers. Wherever we have travelled we have examined the pastures which clothe the land, and, if necessary, we have seen the stock to judge its condition.

We do not think we could have presented to Your Excellency a report worth considering without making this study. In our travels we have not been content merely to receive evidence at formal sittings. We have met the farmers in their country centres. We have met them, their wives, and their workers in their village halls and their wool-sheds. We have travelled the back-country roads and beyond to the last homestead on the fringe of civilization to meet the settler and his family, in order to appreciate adequately the conditions under which they live and work. And having so widely travelled, we must commend to Your Excellency's sympathetic consideration amelioration of the conditions under which some hard-working men and women of sterling qualities struggle to live in the back country. Theirs has been a hard life of endeavour against mounting odds with only dwindling resources to carry on. In many a case hope has receded and given place to despair, resulting in the abandonment of property.

We earnestly pray Your Excellency that this position will not be permitted to continue. We consider it is not the wish of the people of New Zealand that men and women should work under such hard conditions. Our country needs the production from the back country. Let not the brilliance of the sheep industry's progress and prosperity on first-class lands dim our vision of the hardship in remote areas. Let us set our hearts to the task of bringing the cheering warmth of a new hope to these back-country people. With that hope, let us send to them the comforts of a modern life—education, electricity, access to doctor and nurse, those important things which mean more than a world to the mother of a family in the back country.

The sheep industry is progressive. It is an indispensable part of our national welfare. Most sheep-farmers are prosperous to-day, but many back-country farmers still face hardships. We respectfully ask that Your Excellency's Legislature and Government will act to remove these hardships.

If our recommendations can be implemented, the result should be an increase in meat-production, which is most needed if New Zealand is to fulfil its contracts with the United Kingdom. So great is the need for meat there that a united national effort must be made to increase production here.

In all our work we are deeply indebted to many for acts of assistance, courtesy, and of kindness. To the farmers and their wives throughout New Zealand who have received us with warm hospitality, we extend our grateful thanks. We have appreciated particularly the full and valuable assistance of the Ministers of Agriculture and of Lands and their officers. We have had the co-operation of the other State Departments and of the statutory Boards. To all who have assisted we express appreciation.

To Mr. L. W. Woods, our Economist Secretary, has fallen the heavy duty of organizing our extensive tour of New Zealand. It has been a gigantic task, which he has carried out with great skill and ability. His services in collating the vast amount of evidence and assisting in the production of our report have been of a very high order, and members of the Commission accord him their very sincere thanks.

We also convey our keen appreciation of the services of Mr. J. M. Macdonald, of the Department of Lands and Survey; Mr. S. H. Saxby and Mr. J. E. Duncan, both of the Department of Agriculture, who were seconded to us as Technical Associates and who have ably assisted us in their respective subjects.

We would like to record our appreciation of the work of the clerical staff which has assisted us. The evidence has been most capably recorded. This was in the hands of Mr. and Mrs. A. B. Conway and Mr. W. S. Saville during the early part of 1948, and later of Miss M. Trimble, Miss H. Cooper, and Miss S. Child. All of these reporters have rendered invaluable assistance. We would particularly commend the work of Miss Trimble, who has supervised the typing and lay-out of our final report in a most creditable manner. The paragraphing, checking, and indexing is the work of our Assistant Secretary, Mr. A. A. Ross. The farming maps are the work of Mr. M. W. Averis, of the Department of Agriculture, while the maps of sheep industry wards and Rabbit Board areas were drawn by the Head Office staff of the Department of Lands and Survey. We would also record the splendid assistance of our drivers, all officers of the Post and Telegraph Department, who have throughout shown outstanding driving skill in negotiating the difficult country we have had to traverse. Our many requirements while travelling were attended to by our clerk, Mr. N. T. Weeks, whose pleasing courtesy and attention has made our task much lighter.

This is the unanimous report of Your Excellency's Commission.

Whereunto we have set our hand :—

RONALD HUGH WHITE, Chairman.
 RICHARD EDDY, Member.
 LINTON CHARRINGTON GARDINER, Member.
 WALLACE FLETCHER METCALFE, Member.
 WILLIS ALAN SCAIFE, Member.
 HAROLD WILFRED YOUREN, Member.

Signed at Wellington, this 31st day of March, 1949.

LLOYD WILFRED WOODS,
 Economist Secretary to the Commission.

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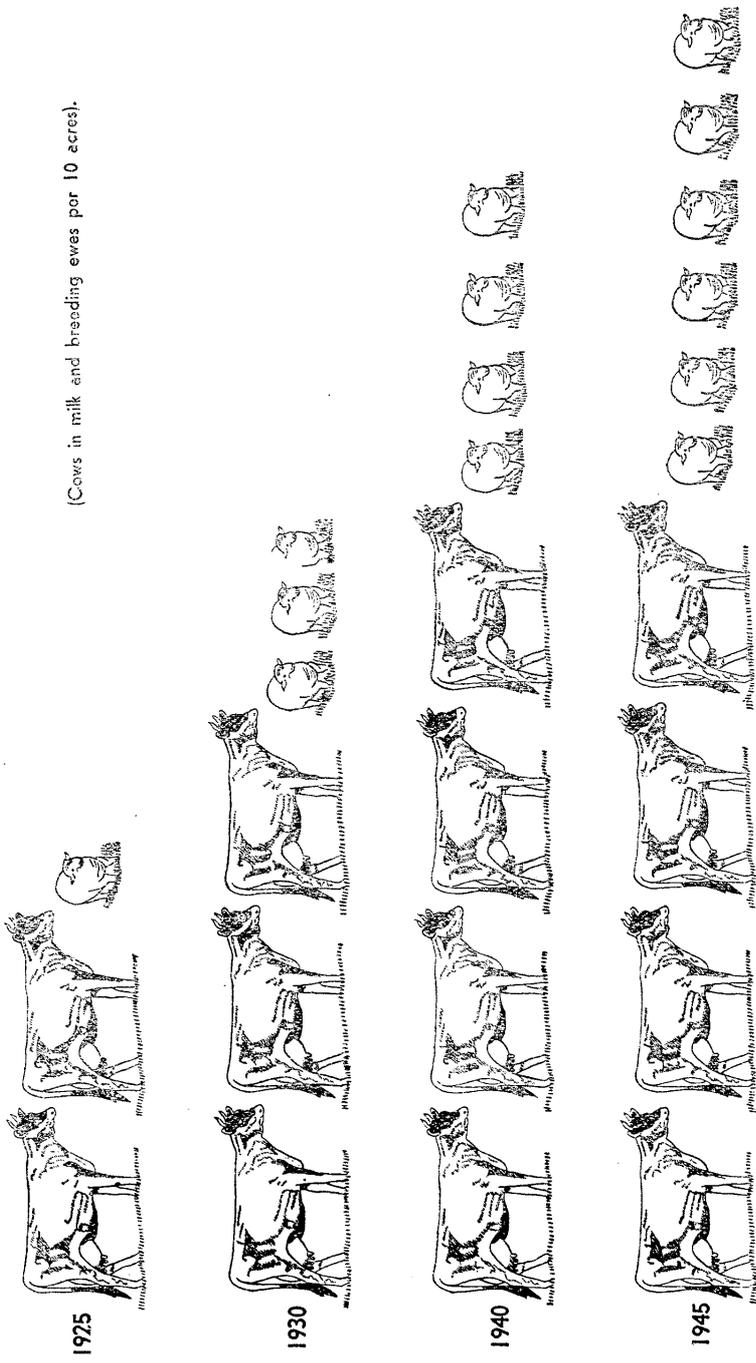
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Increase in Carrying Capacity of Sown Grass Areas—Waikato Region

(Cows in milk and breeding ewes per 10 acres).



PART ONE—INTRODUCTION

I. IMPORTANCE OF SHEEP-FARMING

1. IMPORTANCE OF FARMING TO NATIONAL WELFARE

New Zealand is a farming country. It is from the proceeds of selling overseas the produce of our farms that we have obtained the money to buy steel to lay our railways, to buy machinery to make our roads, and to acquire cars, lorries, buses, carriages, and wagons to provide transport. It is with the proceeds of our farm-produce that we have bought merchandise to stock our many shops. It is to load that farm-produce that overseas ships come to our ports, providing work in many trades for drivers of trucks and for waterside workers. In fact, it is veritably from her farms that New Zealand lives.

This is the basis of all our life. We consider that this is the principle that must underlie our every step. It should be taught to our children in the schools. It should be understood by all our people. It should be given consideration in every Act of your Legislature and in every provision of your Government. So surely as her farming declines, so declines New Zealand.

This does not say that farming is the only occupation of importance in New Zealand. All our people contribute to our national wealth—each according to his chosen task. Transport, housing, education, shops, workers to make and mend streets, all these contribute to welfare no less than the farmer whose products are sold overseas. But it does say that in our land is our heritage. The condition in which we are to leave our land to-day has an all important bearing on our national welfare to-morrow. High levels of farm production do not necessarily mean good maintenance of the land. In reaping the rewards of farming production we must be careful to put enough back into the land to maintain and improve our asset.

2. IMPORTANCE OF THE SHEEP INDUSTRY

The sheep industry contributes about 60 per cent. of our farming production. It is therefore our leading industry. That does not mean its interests should be allowed to impair the interests of any other industry. It does mean, however, that the interests of no industry whatever should be allowed to impair unreasonably the interests of the sheep industry.

We feel confident that, given the encouragement and the opportunity, our sheep-farmers can maintain the standard of our sheep-farming equal to, if not better than, those in any other part of the world. But as an over-all policy there must be an encouragement of good farming—rewards to the efficient farmer who gets the best out of his land while maintaining and improving its condition—penalties for the bad farmer who, when given every opportunity, lets his land deteriorate. This should be the guiding principle of all land policy.

II. STRUCTURE OF THE SHEEP INDUSTRY

1. GROUPS OF THE INDUSTRY

The sheep industry can be divided roughly into three principal sections:—

(i) *The Fine-wool Producer*, whose flocks of Merino, Corriedale, and half-bred sheep roam over very extensive pastures usually consisting of natural tussock grasslands, or danthonia or brown-top dominant swards. The carrying-capacity is usually less than one-third sheep (that is, one sheep to three acres). Both ewes and wethers are run, almost all the lambs being kept to maintain the flock. The product available for sale is almost exclusively wool of a fineness generally ranging from 56 to 64 count, and is produced mainly in the high country of the South Island.

(ii) *The Store Breeder*, whose flocks of Romney, Corriedale, halfbred, or crossbred sheep are carried on semi-improved pastures of danthonia or brown-top with a varying infusion of cocksfoot, timothy, dogstail, rye-grass, and some clover. Carrying-capacity varies from a half-sheep (that is, one sheep to two acres) up to one and a half sheep to the acre or more, depending on the winter feed position. Beef cattle are also carried to eat the surplus growth and to improve and consolidate pastures. Ewe lambs are reared, but wether lambs are either fattened for sale or sold in store condition (that is, for fattening on better country). Five-year-old ewes are culled and sold to the meat-producer to provide his breeding-flock. The products available for sale are (a) wool of 44 count for Romney and up to 58 for Corriedale and halfbred, (b) either fat or store wether lambs, (c) five-year-old breeding-ewes, (d) store or fat cattle.

(iii) *The Meat-producer*, whose flocks almost exclusively of Romney or crossbred ewes in the North Island, or of Romney, halfbred, crossbred, or Corriedale ewes in the South Island, are of breeding-ewes mated to good-lamb-producing rams such as the Southdown, Border Leicester, or Cheviot. They are depastured on improved grasslands mainly of rye-grass and clovers. All lambs are fattened for sale. The meat-producer usually buys five-year ewes from the breeder, takes two-year lambs from them, and sells them fat to the freezing-works. Carrying-capacity varies, but it is usually better than two sheep to the acre. Products available for sale are (a) wool of fineness count 44 for Romney and up to 58 for Corriedale, (b) fat lambs, (c) fat ewes, (d) fat cattle.

(iv) *Inter-dependence of Groups*: It must be appreciated that these are not watertight divisions, and that there are many farms which border between these divisions in varying degrees. The fine-wool producer who runs Merinos seldom has surplus ewes for sale, but those who run halfbreds or Corriedales have some surplus five-year ewes for sale, depending on the location of the property. Similarly, there are "in-between" grades between the store breeder and meat-producer. There is the breeder who fattens some of his Romney wether lambs, and there is the meat-producer who breeds some of his own flock. Although not precise, however, the above definitions are generally well related to the division of interests in the industry.

The important point is that, except for the fine-wool producer who runs Merinos, those three types of sheep-farmers do not exist independent of each other. Many a meat-producer loudly protests at any suggestion that he should shoulder some responsibility for the problems of the store breeder. The more far-seeing meat-producers think otherwise. They realize that the whole future stability of meat-production is bound up with the production of breeding stock on the hills. If a steady supply of breeding-ewes is not available, the meat-producer must breed his own ewes, the result being a reduction of up to 25 per cent. in his production of meat. The problems of any one section, therefore, are the problems of the whole industry, and their solution will allow all sheep-farmers to share the benefit. Map No. 1 shows the estimated movements of sheep from the breeding areas to the meat-producing areas of the North Island.

2. FACTORS IN SHEEP-FARMING

(i) BREEDS OF SHEEP USED

Before proceeding further in a description of the industry, it is advisable, perhaps, to say something of the sheep used. The breeds of sheep commonly used in New Zealand are as follows:—

Breed.	Country.	Average Wool Count.	Approximate Pleece Weight.	Lamb, Per Cent.	Products.
Merino ..	Tussock grasslands, high country	60-64	lb. 7-8	50-70	Fine wool only.
Halfbred ..	Tussock grasslands, danthonia and brown-top country	54-58	8	70-80	Fine wool. Crossed with Southdown produces "Canterbury" lamb.
Corriedale	Tussock grasslands, danthonia and brown-top country	54-58	8	70-80	Fine wool. Crossed with Southdown produces "Canterbury" lamb.
Romney ..	Improved pastures in both Islands	44-48	10	80-120	Crossbred wool. Excellent mother for fat-lamb production.
Crossbred	More than 70 per cent. of our sheep fall in this category. The term has a special meaning in New Zealand—the sheep being really "grade" Romneys	40-50	10	90-110	Crossbred wool. Excellent mother for fat-lamb production.
Cheviot/ Romney Cross	Will thrive under conditions too hard for the Romney. Being used as a cross with this breed	50	8	110-120	Dual-purpose sheep (wool and meat).
Southdown (kept entirely for stud purposes)	Improved pastures	50-58	4	90-100	Fine down wool. Rams used to cross with Romney for fat-lamb production.

(ii) PASTURES

Having described the sheep, some reference is necessary to the grasses and clovers which form the pastures on which the sheep graze. The principal pasture constituents are :—

Plant.	Soil Fertility Required.	Nutritive Value.	Remarks.
Tussock and associated native grasses	Low ..	Low ..	Tussock itself not very palatable, but other grasses associated with it provide feed.
Brown-top	Low ..	Low ..	Forms a dense mat, but carrying-capacity low. Satisfactory under suitable conditions.
Danthonia	Low ..	Medium	Resists drought well and does not require top-dressing to thrive.
Italian rye-grass ..	} High	High ..	A short-rotation grass of first quality.
Short rotation rye-grass (H1)			
Perennial rye-grass ..	High ..	High ..	The best permanent pasture-grass. Needs top-dressing on most soils.
Cocksfoot	Medium	High ..	A very useful grass.
White clover	High ..	High ..	Needs top-dressing.
Subterranean clover ..	High ..	High ..	Needs top-dressing. Does well in dry climates.
<i>Lotus major</i> (clover) ..	Low ..	High ..	Does not require top-dressing. Needs a rainfall of 40 in. or more.
Montgomery and red clovers	Medium	High ..	Particularly valuable for development of pumice land.

(iii) SOILS

The nature of the soil determines to a large extent which of these grasses a farmer will be able to include in his pastures. It is impossible in a brief outline to give any adequate description of the individual soil types. The main classifications are of recent soils, loams, clays, podzols and skeletal soils. The recent soils are mainly soils deposited by rivers and streams, and are generally very fertile. The loams are good soils, but usually need top-dressing. The clays frequently require much drainage as well as top-dressing. The podzols can be either very good or very poor, according to the degree of maturity, while the skeletal soils are mainly poor. But in each main classification there are so many variations that soil can only be judged as a farming factor according to the individual farm or, as Dr. Grange has classified them for us, by their development qualities for farming under Part Three (II, Deterioration) of our report.

(iv) FERTILITY

Fertility is a highly-important factor. The chief fertility factor in soil is the quantity of nitrogen available for plant-growth. Raising fertility means increasing plant-growth, and this is achieved by increasing the supply of nitrogen. But nitrogen is rapidly soluble and does not remain available in the soil for long periods. It can be applied as a manure, but, as such, it is very expensive, costing up to £30 a ton. Nitrogen is, however, extracted from the air by clovers and stored in many small nodules on their roots. Thus growing clovers in a pasture is a good way of ensuring a continuous nitrogen supply. Most New Zealand soils, however, are too

deficient in phosphates to permit the growth of clovers on the necessary scale, so the land needs to be manured with a top-dressing of superphosphate which costs at present £8 11s. a ton in paper bags at the works. The phosphate enables the clover to grow, the clover puts nitrogen into the soil, and the nitrogen increases grass-growth and permits the use of highly-nutritive grasses. This is the general fertility cycle of New Zealand pastures.

(v) RAINFALL

Fertility is not the only factor which affects pasture-growth. Rainfall has a tremendous influence. Maps 2 (i) and (ii) show rainfall conditions. Areas marked in black have a very heavy rainfall, which makes sheep-farming difficult; areas in lines have a heavy rainfall, which brings problems of second growth, and require cattle to consume surplus growth. The area in dots has an ideal rainfall for the sheep industry, while the clear area has a low rainfall with associated problems—unless, of course, it is irrigated, in which case it is artificially brought into a higher rainfall group.

(vi) CLIMATE AND CONTOUR

The other basic influences to be discussed here are those of contour and climate. Some parts of New Zealand which are steep and precipitous are of little or no farming value. But by far the greater part of the country varies from flat plains to hills suitable for grazing animals as shown in map 3. The whole country lies in temperate latitudes, and both in the far north and in the far south there are suitable conditions for sheep-farming. Above the height of approximately 2,000 ft. cold restricts the winter growth of grass in both Islands, and good farming conditions are limited generally to land below 2,000 ft. altitude. Again, most of New Zealand lies in the suitable zone.

Climatic conditions vary from farm to farm even in the same district. Country which slopes into the sun—that is, to the north-west—is better than south-facing country. Country which is sheltered from the prevailing wind is better than exposed country. Absence of liability for heavy snow is a factor. In addition to these farm-to-farm variations, there are certain major differences which enable us to discern different types of sheep-farming—or what we might term “sheep-farming regions.” Since the problems of the industry are mainly regional in character we shall set out the principal characteristics of these regions as stated by the Department of Agriculture:—

3. SHEEP-FARMING REGIONS

(i) NORTH ISLAND REGIONS

(a) *Northland*

This region, the area north of Auckland City, extends northwards from what has been termed the “kauri line,” which marks the southern boundary of the natural kauri forests. Apart from the importance of paspalum as a pasture-plant and the citrus orchards at Keri Keri and Tauranga, the sub-tropical nature of the North Auckland climate is little apparent from its farming, and it is a mixed dairying and sheep-farming area.

The long, narrow North Auckland Peninsula extends in a north-westerly direction from Auckland City and is 200 miles long, with a maximum width of 60 miles. The land surface consists of scattered fragments of mountain ranges composed mainly of greywacke and basic volcanic rocks, joined together by hills and rolling downs of claystone, sandstone, and limestone.

Here and there, as plateaux on the downs country, are basaltic lava flows on which are scattered low, steep-sided scoria cones, while in the far north and on the west coast are large areas of consolidated sand. Numerous coastal indentations and waterways, bounded by areas of alluvial and marine flats, intersect the rolling downs country. Most of the land is less than 500 ft. or 600 ft. above sea-level, a few areas being above 1,000 ft. The Soil Survey Division of the Department of Scientific and Industrial Research has subdivided the 5,200 square miles of the surveyed peninsula into 500 square miles of flats, 2,100 square miles of easy and rolling country, 2,000 square miles of moderately steep hill country, and 600 square miles of steep hill country.

The climate of North Auckland is warm and temperate, and the prevailing winds are westerly. The mean annual rainfall varies between 40 in. and 70 in. Because of the strong westerly winds, the high rainfall, and the heavy nature of the majority of the soils, the spring pasture growth is normally later than it is in the South Auckland and Waikato districts.

The landscape appearance of the region is one of great diversity. Within short distances on alluvial flats and rolling downs pasture lands alternate with unimproved manuka heaths. On the higher hills and mountains pastures, forests, fern, and manuka form a similar complex pattern of improved, unimproved, and reverted land.

Dairying is the most important industry, and is centred on the flat alluvial land and the lower hills in the numerous river valleys, and on the basic volcanic plateaux which are scattered through the region. Intensive fat-lamb production is also practised on these areas, except on the heavier and wetter alluvial flats, which are used almost exclusively for dairying and cattle fattening. The more extensive types of sheep-farming are confined to the surface-sown hills. With its closely associated areas of hill and flat the region is self-contained in its live-stock economy, and there is little inward or outward movement of store or breeding stock.

Paspalum pastures are the most characteristic feature of the region, and, whilst special-purpose paspalum pastures occur further south, it is only in this region that paspalum assumes real importance. Paspalum is a tropical grass, and for vigorous growth it demands soils of high fertility and the absence of heavy winter frosts. It was first sown on the rich alluvial river flats, where it gained almost complete dominance owing to its resistance to winter flooding, but its use has since extended to poorer soils where, although its production is not high, it forms a close permanent sward. Paspalum pastures do not start to make vigorous growth until November, but production is high through the summer and early autumn, and the seasonal production of paspalum is reflected in dairy production by the lateness of the spring growth. Also owing to the vigorous summer and early autumn production, the rank feed which is in excess of the dairy herds' requirements is often left *in situ* to carry the cows through the early part of the winter, so that the area saved for hay per cow is less in this region than in other dairying districts.

Soil type has been an important factor in influencing the development of farming lands. The early settlers were attracted to the more fertile areas covered in puriri and taraire bush on the basic volcanic and limestone soils; later arrivals developed the mixed bush lands on the alluvial flats and higher hills and mountains, but avoided the large areas of rolling downs in manuka scrub on the poor gumland and ironstone soil areas. The gumlands originally carried kauri forests, and the land was dug over

for gum during the last two decades of the nineteenth and the first two decades of the twentieth century. The gum-diggers left the land in a much worse condition than it was originally: they repeatedly burnt off the surface covering and left the country in a very broken condition. The soils, mature podzols, are acid and of low fertility, and were long neglected for farming. Recent development work has shown that satisfactory dairying pastures can be established, provided the land is thoroughly cultivated, and certified grass and clover seeds are applied with adequate lime and phosphates. The present tendency in land development is to restrict work to the easier ploughable or "tractor" country, and the grassing of the gumland soils is likely to receive increasing attention in future years. Unfortunately, large areas are not well watered, and special water-supply schemes will be a necessary prerequisite to pasture development in order to provide drinking-water for live-stock.

In addition to these scrub-land areas, which are capable of early development, there are other scrub areas which are more intractable, and the ironstone soils and sandy gumlands with an intricate pan formation are likely to remain in an unimproved state for many years to come.

The emphasis which has just been given to the manuka heaths and paspalum pastures should not be allowed to obscure the high farming development which occurs on the more fertile soil areas. Farms on the basic volcanic plateaux, backed by steep-sided scoria cones, with fields of rye-grass pastures, divided by neat stone walls and protected with groves of handsome puriri and taraire trees, present as charming a landscape and as favourable an example of efficient grassland farming as can be found in most parts of the Dominion.

Evidence before us showed that there are 250,000 acres of developable land in the far north, but as the greatest proportion of this is future dairying land it is beyond the scope of the sheep industry. The problems of the North are largely in the development of its gumlands soils.

(b) *South Auckland* (Manukau, Franklin, and Raglan Counties)

Sheep-farming practices are rather different in each county, but it is not possible to fit them into any other region. Breeding-ewes account for 391,000 of the increase of 530,000 in sheep numbers in the region since 1925. Most of this is in Raglan, where ewes were more than three times as many in 1945 as in 1925. In this county the expansion of sheep numbers has taken place in spite of the deterioration of steeper and wetter hill country towards the southern end, this being offset by the improvement of the easier limestone and volcanic areas and the development of the scrub country in the northern half of the county. Here top-dressing and the improvement of ploughable land continue to raise carrying-capacity, and most of the fat-lamb production, requiring a third of the ewes of the county, is in this portion. Surplus cull and cast-for-age ewes from Raglan are readily absorbed by Waikato fat-lamb producers.

Manukau County includes the islands in the Hauraki Gulf. Here and in the eastern hills pasture deterioration of bush-burn sowings is evident, especially on danthonia country, but this decline in carrying-capacity has been overtaken by the improvement of ploughable valleys. Franklin County is predominantly a dairying district, but fat-lamb farming has expanded on the easier parts of the eastern foothills and in the Karaka

and Western Coastal belt. Town milk-supply and fattening stock for the metropolitan markets are prominent features in these two counties in which the number of breeding-ewes is less than half the breeding-ewes in Raglan.

(c) *The Waikato and Hauraki Plains* (Waikato, Waipa, Otorohanga, Piako, Matamata, and Hauraki Plains Counties)

The number of sheep has increased by 1,210,000 since 1925, and of these 790,000 are breeding-ewes. Most of this remarkable increase is recorded after 1935, and from that year dairy-cow numbers changed very little. Improved carrying-capacity through the use of top-dressing (illustrated in Fig. 1), the development of second-class scrub country, the necessity to run sheep because of the ragwort menace on dairy-farms, and the use of cobalt in bush-sick areas are the principal reasons for the increase in sheep. Southdown rams are used on most of the additional ewes, but the use of the Romney ram has gained popularity recently for fat-lamb production. There are a few farmers who have changed from dairy cows to sheep in recent years, but this accounts for only a fraction of the gain in sheep. Dairy-farmers are holding their cow numbers to the limit of existing labour and facilities and are taking up increased carrying-capacity with breeding ewes for fat-lamb production. At present more than three-quarters of the annual requirements for breeding-ewes for the Waikato come from outside the area, mainly from the East Coast districts and also from the King-country. With the improvement of pastures to the present high quality, the proportion of run cattle to sheep has declined steadily, and wethers have also declined for the same reason, reaching low levels by 1935.

(d) *Cape Colville* (Great Barrier, Coromandel, Thames, and Ohinemuri Counties)

Since 1925 the number of sheep increased by 57,000, and of these 33,000 are breeding-ewes. There is very little flat land in Barrier and Coromandel Counties, and these contain two-thirds of the sheep in the region, which are devoted almost exclusively to wool and store-sheep production. In these counties sheep numbers have remained about the same since 1930, though the quality of the stock is tending to decline. The soil is poor with little exception and the country steep, and farmers rely on the annual burning of danthonia to hold the pastures and check fern and scrub invasion. This is in part an alternative to running beef cattle, since it is difficult to winter cattle on only poor hill danthonia. In many cases there is a continued deterioration of fertility which is leading to ultimate reversion with little hope of revival, it being apparent that liming and top-dressing are unlikely to be payable. Dairying is increasing as settlers confine their operations to more workable country. Sheep in Thames and Ohinemuri Counties are associated with dairy-farming to a large extent, and dairying is the predominant interest. The highland part of the region has a small surplus of breeding-ewes and wethers, which is absorbed by the adjacent Waikato areas. Rather less than half the ewes in Thames and Ohinemuri are Southdown mated for fat-lamb production.

(e) *The Central Plateau* (Tauranga, Whakatane, Rotorua, and Taupo Counties)

The increase in the number of sheep in this region since 1925 was 314,000, including 215,000 ewes. Except for a limited area where the Tarawera and Ngaurahoe ash showers fell, the region is bush sick and sheep-farming was

severely handicapped until the application of limonite brought some success in the period 1930-35. Not until the introduction of cobaltized superphosphate in 1935 was real progress possible. This opened an era of development which gathered pace until halted by fertilizer and material shortages, since phosphatic top-dressing is essential to pumice-land farming, especially in the early stages. Tauranga County shows a most spectacular rise in sheep numbers which continued over war years because much of the area was already established in grass. Three-quarters of the ewes in this county are mated to Southdown rams for fat-lamb production. The State, through the Maori Affairs Department and the Department of Lands and Survey, is concerned with breaking in extensive tracts in this region, using wethers and run cattle drawn from East Coast districts in the process. A fairly high percentage is recorded compared with other districts, but wethers give way to ewes or dairy cows, and the necessity for run cattle diminishes as consolidation and pasture establishment is achieved. While much pumice land is capable of early development, questions of transport and roading arise. Partly for this reason, fat-lamb production is a lesser consideration at this stage in Rotorua and Taupo Counties, the emphasis being on the sale of wool and surplus Romney ewes.

(f) *The East Cape* (Opotiki, Matakaoa, Waiapu, Uawa, Waikohu, and Cook Counties)

This region records a decline of 73,000 ewes since 1925, but the picture is rather that the first four counties mentioned above declined up to 1935, while in Cook County numbers increased. The northern counties are in fairly high rainfall areas, and some of the country is poor as well as steep. Reversion accounts for most of the decline in sheep, and farms have been abandoned in Opotiki County. There is less reversion in the southern part of the region where rainfall is lower, but the substantial increase in ewes in Cook County arises mostly from the improvement of the Gisborne flats, where the bulk of the fat-lamb farming on the East Coast is found. Erosion is serious in this region because of the effect of heavy downpours on papa hill country, but overstocking with sheep has opened and deteriorated the pastures and aggravated erosion troubles. In the past ten or fifteen years settlers have taken some steps to arrest the deterioration by increasing beef cattle to the extent of about 65,000 head, and the introduction of subterranean clover is also helping. Probably the decline in sheep numbers has not quite reached its end. Wool and surplus ewes and wethers are the principal products, and of about 250,000 ewes and 100,000 wethers which leave the region every year the greater part goes to the Waikato area. The distance from suitable markets makes it unprofitable to quit store lambs so that a high proportion of surplus stock are sold as two-tooth ewes and wethers. Transport costs, fencing, access, and labour problems are foremost, and the question of top-dressing hill country has been deferred for these reasons, although the present small beginnings in top-dressing should lead to a wider appreciation of its value.

(g) *The Western Uplands* (Kawhia, Waitomo, Taumarunui, Ohura, Clifton, Whangamomona, Kaitieke, and Waimarino Counties)

This region covers the extended limits of what is loosely referred to as the King-country, and it comprises a deeply dissected area, mostly of marine origin, which slopes from the pumice plateau to the western coast. Total

sheep have increased by 750,000 since 1925, of which 500,000 are breeding-ewes. Much of the region is subject to heavy rainfall, and this with mild winters, causes pastures to revert easily to fern and manuka. The difficulty of checking this reversion increases on poor soils and on steep areas. Many mistakes were made in the original development of the district, and these have led to large-scale reversion and to the abandonment of holdings, and this has been hastened by economic and financial conditions. Bush sickness contributed to abandonment in Waitomo County. It has taken many years of experience to find what land is likely to be capable of being successfully farmed, and what methods are necessary to farm it. This process is continuing. It is now realized that the use of suitable permanent grass-seed mixtures and the introduction of clovers, particularly *Lotus major*, are the basis of pasture establishment, but in wet areas it is often difficult to secure a good bush burn, which is an essential preliminary after scrub-cutting. Holdings with little or no ploughable land are in difficulties because the wintering of stock becomes a problem, particularly of beef cattle, which are essential for fern-control, but which are not usually a source of profit on this class of country. With the close of the bush-felling period reversion reached a peak, with settlers retreating to the easier and more workable country, which has increased its carrying-capacity and offset the decline on other areas. In the past ten years there has been little further large-scale deterioration and reversion, but the aggregation of holdings into workable units, the appreciation of methods of pasture establishment, and the effective use of run cattle has begun a period of rehabilitation of reverted areas. This has been assisted by the use of cobalt in bush-sick areas. At the same time some districts are not yet regarded as capable of being economically developed or farmed. In recent years progress has been made with top-dressing hill-country areas, and this appears to be a solution for those areas of easy access.

(h) Taranaki

This includes the Counties of Taranaki, Inglewood, Egmont, Waimate West, Stratford, Eltham, and Hawera—that is, the coastal plain round Mount Egmont and the broken hilly fringe of the great central plateau. Sheep numbers have increased by 265,000 and breeding-ewes by 204,000. In 1945 about 40 per cent. of breeding-ewes were mated to Southdown rams. The plains have fertile sandy brown loam soils (which have been improved by phosphate and some potash top-dressing, excellent shelter-hedges, and rotational grazing). The back hill country, which was taken up in fairly small blocks about 1910, has deteriorated and been largely abandoned as a result of high rainfall, inadequate fencing and cattle management, and insufficient finance. This area comprises the eastern hill fringes of Inglewood, Stratford, and Eltham Counties. Its fate appears to have been sealed by the depression which occurred just when the settlers were struggling to adapt their methods to the peculiar local conditions and needed financial support. The nearer hill country has remained in a fairly good and prosperous condition through the aid of a little top-dressing and the extra income obtained from the use of dry dairy stock as the cattle beast, the animals being in calf and sold to dairy-farmers in the spring. The region shows a recent slight decrease of dairy-farming in favour of fat-lamb farming, but dairying remains the dominant feature of the region. Some combination of the two is occurring on the hills east of the main road with success and may be pushed back into the hinterland.

(i) *Hawkes Bay*

This region, the Counties of Wairoa, Hawkes Bay, Waipawa, Waipukurau, and Patangata, is a belt of rolling country stretching from the Ruahine Range of the Main Divide to the Wharaerata Ranges of the East Cape region. The area is one of good soil with warm summers and cold winters and an average but sufficient rainfall approaching 40 in. over most of the region, though tending to drought in January and February. The region is completely given over to fat-lamb production in the south-west, mainly so in the centre and south-east, and is rapidly swinging to fat-lamb production in the north. Wairoa County, with its steeper hills, presents more problems and difficulties than the rest of the region. Except in Wairoa County, reversion is absent. The introduction of subterranean clover in 1932 made possible a great improvement in the pastures of the south-western dry part of the region, and this, with the associated use of top-dressing, has greatly increased carrying-capacity. Where the rainfall is greater, white clover has been developed in the pastures with a similar effect. The increase of 1,220,000 breeding-ewes in twenty-five years since 1920 (of which 725,000 is since 1925) is the dominant feature of the region's development.

(j) *Rangitikei*

This is a block of country (the Counties of Patea, Waitotara, Wanganui, Rangitikei, Kiwitea, and Pohangina) bounded by the South Taranaki Bight to the west, the King-country and National Park to the north, and the Rangitikei River and the Ruahine Range to the south and east. The number of sheep has increased by 785,000, and breeding-ewes by 725,000. In 1945 about 35 per cent. of the ewe-flock were put to Southdown rams. The characteristic features of the region are its fertile coastal plain and rolling downs, its low-rainfall hill country (which includes the Taihape and Hunterville districts), its high-rainfall hill country (which includes a portion of the King-country) and its highland tussock plains round Waiouru. The high-rainfall hill country has largely reverted and been abandoned for similar reasons to that of the Taranaki region, but in a few cases where it is owned in conjunction with the lowland fat-lamb farms as a private source of breeding ewes it has been kept in good order. Arable farming on the low country has largely given way to fat-lamb farming; so, to a less extent, has dairying, a change in which ragwort has played a small part. The productivity of the low-rainfall hill country has greatly increased as a result of top-dressing and the provision of supplementary feed for cattle. These practices have been assisted by the presence of the Main Trunk railway, and by the fact that the Taihape district has a deep soil with a high lime content, much of which is ploughable. The Hunterville hill country shows signs of being over-stocked. The region has an exportable surplus of breeding-ewes. The fattening of Romney wether lambs is very common.

(k) *Manawatu*

This region comprises a mixed area of mostly very good farmable land lying between the first-class land of Rangitikei and Hawkes Bay regions, the second-class country of the south-east coast hills, and the hard, reverting country of the Hutt. This region includes the Counties of Dannevirke, Woodville, Pahiatua, Oroua, Manawatu, Kairanga, and Horowhenua. These counties have similar soils, topography, and rainfall. Of these counties, Dannevirke, on the south fringe of the Hawkes Bay region, is mainly good intensive sheep land, as is Oroua and

the northern part of Manawatu County on the southern fringe of the Rangitikei region. Kairanga County, surrounding Palmerston North, is a strong dairying area which provides the city milk-supply. The southern end of Horowhenua, about Otaki, is also largely engaged in dairying, mainly for the Wellington City milk-supply. There is an area of fertile ploughable land stretching from the southern end of the Horowhenua County and including the bulk of that county together with the fertile river soils of the Kairanga, Oroua, and the bulk of the Manawatu County.

This block of country is bordered by a belt of sand country along the coast which extends from Otaki to the Rangitikei River, and varies from two up to ten miles in depth, penetrating deepest into the more fertile country between Foxton and Rangiotu and also north of Rongotea. While the coastal strip is loose, unconsolidated sand and as yet of little farming use, the older inland consolidated sands have in places been developed to high producing dairy and fat-lamb farms. An extensive intermediate belt is at present in course of development and can be expected to show more improvement in stock-carrying capacity than any other country in the area. On the inland side the western counties as well as the eastern counties run on to the main dividing range, where the outer fringe of steep greywacke country has generally been fairly well maintained by the use of cattle from the lowlands. The border land between State forest and other Crown reserves, however, has shown marked deterioration particularly in the southern part of both the Pahiatua and Horowhenua Counties. In the east, Woodville County is partly broken in terrain and partly good flat ploughable land. Pahiatua, on the south-east, again varies from good to first-class land. This region, therefore, is an "in between" region showing over-all increases, which should be remembered as—

- (1) Outstanding increases on the portion of first-class land.
- (2) Small increases on the second-class portions.
- (3) Reversion and regression in the poorer belts.

These belts are too intermingled to be identified as separate regions. Total sheep numbers have increased by 708,000 and breeding-ewes by 508,000. Cows in milk have increased from 107,000 to 128,000.

(l) *Castlepoint*

These are the "pastoral hills" of the south-east coast—the Counties of Castlepoint, Weber, and Akitio—although a belt of similar hill country extends down the coast as part of the Wairarapa region. The area is nearly all in surface-sown pastures, the steeper parts showing some signs of erosion. The sheep population has decreased by 55,000 and breeding-ewes have increased by 3,000, the latter being on the less steep hills and the ploughable flats. Carrying-capacity has therefore increased slightly. The area is almost completely one of Romney store sheep-production with extensive farming. Top-dressing has been out of the question on much of the area owing to the prohibitive cost of freight from the railway—up to £3 per ton. There is a belt of hard scrub through the region which is now just as it was in 1925, but the remainder of the region has been improved and well grassed.

(m) *Wairarapa*

This region, the Counties of Eketahuna, Mauriceville, Masterton, and Wairarapa South, divides into three belts. One is the line of coastal hills similar to the Castlepoint region. Another and almost insignificant belt is

the fringe of hard country along the foothills of the Tararuas. Between these lie the main belt of the Wairarapa—flat to rolling good country, warm and well watered, and benefiting from both improved sown pastures and top-dressing. This part of the region is intensively farmed for fat-lamb production, approximately 27 per cent. of the flocks being Southdown mated in 1945; and most Romney wether lambs being fattened. Breeding-ewes have increased by 101,000 and total sheep by 109,000.

(n) *Featherston*

This region has been designated "Featherston region" although, in addition to Featherston County, it includes the Hutt and Makara Counties. These latter are, however, of little importance to the general picture of sheep-farming. Both have had much of their flatter areas taken for urban housing schemes. Makara County is generally steep, and fully exposed to the cold force of the storms from Cook Strait. Hutt County, with the general exception of the Judgeford and Wainui-o-mata areas, consists of the steep, hard fringe of the southern end of the Tararuas, where difficult conditions, high rainfall, and poor soils have resulted in a reversion to scrub overtaking most of the efforts at development. Featherston County has better land, and a large area of the southern Wairarapa plain is given over to dairying. The rolling downs, particularly round Martinborough, are all first-class intensive areas. The coastal hills are in a different category to those of the Wairarapa and Castlepoint regions. They are steeper and colder on account of exposure to southerlies deflected up the east coast of the South Island, and much more difficult of access. Reversion appears to be greater and pastures generally poorer. Sheep have increased in number by 82,000, made up of an increase of 92,000 in the Featherston, 3,000 in the Makara Counties, and a decrease of 13,000 in Hutt County. Breeding-ewes have increased by 79,000.

(ii) CHARACTERISTICS OF NORTH ISLAND FARMING

(a) *Changes in Farming Practices*

Over the past twenty-five years there has been a definite tendency towards the elimination of all breeds other than Romney and Southdown. In 1920, for instance, Lincoln rams accounted for about a sixth of all rams, but their importance rapidly declined until they were less than 5 per cent. after 1924. Once bush-burn fertility declined, the rearing of Lincoln hoggests became difficult, and the substitution of the Romney overcame much of this difficulty and at the same time provided a ewe more suitable for the requirements of the growing fat-lamb industry. Leicester rams were of minor importance, but gave way to Southdowns with the improved quality of the pastures, and after 1930 their numbers have been very small.

There was a steady increase in the importance of Southdown rams, from 8 per cent. in 1920 to 23 per cent. in 1930. The growing overseas demand for fat lambs, together with the improvement of pastures, was primarily responsible for this trend. The use of Southdown rams was increased by the depression, when greater returns were forthcoming from fattening than from wool and store-sheep production, the percentage rising to 33 of all rams in 1933. In 1947 Romney rams accounted for about 66 per cent. of all rams and Southdowns about 32 per cent., other breeds being of no practical significance except the Lincoln, which is used sporadically for strengthening Romney fleeces.

The increase in financial returns from ewes because of the development of the fat-lamb industry has resulted in an erratic but distinctly downward trend in wether numbers from about 4,000,000 in 1920 to less than 2,500,000 in 1947. This declining trend was most noticeable after severe falls in crossbred-wool prices. At the present time the development of the pumice land by the State requires large numbers of wethers, and in this area increases have been recorded in recent years. In some localities numbers have been influenced by wether country being improved to carry ewes or, alternatively, deteriorating and going out of production.

The need for run cattle for pasture and fern control has been more appreciated of recent years, but the practice varies considerably over the North Island. It is generally considered that about one cattle beast to ten sheep shorn is the standard ratio, but in the lower rainfall districts such as the East Coast the ratio is about one to twelve, whereas in the King-country and North Auckland the proportion is one to eight or less. The alternative to the use of cattle on danthonia country is the practice of summer burning, but as this inevitably leads to complete reversion to scrub or gorse it is no longer the practice except on poor steep hills such as in Coromandel or Hutt Counties. (In Hutt it is used mainly to reduce gorse.) In the eastern districts cattle numbers have increased substantially since 1930, offsetting in general the decline in sheep. Because of the greater increase in sheep on the low country where the necessity to run cattle is not so great, the over-all picture is rather obscure.

The introduction of sheep in dairying areas has been a feature since 1935 in the Waikato and some other areas, but not in Taranaki. The majority are purchased as five-year ewes for fat-lamb production, but the fattening of store lambs accounts for an appreciable number. On fat-lamb farms the normal practice is to purchase store cattle, mostly beef breeds, to fatten on surplus growth. On some hill districts adjacent to dairying areas young dry dairy cows are required for pasture and fern control. These are put in calf and sold back to dairy farmers.

(b) *Main Classes of Sheep Country*

Since the annual statistics are collected on a county basis, the discussion of live-stock figures has been confined to regions comprising groups of counties where sheep-farming is on roughly similar lines. Actually, farming may be better classified into five groups:—

- (1) *Country Where Farming Has Not Been Successful.*—This country consists of steep and broken land in high-rainfall areas, often with poor soils. The chief areas are in the northern and southern portions of the King-country. Failure to secure a successful burn after the first felling of the bush made reversion to scrub inevitable, since there was no possibility of a second burn until scrub growth was dense and tall enough to supply a good ground cover of ash.
- (2) *Surface-sown Hill Country Presenting Problems of Deterioration.*—This includes most of the farmed hill country of the North Island. The general problem is one of changing the country from a naturally deteriorating condition to an improving one. The approach to this problem lies in the following: (i) introduction of clovers into pastures; (ii) the effective use of cattle; (iii) aggregation of holdings into workable units; (iv) more subdivisional fencing; (v) the application of fertilizer by hand or the spreading of fertility by means of the grazing animal; (vi) the improvement of ploughable areas; (vii) the extension of access tracks by bulldozing and by scrub-cutting.

- (3) *Surface-sown Hill Country Which is Tending to Improve.*—This is limestone or blue papa country where the soil is sweet and the rainfall about 40 in., and often includes pockets of rich, ploughable soil. Little or no top-dressing is undertaken except in areas close to the railway. Such country exists mainly in parts of Poverty Bay, Southern Hawkes Bay, and around Taihape and Masterton.
- (4) *Highly-productive Ploughable Country.*—This is devoted almost entirely to dairying and fat-lamb production with a limited amount of cropping. The chief areas are the Wairarapa Plain, Southern Hawkes Bay, Manawatu, Wanganui, Taranaki, the Waikato, and Hauraki Plains. Increased carrying-capacity has been absorbed in fat-lamb farming rather than dairying. It should be noted that of the increase in breeding-ewes from 6,000,000 in 1920 to 12,000,000 in 1945 just under 3,500,000 were Southdown mated and only a little more than 2,500,000 were mated to Romney rams, some of the increase being on the ploughable areas. It is notable that since 1933 Romney-mated ewes have accounted for two-thirds of the total and Southdown-mated ewes for almost a third.
- (5) *The Pumice Country.*—Only a part of this area has been developed, mainly in the Upper Waikato, Rotorua, and Bay of Plenty. Cobalt deficiency held up the breaking-in of pumice lands until 1930, and at the present time the central pumice plateau offers a greater scope for potential farming than any other region.

These areas are shown on a map (No. 4 (i)) in which the smaller pockets are not indicated because of the scale of the map.

(c) *Factors in Development*

The chief factor in the development of North Island farming since 1920 has been the improvement in soil fertility on the more accessible ploughable country, the carrying-capacity increasing at a greater rate on this land than on hilly country. The difference has been accentuated by the use of machinery, which is impracticable on hill country. A fertility-building cycle has been set in motion through top-dressing with lime and fertilizer, drainage, and the use of certified rye-grass and clover, together with a greater concentration of live-stock. Another aspect has been the application of cobalt with superphosphate on bush-sick pumice land.

Fundamental to the success of top-dressing is the presence of clovers in the pasture. On hill country, because of the difficulty and cost of top-dressing by hand, this is a most important factor and the danthonia - brown-top swards so characteristic of North Island hill country show little response to fertilizer until clovers are introduced. Experience has shown that *Lotus major* on the wetter hills, and subterranean clover on the drier hills and shingle plains, are the most suitable species.

The two chief features in the deterioration of hill country are reversion and erosion. These are associated with the amount and the seasonal distribution of the rainfall, but they do not usually occur with equal severity in the same locality. Thus in the Poverty Bay area, which is subject to periods of drought and flood, erosion is the major feature, while in North Auckland and the King-country, where the rainfall is higher and more evenly distributed, reversion is the major feature.

The course of improvement or deterioration has been affected by economic conditions. In general, production from the hill country has been greater when prices were high, while production from the flat country has been greatest when prices were lowest because of the need to produce more in order to make a living. The hill-country farmer is unable to fatten lambs and cannot increase his flock without overstocking. Overstocking has accelerated the deterioration of the hill country by adding to the drain on natural fertility.

Economic conditions have also influenced the course of improvement or deterioration in another way. Store sheep and ewe values are liable to wider fluctuations than fat-stock prices, and the hill-country farmer is liable to suffer more severe variations from year to year than the fat-lamb producer. Under financial stringency, stocking practices are frequently resorted to on hill country which permit fern and second growth encroachment. These are overstocking with ewes, the running of ewes on country more suited to wethers, fattening lambs and cattle at the expense of breeding store stock—that is, the adoption of flat-country farming practices. In depression periods the tendency is to reduce the amount of hired labour and to postpone maintenance, and this has a more serious and lasting effect on hill country liable to reversion than on the highly-productive ploughable areas. On better country of high natural or built-up fertility less serious long-term damage arises from price recessions, and at times improved farm management practices are introduced in order to raise production. Nevertheless, it is generally true that the price recessions following 1929 prevented the introduction and extension of essential hill-country improvement practices such as subdivision, top-dressing, spelling, scrub-cutting, and cattle stocking.

(iii) SOUTH ISLAND REGIONS

(a) Marlborough

This region, the Counties of Kaikoura, Awatere, Marlborough, and Sounds, is the Marlborough Land District and lies to the east of the main mountain chain, and stretches from the Conway River, in the south, to Cook Strait. The region throughout is extremely broken and mountainous; its characteristic grassland association was tussock, which is largely changed to danthonia. The region falls into five distinct classes:—

- (1) The Sounds County, where grazing lands are largely the result of bush burning and surface sowing late in the last century. Many of these surface-sown hill pastures, which now consist of danthonia, are reverting to scrub, and erosion is becoming evident, mainly the result of overstocking in the past. Almost without exception Romney flocks are maintained. Total numbers are declining, breeding-ewes falling from 102,000 to 97,000 in 1945.
- (2) Lands not used for any grazing purpose. These comprise the high barren country on the main divide and on the tops of the Kaikouras and the bush-clad hills north-west of the Wairau River Plain. The amount of abandoned country is being added to as erosion depletes the carrying-capacity of back-country stations. Examples are Molesworth and Glazebrook Stations, recently declared Soil Conservation Reserves.
- (3) The Seaward Kaikouras in the south, where the grassland is partly danthonia, partly better grasses. Flocks are of halfbreds and Corriedales.

- (4) The tussock belt on the inland hills, some of which provides good grazing, some of which, as in the Wairau Valley and along the Ure, has changed to danthonia, and some of which, as on Molesworth Station, has been very seriously eroded, the result of overstocking and indiscriminate burning. The sheep carried are principally Merinos and halfbreds, and their numbers have declined.
- (5) The small area of first-class land comprising the flats around Blenheim, Tuamarina, and Kaikoura, where dairying and fat-lamb production are the most important industries.

Rainfall averages 45 in. over the Sounds County and the inland ranges, and 25 in. around Blenheim and down the east coast. Distribution throughout the year over the latter area is poor, and frequently drought conditions are encountered in the summer and autumn.

A relatively static position is evident in the sheep industry. Total sheep increased from 1,041,000 in 1925 to 1,091,000 in 1945. Breeding-ewes increased from 537,000 in 1925 to 592,000 in 1945. In Kaikoura and Marlborough Counties there has been a considerable increase in the number of flocks under 500 and a substantial fall in the number of flocks over 2,500. In the Sounds and Awatere Counties the tendency has been for consolidation, and increases are evident in the number of flocks of 500-2,500, with a large decrease in flocks of 500 and under. Sounds and Awatere have declined, and Kaikoura and Marlborough improved.

Subterranean clover has been introduced on the medium-to-light soils of Fairhall, Omaka, Hillersdene, Wairau Valley, and Seddon with good results. Perennial rye-grass is carried with the sub-clover, and these pastures have doubled in stock-carrying capacity. The high price ruling for sub-clover seed in recent years encouraged some farmers to hold their clover for seed.

(b) *Nelson*

This region, the Counties of Buller, Collingwood, Inangahua, Murchison, Takaka, and Waimea, comprises the Land District of Nelson, lying to the west of the main mountain chain, and stretches from Cook Strait to the northern boundary of Grey County on the West Coast. The region is generally high and rough, peaks of over 4,000 ft. in height being not uncommon throughout the main range and the many subsidiary spurs. Rainfall over the area varies, the extremes ranging from 100 in. and more per annum in Buller, Murchison, Inangahua, and Collingwood Counties to an average of 36 in. in Takaka and Waimea Counties. The distribution of rainfall is poor in Takaka and Waimea, where summer and autumn droughts are encountered frequently. Three-quarters of the area of the region is unoccupied land and includes the bush-clad Tasman, Brunner, and Lyell Ranges, extending through Collingwood, Takaka, Buller, and Inangahua Counties, and the mountain-tops of the main divide on the eastern border of Waimea and Murchison Counties. Wet pakahi lands on upland terraces in Collingwood and Buller Counties are also in the unoccupied area. On many of the occupied ranges a serious cobalt deficiency militates against the grazing of stock, although licks and top-dressing of holding paddocks and accessible flats are overcoming this to a certain extent. Large areas of bush have been burnt off in the past and some surface sowing attempted, but a great deal of this has been abandoned and allowed to revert to fern and scrub because of mineral deficiencies and consequent

stock losses. Areas where this has happened are found on the hills to the west of the Waimea Plain and areas surrounding the headwaters of the Motueka River near Tadmor and Glenhope. From Inangahua Junction to Reefton there is ample evidence of land unsuitable for pastures being allowed to revert to blackberry. Farming has become increasingly concentrated on the Waimea Plain, the Motueka and Riwaka Rivers Plain, the fertile coastal strips at Takaka, Collingwood, and Karamea, and the rich river flats of the Buller at Murchison. Tussock-grazing country is found in a small area on the eastern boundary of the Waimea Plain, where the tussock cover has changed to danthonia, but the amount is negligible relative to the whole region. An area of 5,000 acres along the western shores of Tasman Bay is intensively farmed as fruit orchards, and there are many hop and tobacco farms around Motueka and up the Motueka River Valley.

In this region dairying is of greater importance than sheep-farming, although the revenue from tobacco, hops, and fruit exceeds that from dairy and sheep farming combined. Dairy cows increased from 27,000 to 32,000. The increase in the number of total sheep was small, from 423,000 to 469,000, and the increase in breeding-ewes was also small, from 232,000 in 1925 to 260,000 in 1945.

The sheep are principally Romney and Romney crossbred ewes, on which Romney and Southdown rams are used. In the drier parts of Takaka and Waimea Counties some halfbred ewe flocks are run, and in recent years the use of Romney rams on these flocks has been necessary.

(c) *West Coast*

This region lies to the west of the Alps, occupying a narrow strip 230 miles long by from 20 to 50 miles in depth. It is completely isolated from surrounding regions by high snow-clad mountains and dense virgin forests, the only access being the rail and road connection through Otira and the Lewis Pass road to Canterbury, and the Buller River valley route to Nelson. Breeding-ewes have increased from 42,000 to 58,000, and total sheep from 64,000 to 79,000.

The area was originally all forest, and the felling of the timber late in the last century was followed by bush burns which gave an initial fertility to the land cleared. Very high rainfall (200 in. in some parts) made secondary growth very rapid, but for some years wethers and cattle were run quite successfully on the terraces, and ewes on the flats. As the fertility resulting from the bush-burn ran out, blackberry and scrub took control, and in an unequal struggle sheep-farming gradually retreated to the flats.

Sheep-farming in the region shows four principal characteristics over the period, namely:—

- (1) Total sheep increased slightly up to 1930 and have remained almost constant since then, though there is a slight tendency to fall lately.
- (2) Increased top-dressing, and the sowing of better pastures on the flats, has increased the number of ewes being carried there.
- (3) The terraces, which previously carried a large number of wethers, have reverted to blackberry and scrub.
- (4) Total wethers have therefore fallen sharply due principally to (3) above, and also partly to (2), the ratio of wethers to ewes falling from 24 per cent. in 1920 to 4 per cent. in 1945.

Cattle numbers have remained fairly constant, the reversion of terrace country being offset by an increased carrying of cattle to give adequate pasture control on the flats. As is to be expected in such a high-rainfall area, the ratio of cattle to sheep is high—nearly 50 to 100 sheep shorn. Much of the reverted country now runs cattle only, of which over 1,000 are sent fat to Christchurch each winter.

(d) *North Canterbury*

This area, which includes the Counties of Amuri, Cheviot, and Waipara, is approximately 2,250,000 acres in extent, and includes high country, tussock hill country, and basins where mixed farming is the practice. On the poorer land of the basins the State Forest Service has planted a total area of 34,700 acres.

The term "high country" used for this particular region applies to an area of approximately 1,300,000 acres, which, because of the size of some of the sheep-stations, includes both mountainous and barren tops as well as good tussock hill country. The two high-country sheep-stations in the extreme north of the region covering 336,000 acres show a decline in sheep numbers from 54,000 in 1920 to 23,000 in 1945. A part of the fall has been offset by a rise in cattle numbers. Nevertheless, this section has regressed, some of the reasons given being high snow losses, poor access, indiscriminate burning followed by erosion, and the difficulty of obtaining labour. The remainder of the high-country runs show relative stability in sheep numbers. Seven runs, which account for practically the whole of the remainder, had 47,000 sheep at the commencement of the period (1920) and 51,000 in 1945.

The remainder of the hilly country which is a good tussock grazing area has remained stable in the numbers of stock carried. A sample of twenty farms shows that in 1920 they carried 61,000 sheep and in 1945, 62,000. In this particular section erosion is not a problem, although in the south-eastern portion *nassella* tussock has become a problem.

Total sheep numbers have increased from 924,000 to 1,026,000, the main increase occurring in the mixed agricultural regions in the basins around Waikari, Hawarden, and Culverden and the Cheviot basin. Breeding-ewes have increased from 554,000 to 646,000. The increase is attributed to the use of better strains of pasture seeds and to top-dressing. In this area cropping is also of considerable importance, the area devoted to this in 1945 being 45,000 acres.

Cattle are not very important, although there has been a slight increase over the past five years, as the two high-country stations are making a change from sheep to cattle. Dairying is of no importance.

On the hill country, Corriedales and halfbreds predominate, the region being a particular stronghold of the Corriedale, the rams of this and halfbreds representing 70 per cent. of those used. The predominance of Corriedale is possibly due to the originator of the breed, Mr. James Little, acquiring land in the Waipara County. In the basins the Southdown ram has increased, being used on Corriedale and halfbred ewes for fat-lamb production.

There has been no outstanding change in the region, which, owing to the great area of hill country, is predominantly a sheep region. The hill country produces wool and surplus breeding-ewes and store-lambs, the flat areas cash crops, mainly wheat, and fat lambs.

(e) Foothills

This region comprises the Counties of Ashley, Oxford, Tawera, and Selwyn, being bounded by the Southern Alps to the west, the Waipara River to the north, the Christchurch region to the east, and the Rakaia River to the south. The area includes both mountainous and flat land, the former predominating. Rainfall in the north-west averages 40 in. Snow losses are high in the mountainous country of Tawera, Oxford, and Ashley Counties. All of the counties in the region contain a belt of light shingly plains land in their eastern parts, a belt of tussock-clad foothills country in the centre, and high mountainous country to the north and west. Pockets of heavier land are found in Oxford County, and here cereals, small seeds, wool, and fat lambs are produced. Semi-intensive sheep-farming, with the main products wool, store and breeding stock and some cereal and fat-lamb production, occupies the balance of the plains belt. The foothills are the source of supply of ewes for flock replacements on the plains, and no fattening or cereal-production is undertaken on these hills. Sheep on the plains and the foothills are principally halfbreds with some Corriedales, and in latter years there has been a tendency to increase the use of Romney rams for ewe-replacement breeding. Southdown rams are the fat-lamb sires. The high mountainous country which forms the greater proportion of the region carried halfbred and Merino flocks on very extensive grazing runs. The former breed predominates, and the decrease in the carrying-capacity of much of this country is in part attributed to the change-over from Merino to halfbred about 1919. From three to four Merinos were previously carried, as against two halfbreds to-day. Erosion is confined to the hills surrounding the basin of the upper reaches of the Waimakariri River. Between 1925 and 1945 sheep increased slightly from 543,000 to 553,000, Selwyn County accounting for the greater part of the increase. Oxford and Tawera Counties have remained static, while Ashley County has regressed. Breeding-ewes increased slightly from 327,000 in 1925 to 330,000 in 1945.

(f) Plains

This block of country (the Counties of Malvern, Kowai, Rangiora, Eyre, Papanua, Ellesmere, and Springs) is almost completely flat except for some low downs on the northern and western borders of Kowai and Rangiora, and it can therefore be classed as a true Canterbury Plains area. The region has been formed by the overlapping fans formed by the Rakaia, Selwyn, Waimakariri, and Ashley Rivers, which account for the shingly areas which are interspersed with good soils varying from light sandy loams to the heaviest of silts. Mixed farming is therefore the pattern--cropping, intensive fat-lamb production, and some dairying in the areas nearer to Christchurch City.

Sheep increased from 472,000 to 726,000 and breeding-ewes from 297,000 to 425,000. This, however, has been offset by a small decrease in the area under crop of 2,000 acres since 1920, showing a degree of stability in sheep-farming in the area. The small net increase in sheep numbers which has taken place can be attributed mainly to the increased area under sown grass. Further increases will come from the use of better grasses and more wide-spread liming. Fat-lamb production dominates the sheep-farming except on the scattered shingly areas where Corriedales, halfbreds, and Romneys are run.

The Southdown ram has risen to be the principal one for fat-lamb production.

Cattle are of little importance in the region, and dairying has increased only slightly over the period, mainly because of an expansion of the need of Christchurch City for whole milk.

The feature of the region is the dominating part played by cash crops, such as wheat, barley, peas, and potatoes. The plains region early in its settlement became the granary of New Zealand, and the techniques of crop-production are now ingrained in the farming community of the area, with a result that any changes from this type of farming are likely to be very slow. Fluctuations in the acreage of crops occur, these being particularly noticeable in the slump period, when the acreage increased and the number of sheep declined. In spite of the fluctuation, the fact that of a total area of 624,000 acres occupied, 114,000 were in annual crops in 1945 shows the considerable part played by the agricultural industry in the region.

(g) *Christchurch* (Heathcote, Waimairi, and Halswell Counties)

These counties surround the City of Christchurch and have been grouped, as they are, in effect, the area from which the city draws its milk-supplies and fresh vegetables.

Of the total occupied area of 65,000 acres no more than 10,000 acres are devoted to sheep-farming, this area being divided into two sections, one in the north on light land along the Waimakariri River where store sheep are raised and the other in the south and south-east on the hill slopes of Banks Peninsula with store sheep and fat lambs.

There has been a slight increase in sheep numbers over the period, breeding-ewes accounting for the greatest increase from 19,700 to 25,000, this being attributed to the establishment of better pastures. However, the place of sheep in the farming economy of the region is small when account is taken of the fact that of a total of 1,740 holdings in 1945 only 51 carried sheep, and of these, 10 owners had about 28,000 of the total of 43,000 sheep.

On the hills and on the section along the Waimakariri River very few fat lambs are raised, but a number are raised on the hill farms containing fertile valley floors.

The main characteristics of the region are the number of holdings devoted to dairying for town milk-supply and to market gardening: sheep, in effect, only occupy the lighter areas on the outer fringe of the northern and southern part of the region.

(h) *Banks Peninsula*

This region, comprising the Counties of Akaroa, Wairewa, and Mount Herbert, is an isolated area of Canterbury hill country surrounded by sea except for its western boundary, which is the Canterbury Plains. The highest peak is 3,000 ft., and a number of others are over 2,000 ft. Rainfall is heavier than on most parts of the plains, averaging 45 in. yearly.

Total sheep have increased from 242,000 to 279,000, and breeding-ewes from 170,000 to 194,000. However, this increase has been permitted by a decrease in dairy-cow numbers.

Unlike other parts of Canterbury, the Peninsular flocks are largely Romney, and to maintain them young stock are drawn from the Chatham Islands and Southland.

Fat lambs are the main source of revenue. Southdown rams predominate, and for 1945 of the rams used 47 per cent. were of this breed. The breeding of prime cattle to cater for the Christchurch meat trade in the winter is important.

There is very little reversion or erosion, but the continued maintenance of the cocksfoot pastures in the region may need a higher proportion of cattle to sheep than is at present the case.

(i) *South Canterbury*

This region, which includes the Counties of Waimate, Waitaki, Levels, Geraldine, and Ashburton, stretches from the Southern Alps to the east coast, and from the Rakaia River in the north, to the Hawkdun and Kakanui Ranges in the south. The flat coastal belt varies in width, extending 25 miles inland in the north and tapering off to a narrow spit in the south at the mouth of the Waitaki River. The seaward area is composed of alluvial plains and is very suitable for mixed farming, the products being cereals, small seeds, wool, and fat lambs. Further inland is a narrow belt of tussock-clad foothill country of an almost uniform depth of 10 to 15 miles extending the full length of the region and running into a brown-top area on the southern fringe. Halfbred flocks are maintained on this country, the main sources of revenue being the sale of breeding and store stock to farmers on the plains, and the sale of wool. There are some Romney flocks, and these are increasing. Top-dressing on both areas has increased the carrying-capacity to a small extent, although the reduction in the acreage of annual crops has been the chief factor contributing to the rise in sheep numbers on the Canterbury Plains. Beyond the belt of foothill country lies the mountainous hinterland, where only very extensive sheep-farming is possible. Flocks are Merinos and halfbreds, and include a large percentage of wethers. There has been stability in this area throughout the 1925-45 period in the numbers of holdings, and in the sizes of flocks. Winters are harsh and snow losses are high in this area, while the summers are usually hot and dry. Rainfall throughout the year averages 25 in. over the coastal belt and 40 in. inland. Distribution of rainfall throughout the year is irregular on the plains, and the Rangitata diversion is an attempt to overcome this by irrigation in Ashburton County. Similar schemes are in operation in Levels, Waimate, and Geraldine Counties.

Changes of the greatest importance in relation to sheep-farming between 1920 and 1945 were an increase in breeding-ewes from 1,626,000 to 1,964,000, and in total sheep from 2,648,000 to 3,290,000. The quantity of lime railed rose from 4,000 tons in 1925 to 60,000 tons in 1945.

(j) *Mackenzie*

This comprises the hill and high country county of the same name, Mackenzie. Breeding-ewes increased from 272,000 to 283,000, and total sheep from 492,000 to 532,000, presenting a picture of general stability.

The region is mainly a high-level tussock plateau at a height of over 1,000 ft. with high ranges, and between these the large lakes of Pukaki and Tekapo. Winters are severe, with heavy snowfalls, and the summers are generally hot and dry. Sheep-farming since the end of the nineteenth century has been devoted to the extensive grazing of Merino flocks over vast areas. The fall in the value of fine wool during the depression saw some change to halfbreds in order to quit culled-for-age ewes to the Canterbury Plains farmers for the production of "Canterbury" lamb—a South-down ram on halfbred ewes. The change has, however, brought trouble to the high country, as less than two halfbreds can be maintained where three Merinos grazed comfortably, and also because the halfbred is much

less hardy in bleak winters. The effect has been overstocking, and later, when pasture depletion became evident, a reduction in the number of ewes run. The higher prices ruling for fine wools may hasten a return to the Merino.

(k) *Otago* (The Counties of Waihemo, Waikouaiti, Tuapeka, Peninsula, and Taieri)

This is a varied area, from first-class land on the flats in Taieri and Waihemo, to rolling hills (the famous brown-top area) of Tuapeka, and some steep and broken poor country. Breeding-ewes have increased from 460,000 to 684,000, and total sheep from 868,000 to 1,177,000. Cows in milk have declined from 21,000 to 16,000.

Stock-carrying capacity is greatest on the Taieri Plain and in the Palmerston district, where flat lands have been ploughed and well grassed. Some of the flats and rolling hills along the Molyneux River are also able to carry large numbers of sheep.

In two large belts of the area farming has not proved successful. The first is the coastal hill strip of the Akatore district in Taieri County, where poor soils, scrub and fern, and lack of shelter from cold storms sweeping in from the sea have proved insurmountable difficulties. The area is to be planted in State forest. The other area is a belt of scrub country running from Dunedin and the hills behind Waikouaiti back to the valley of the Molyneux. This is steep, broken country.

Apart from some parts of good flat ploughable country on the Taieri Plain, in the valley of the Molyneux, and around Palmerston in Waihemo County which has been developed as first-class land, sheep-farming has generally been a struggle on difficult hill country, and production has tended to be mainly of store sheep and wool. Despite this, however, the region progressed substantially.

(l) *Central Otago*

This region, comprising the Counties of Lake, Vincent, and Tuapeka, includes the "high" country of the south. Breeding-ewes have increased from 454,000 to 632,000, and total sheep from 964,000 to 1,212,000. Total wethers at 223,000 in 1945 are only 3,000 less than in 1925.

The region is principally one of high-level tussock grazing. The Southern Alps, which form the mountain backbone of the South Island, break up into a series of ranges about the Otago-Westland border. Near this divide are steep valleys where all but the valley-floors are in virgin forest. These valley-floors are generally wet and are used for run cattle, mainly Herefords. As the ranges proceed south they lose altitude; the forest becomes scattered and then disappears, giving way to open tussock country. On the higher, steeper, and more snow-frequented country Merinos are run, with halfbreeds on the lower hills and plateaux. On some of the warmer faces Corriedales are run.

In many of the valleys are large lakes, and the rivers from these form the giant Molyneux River basin whose floor, though dry and arid naturally, is very fertile when irrigated. These irrigated lands are used largely for fruitgrowing and for dairying, but some Romney flocks are maintained on irrigated sown pastures and mated to Southdowns for fat-lamb production. Not many cattle are run except in the mountain valleys.

Persistent burning, coupled with very dry conditions (a rainfall of less than 15 in. in places), a plentitude of rabbits, and overstocking, has depleted a large part of the south of the region. Irrigation and the eradication of rabbits are perhaps the two factors on which regeneration will hinge most.

(m) *Southern*

This covers the Counties of Wallace, Southland, Clutha, and Bruce. The Counties of Fiord and Stewart Island have been omitted, being of no significance for the sheep industry. In this region breeding-ewes have increased from 1,227,000 to 2,842,000, total sheep from 2,026,000 to 4,340,000, beef cattle from 69,000 to 90,000, while cows in milk have decreased from 87,000 to 62,000.

Here the mountain ranges have generally run out to rolling downs and plains, ploughable, easy of access, fertile, well watered by an even rainfall, and generally developed as first-class fattening pastures. The coastal hills of the Catlins district, the Hokonui Hills in the centre, and the Takitimu Ranges on the west are exceptions which remain largely in bush. The northern part of Southland County is a drier former tussock plain, and is partly store-sheep producing and partly fat-lamb. The region is one of the country's best sheep areas. Provision of winter feed is a major part of sheep-farming economy in Southland, and each year a large proportion of the arable land is sown in root and fodder crops for this purpose.

(iv) CHARACTERISTICS OF SOUTH ISLAND FARMING

(a) *Changes in Farming Practices*

Except in Southland, there have been no sweeping changes in sheep-farming practices in the South Island similar to those which have characterized the 1925-1945 period in the North Island.

A large part of the South Island runs fine-woolled sheep run largely for wool alone. This area has not varied in size or location, nor has the total number of sheep involved varied to any great extent. The sheep used are the Merino, the halfbred (bred originally from a Merino ram crossed with a Lincoln or English Leicester ewe), and the Corriedale. All three are similar in purpose and are interchangeable on much of the country, although Merinos predominate on the mountains and Corriedales on the warmer coastal hills. Changes have occurred in breeds according to economic conditions, there being a swing away from Merinos when prices of very fine wools fell relatively to coarser wools, and when income from meat makes the halfbred a better proposition. But fewer halfbreds can be carried on any area than Merinos, and the halfbred is a less hardy sheep, so that severe winter pasture depletion or reduced stocking, and a boom again in very fine wools, result in a trend back to Merinos at the expense of halfbreds. However, the totals of all three breeds remain stationary.

The Romney has always been a leading sheep of Southland, and has remained so, tending to replace Lincolns there and in Otago and North Otago. It is now gaining a foothold in South Canterbury. It has become the sheep of Banks Peninsula. Because these areas contain a major part of the sheep of the island, the Romney stands high in importance although so restricted in locality. It is wanted by fat-lamb producers, but the supply is limited.

For the rest of the South Island the halfbred ewe has always been and remains the traditional ewe, although Corriedales prevail on the warm coastal tussock hills of North Canterbury and there is in places a tendency to breed a three-quarter bred ewe from a halfbred ewe crossed with a Romney ram.

The fat lamb of the North Island is the Down cross on the Romney, and this applies, too, to the Southern and Otago regions. Elsewhere the South Island fat lamb used to be from a halfbred ewe crossed with a Border or English Leicester ram. To-day the Southdown has replaced the Leicester, and the product, the Southdown-halfbred lamb, has attained fame as the "Canterbury" lamb.

There has been a downward trend in the ratio of wethers to breeding-ewes as in the North Island except that there remain large wether areas in the South Island which will not winter ewes and must remain dry sheep country.

Except in Westland, run cattle do not feature extensively in South Island pasture control practices as in the North because of the general absence of improved surface-sown areas, cattle being of lesser pasture control value on tussock grasslands.

(b) *Main Classes of Sheep Country*

In the South Island the main classes of country are . . .

- (1) Forest and scrub areas, including mountain rock where farming has never been established.
- (2) Natural tussock grasslands over which sheep flocks have been grazed extensively since the development of the Island in the "sixties." There has been no general improvement of these areas.
- (3) Good ploughable country (either flat or rolling hills) which has been top-dressed and sown in improved permanent pastures. On this country sheep are pastured, in association with annual crops, for winter feed, although the growing of cereal crops competes for some of this land in the Canterbury regions.
- (4) Improved hill country where former tussock or bush country has been surface sown and developed to second-class pastures either by top-dressing or by good management. Most of this is now danthonia or brown-top.
- (5) Deteriorating hill country, including some high-level basins. This is mainly tussock land which has been overstocked and over-burnt. Some is former bush country where the fertility has run out.
- (6) Country where farming has failed because of either too high a rainfall promoting an unequal struggle against second growth, or too low a rainfall coupled with overstocking and other forms of poor management depleting the natural tussock.

(c) *Factors in South Island Sheep-farming*

The outstanding feature of the past twenty years of South Island sheep-farming has been the absence of change of development except in the far south, where the sheep numbers have more than doubled in twenty years. This is the result of two factors—(1) the tussock grasslands do not permit a ready improvement by the same methods as did the bush-clad hills of the North Island, and (2) in the flat areas of the Canterbury Plains sheep-farming

must compete and rotate with pulse and grain cropping. The average life of a pasture is four to five years, and there is little incentive to maintain longer life by better pastures or top-dressing when wheat will be rotated over the land in at least six-year intervals.

In the Southern region good sown pastures and top-dressing have resulted in outstanding development similar to that of Hawkes Bay and the Waikato. However, in the South the cold winter precludes purely grass feed, and the feature of the region's farming is the growing of auxiliary winter feed crops.

During recent years lime has been increasingly used in Canterbury and may ultimately increase carrying-capacity. In Canterbury increases in sheep numbers have been mainly at the expense of annual crops.

Generally, the influence of economic conditions has been slight in the South Island. In periods of price-recessions the extensive grazier who probably dominates the Island cannot protect himself from a falling income and cannot easily be drawn into the North Island errors of overstocking, for he cannot buy replacement stock and his lambing is usually sufficient only to maintain his flock. Consequently, he suffers most in a depression, as was recognized by the reduction of leasehold rents.

The Plains farmer turns to grain and pulse crops in a depression and thus readily protects himself. For example, in the Plains region grain and pulse crops showed an all-time record area of 136,000 acres in 1933, while sheep were at their lowest with a figure of 447,000.

(Map No. 6 in the Atlas, Part Five, comprises a set of twenty-seven maps showing the establishment of the sheep industry in each region and its relation to dairying.)

4. THE SHEEP INDUSTRY TO-DAY

(i) SHEEP POPULATION

The following table shows the sheep population of New Zealand:—

NUMBER OF SHEEP IN NEW ZEALAND (IN MILLIONS)

Year.	North Island.	South Island.	Total.
1861	0·7	2·1	2·8
1871	1·9	7·8	9·7
1881	4·1	8·9	13·0
1891	7·2	9·6	16·8
1901	10·2	10·0	20·2
1911	12·8	11·2	24·0
1921	12·8	10·5	23·3
1931	15·9	13·9	29·8
1941	17·9	13·9	31·8
1945	19·1	14·9	34·0
1947	18·1	14·6	32·7
1948	18·4	14·1	32·5

The distribution of these sheep throughout New Zealand is shown in maps 7 (i) and (ii).

These sheep may be divided into the following classes:—

CLASSES OF SHEEP IN NEW ZEALAND
(00,000 omitted)

Year.	Rams.	Wethers.	Breeding-ewes	Dry Ewes.	Lambs.	Total.
1920	3·1	39·0	115·7	18·2	63·2	239·2
1925	3·6	30·6	137·2	8·8	65·3	245·5
1930	4·5	33·7	175·6	10·8	83·8	308·4
1935	4·7	24·8	178·1	9·9	73·2	290·7
1940	5·4	24·3	197·3	9·7	73·9	310·6
1945	5·6	25·3	208·7	9·2	91·1	339·8
1948	5·7	22·5	210·6	6·6	79·5	324·8

It is not possible to record the exact number of sheep of each breed as flock sheep are not recorded by breeds, and the numbers of any particular breed refer only to stud sheep. The following table showing breeds of rams, however, gives some indication of the present position:—

RAMS BY BREEDS AS PERCENTAGE OF TOTAL RAMS
(To nearest per cent.)

Breed.	1920.	1925.	1930.	1935.	1940.	1945.
Merino	4	6	5	3	3	2
Lincoln	10	3	2	1	Neg.	1
Romney	54	53	52	48	52	55
Border Leicester	8	8	5	4	3	2
English Leicester	8	6	5	4	3	1
Shropshire	1	1	2	1	Neg.	Neg.
Southdown	5	9	16	25	27	29
Corriedale	5	7	7	6	5	4
Halfbred	5	6	5	6	5	4
Ryeland	Neg.	Neg.	Neg.	1	1	1
Others	Neg.	1	1	1	1	1
Total	100	100	100	100	100	100

The number of owners with flocks of the various sizes in 1947 was—

1- 200	.. ..	7,197
201- 500	.. ..	7,011
501- 1,000	.. ..	8,029
1,001- 2,500	.. ..	8,087
2,501- 5,000	.. ..	1,910
5,001- 7,500	.. ..	407
7,501-10,000	.. ..	124
10,001-20,000	.. ..	97
20,001 and over	.. ..	15

32,877

The number of beef cattle was as follows:—

BEEF CATTLE (ESTIMATED)

1920	1,821,652	1940	1,931,362
1925	1,557,395	1944	1,906,591
1930	1,605,204	1947	2,047,990
1935	1,552,682		

(ii) CARRYING-CAPACITY

By 1883, 2,250,000 acres had been ploughed and sown in grasses, while a further 2,500,000 acres had been surface sown. By 1913 these figures had risen to 5,000,000 and 9,250,000 respectively.

The following figures show the change that has taken place :—

	Primitive.	Present.
	Acres.	Acres.
Forest and scrub land	41,000,000	23,000,000
Exotic plantations .. .. .	..	800,000
Tussocky grassland	17,000,000	14,000,000
Open subalpine vegetation	900,000	900,000
Alpine vegetation and bare rock	6,000,000	6,000,000
Coastal dune vegetation	300,000	150,000
Sown grassland .. .. .	..	18,000,000
Cultivated land, orchards, &c. .. .. .	..	1,500,000
Lakes and rivers	800,000	800,000
Boroughs, roads, railways, &c. .. .. .	..	850,000
	66,000,000	66,000,000

The position in 1920 and 1945 was as follows :—

	North Island.		South Island.		Total.	
	1920.	1945.	1920.	1945.	1920.	1945.
Pastures and Crops (Millions of Acres)—						
Sown grass	11.0	12.3	5.0	5.25	16.0	17.5
Annual crops	0.3	0.25	0.7	0.75	1.0	1.0
Native grass and tussock	1.5	1.25	13.3	13.0	15.0	14.0
Total	12.8	13.8	19.0	19.0	32.0	32.5
Live-stock (in Millions)—						
Cows in milk	0.5	1.5	0.25	0.25	0.75	1.7
Total cattle	2.5	4.0	0.5	0.5	3.0	4.5
Sheep shorn	13.0	18.0	10.0	12.5	23.0	30.5

The intensive nature of the North Island development and the increase in carrying-capacity since 1920 is shown in the following table :—

NUMBER OF LIVE-STOCK PER ACRE OF GRASSLAND (SOWN GRASS,
NATIVE GRASS, AND TUSOCK)

Live-stock.	North Island.			South Island.			New Zealand.		
	1920.	1925.	Percentage Increase.	1920.	1945.	Percentage Increase.	1920.	1945.	Percentage Increase.
Cows in milk	0.04	0.11	175	0.01	0.01	Nil	0.02	0.05	150
Total cattle	0.19	0.30	58	0.03	0.03	Nil	0.09	0.11	22
Sheep shorn	1.00	1.33	33	0.53	0.66	24	0.72	0.44	31

(iii) TOP-DRESSING

The carrying-capacity of the land has been increased markedly by the greater use of fertilizer. The outstanding feature is the dominating importance of phosphatic fertilizers:—

(Thousands of tons)

Season.	Super-phosphate (Straight).	Other Phosphates.	Blood and Bone, Blood, Bone, &c.	Potash, Sulphate of Ammonia, Nitrate of Soda.	Total.
1928-29	275	151	25	14	465
1932-33	307	59	26	11	403
1937-38	447	121	22	21	611
1942-43	295	27	35	5	362
1945-46	445	27	24	11	507

Normally, New Zealand supplies of rock phosphate for superphosphate-manufacture come from Nauru and Ocean Islands, and production and distribution to fertilizer-works were administered by the British Phosphate Commissioners, an organization set up following World War I to distribute the phosphates from these mandated islands. Provision was made for Great Britain and Australia each to obtain 42 per cent. and New Zealand 16 per cent. of the total output. Great Britain, however, obtained her supplies from other sources, and Australia and New Zealand have shared the output from Nauru and Ocean Islands.

After the phosphate rock reaches New Zealand it goes to the fertilizer-works; eight works manufacture superphosphate and one manufactures a heat-treated phosphate. The potential output of all works combined is in the vicinity of 700,000 tons annually.

Blood and bone and blood and bone-dust are by-products of the Dominion's meat industry, and they are used largely for market gardening and in mixtures for annual crops. Potassic and nitrogenous fertilizers are used to a limited extent only; potassic fertilizers are used for top-dressing pastures in certain areas when the soil is deficient in potash and for special mixtures for annual crops. Nitrogenous fertilizers are used mainly by market-gardeners and orchardists.

The areas top-dressed were as follows:—

(Thousands of acres)

Year Ended 31st January,	Artificial Fertilizer Only.	Lime Only.	Fertilizer and Lime.	Total Area Top-dressed.
1927	1,410	107	4	1,521
1932	2,068	387	*	2,454
1937	2,122	177	1,027	3,326
1942	2,324	380	1,508	4,212
1948	2,654	548	1,481	4,684

* Not quoted for this year.

(iv) PRODUCTION

Killings of sheep, lambs, cattle, and calves were as follows :—

	Sheep (Millions).	Lambs (Millions).	Cattle (Thousands).	Calves (Thousands).
1920-21	5.3	3.6	417	35
1930-31	4.3	8.2	367	444
1940-41	5.1	12.0	600	1,060
1946-47	5.0	11.8	719	1,085

The figures for cattle and calves naturally include some production from the dairy industry.

Wool-production figures were as follows :—

	Million lb.		Million lb.
1880	67	1920	174
1890	106	1930	273
1900	148	1940	310
1910	200	1947	346

The estimated value of production of the sheep industry to-day is as follows :—

(a) Value of exports (year ended 30th June, 1947)—

	£
Wool	42,849,000
Meat	30,458,000*
Skins	9,038,000†

(b) Value of internal consumption—

Meat	10,000,000 (estimate)
Wool	1,000,000 „
Skins	350,000 „
	93,695,000

* Includes approximately £1,000,000 of dairy industry produce.

† Includes approximately £1,500,000 of dairy industry produce.

(v) GENERAL CONDITIONS

A general picture of the industry to-day portrays three features :—

- (a) The man on good, improved land is doing well. Prices for his products are high and, though costs are high, the margin between cost and price is very satisfactory. His lands and his stock are in good condition. His economic position is sound.
- (b) The man on deteriorating hill country is doing badly. Prices for his products are high, but the low level of production from his land leaves him insufficient to meet the expenses necessary to maintain his land against deterioration.
- (c) The man on high country is doing comparatively well at present prices, although facing heavy costs to maintain his land. His worst fears are insecurity of tenure and a fall in wool-prices, which have fluctuated violently in the past. His greatest difficulty is the general problem of keeping men and their families in the high country.

The most significant feature is that problems should persist in times of high prices when the general margin between costs and prices is satisfactory. This throws into focus the nature of these problems. They are not problems of agricultural prices or margins. They are not problems of inadequate rewards for labour in the ordinary sense. They are problems of the productivity of certain types of land and problems of living in remote areas. Let us then examine these problems in broad terms.

III. PROBLEMS OF THE SHEEP INDUSTRY

The problems of the industry can be divided into two separate classes—those of which the solution is improved production from the land, and those which can only be solved by improving the conditions of life on the land. We believe that the solution of these problems necessitates getting to the root of the problem in each case.

I. PRODUCTION PROBLEMS

(i) DETERIORATED HILL COUNTRY

Probably the chief problem in point of magnitude of effect on production is the raising of fertility on hill country. It is not correct to assume that all land in New Zealand was ideal for farming and that we were endowed with a productive heritage in our land. Some of our land was fertile, notably the plains of Taranaki and of Canterbury, but only limited areas. The greater proportion of the bush-clad hill soils was naturally too infertile to carry permanent grass pastures. This fact is of basic importance and should be clearly understood. The position was confused by a rapid and excellent early strike of grass which was presumed by the early settlers to indicate good soil. This proved false. The good first strike was entirely due to the temporary fertility provided by the top-dressing of ash from the bush-burn. As this top-dressing ran out after a few years, deterioration set in. We must emphasize that in using the word "deterioration" we wish it to be clearly understood that there was no real deterioration of the soil, which was low in fertility in the first instance. The deterioration was only from the false or induced fertility resulting from leaf-mould and ash top-dressing. This gives the clue to the solution of the problem, to raise the fertility by some induced method again and to make it permanent. That method can only be by top-dressing with fertilizer and by introducing clovers into the pastures. We will refer to this problem under the term "deterioration."

(ii) DEPLETED COUNTRY

The other aspect of production problems is that where the pasture cover has gone or is disappearing. This occurs only where the rainfall is light. Under these low rainfall conditions the pastures, whether they were tussock grasslands or danthonia swards, did not stand up to grazing by animals. Had it been grazing by sheep only these pastures could have been spelled. About the "eighties" of last century, however, the rabbit gained the upper hand in grazing and proved uncontrollable, with the result that over large areas most of the vegetative cover disappeared. It is no use talking of spelling country, of over-sowing, or of any other palliatives so long as the rabbit remains. The solution is the extermination of rabbits. After rabbits have been eliminated we can proceed to establish pastures more suited to the low-rainfall conditions. We have discussed this under the heading "Depletion."

(iii) EROSION

If one looks at these basic problems as we have examined them one is forced to the conclusion that the root causes are the lack of fertility and rabbit-infestation. The hue and cry on erosion is therefore misleading. In fact, the erosion is not due generally to an irremediable characteristic of the land which requires the abandonment of farming. Nor does it result from bad farming practices which necessitate spelling of the land and control of the farmer. New Zealand as a whole is little threatened by erosion other than river erosion. It is threatened by lack of fertility in some areas and depletion by rabbits in others. Raise the fertility and exterminate the rabbits, and, with a few exceptions, you will end the causes of erosion. We shall deal later with the published propaganda on erosion and its misleading nature. Suffice to say at this stage that the two root causes of problems associated with productivity of the land are rabbits and low fertility. We shall treat them accordingly under the headings of "Deterioration" and "Depletion."

2. PROBLEMS OF LIVING

The second group of problems is associated with the conditions of living on the land. We have divided them under two general headings—those associated with the process of getting production from the land (as distinct from the actual productivity of the land) and those associated with a satisfactory form of life in a remote community. We shall deal with them under the headings of "Production Difficulties" and of "Labour and Community." As distinct from the production problems under (1) above, which have single root causes, the living problems have scattered, very diverse causes which we must treat in all their scattered diversity.

3. LOCAL PROBLEMS

In addition, during our tour, we have had outlined to us lesser problems which are still of paramount importance locally. We shall deal with them under the heading "Miscellaneous, Mainly Local, Problems."

IV. SHEEP-FARMING FOR TO-MORROW

In the foregoing section we have traced the principal problems of the sheep industry, and in Parts Two and Three of this report we shall state in detail our recommendations for handling these problems. Let us consider briefly the general future of the industry. There is always a tendency for the existence of problems requiring solution to dim the brilliance and distort the clear outlines of the whole picture before us. The panorama of the sheep industry as we have seen it is a grand one. It is a story of great developments. From the dense bush to the richly-grassed fields carrying upwards of two and a half sheep to the acre is a far step in our first hundred years. It is an achievement which reflects credit on our sheep-farmers who have directed development, on the farm-workers who have worked the land, and on the technical experts who have devised the means of improvement. The sheep industry has climbed slowly from nothing to its current production of £80,000,000 worth of exportable produce. We do not think it has reached its zenith. It can go on expanding and improving till it will produce £150,000,000 of exportable products in fifty years' time at present

parity prices, if our recommendations can be put into operation. That step is dependent on fertilizer to raise fertility. If rabbits are cleared and suitable highly nutritive low-rainfall-resistant pasture plants found, the production of the industry will advance beyond that.

So much for improvements on the land where production is low, but what of the land that is good or first class now? We do not believe that it has reached its maximum production. The two principal avenues apparent for improvement are further subdivisional fencing of holdings to give greater control by rotational grazing, and greater plantings of trees to give shelter not only to live-stock, but, more important still, to pastures.

This latter is perhaps the great need for to-morrow—to encourage the farmers of New Zealand to become tree conscious; to promote more study of the effects of shelter on plant-growth and research into methods of planting trees to effect such growth; and to plant all waste corners, rough faces, and non-farmable ground in trees to smother weeds and to yield on the farm, if possible, as much as practicable of the farm's timber needs "thirty and forty years on." To this end should the policies of the Agriculture and Lands Departments be focused, and to this campaign the Council and executive officers of Federated Farmers should give their vigorous support.

Great as has been the sheep industry's past, still greater can be its to-morrow.

PART TWO — RECOMMENDATIONS ON ADMINISTRATION

I. GENERAL ORGANIZATION

The organization of an industry is a matter of great importance. When that industry is New Zealand's largest industry, organization is even more important. By organization we do not refer to that known as Federated Farmers of New Zealand. We mean the arrangement and ability of the sheep industry, both the farmers and the farm workers who constitute the industry, to administer the affairs of the industry.

1. PRESENT POSITION OF THE SHEEP INDUSTRY

Let us examine the present position. There are three official industry bodies—the Meat Board, the Wool Board, and the Wool Disposal Commission; and there are four administrative bodies—the Department of Lands and Survey, the Department of Agriculture, the Soil Conservation and Rivers Control Council, and the Department of Scientific and Industrial Research.

(i) THE MEAT BOARD

The Meat Producers' Board was established in 1923, the general purposes being set out in the Meat-export Control Act, under which the Board was set up. The Preamble to that Act reads :—

WHEREAS the economic welfare of New Zealand has lately been adversely affected by reason of a reduction in the net returns receivable by persons engaged in the business of the production of meat for export, such reduction being due in part to falling prices and in part to the charges payable in respect of freight and other services: And whereas conferences have lately been held of representatives of the Government and of persons whose business is the production of meat for export, and it has been resolved that the public economic welfare will be promoted by the establishment of a Board of Control, with power to act as the agent of the producers in respect of the preparation, storage, and shipment of meat and in respect of the disposal of such meat beyond New Zealand: And whereas it is desired to give effect to the resolutions aforesaid, and to provide by law accordingly: And whereas it is further deemed necessary and desirable that the expenditure of the Board of Control should be subject to audit as if it were public expenditure, and that the expenditure of the Board should be guaranteed by the Government of New Zealand . . .

The constitution of the Board is as follows :—

- (a) Five representatives of the producers, one of whom is Chairman.
- (b) One representative of the dairy-producers.
- (c) One representative of the stock and station agents.
- (d) Two representatives of the Government.

For the election of producer representatives New Zealand is divided into twenty-one electoral districts, the largest district having three delegates to the Electoral Committee, while there are two other districts with two delegates each, the remainder having one delegate. The Electoral Committee receives nominations for producer members, such nominations being moved and seconded by registered sheep-owners. The Committee elects the required number of representatives from among those nominated. There is thus no direct system of local representation as there is nothing to prevent all five producers' representatives coming from either the North or the South Island. These producers' representatives hold office for two years, and three retire one year, and two the next.

The powers of the Board are generally contained in sections 9, 10, and 12 of the Meat-export Control Act, which are as follows :—

Section 9—

(1) For the purpose of enabling the Board effectively to control the export, sale, and distribution of New Zealand meat the Governor-General may, acting under the powers conferred on him by the Customs Act, 1913, and its amendments, prohibit the export from New Zealand of any meat save in accordance with the determination in that behalf of the Board.

Section 10—

(1) The Board is hereby empowered to determine from time to time the extent to which it is necessary for the effective operation of this Act and the fulfilment of its purposes, that the Board should exercise control over the export of meat from New Zealand, and may assume control of such meat accordingly.

(2) In any such case the control of the Board shall operate as from a time to be specified in that behalf by the Board by notice in conformity with this Act.

(4) The control to be exercised by the Board over any meat may, as the Board in any case determines, be absolute or limited.

(5) All meat of which the Board has assumed absolute control shall be graded and shipped as the Board directs, and shall be sold and disposed of only by the Board or by direction of the Board, at such times and in such manner and on such terms as the Board in its discretion determines.

(6) Where the Board has assumed limited control the extent of the control shall be defined by notice as aforesaid, or by agreement between the Board and the owners of the meat or other persons having authority to enter into an agreement with the Board with respect to such meat.

Section 12—

(1) After the constitution of the Board, or after such later date as the Board by public notice appoint, no contract for the carriage by sea of any meat to be exported from New Zealand shall be made save by the Board, acting as the agent of the owners of that meat or of other persons having authority to export that meat, or in conformity with the conditions to be approved by the Board.

The Meat Board is therefore a Board concerned with the marketing of meat, and under the bulk-purchase contracts with the United Kingdom Government it is responsible for the grading, shipping, and insuring of the meat sent to British ports.

(ii) THE WOOL BOARD

The Wool Board was established by the Wool Industry Act of 1944. It is constituted of eight members and one associate member, as follows :—

- (a) Two Government nominees.
- (b) Six elected producer members.
- (c) One associate member, the Director-General of Agriculture.

Members of the Board are appointed for a term of two years and are eligible for reappointment. The Electoral Committee which elects the producer members of the Meat Board also elects the members of the Wool Board.

The functions of the Wool Board are set out as follows :—

- (a) To promote the use of New Zealand wool, in existing or in new markets, by such methods of publicity or other means as commend themselves to the Board :
- (b) To promote, by way of subsidy or otherwise, scientific or industrial researches in relation to wool or sheep, with a view to the improvement of the quality of New Zealand wool, or the increased production thereof, or the discovery of new or improved methods of utilizing it, or generally in connection with the wool-production industry :

- (c) To act in combination or association with any body having similar functions, whether established in any other part of His Majesty's dominions or elsewhere, on terms of sharing the costs and expenses involved in that combination or association in such proportions or in such manner as may be mutually agreed upon :
- (d) To exercise such functions in relation to the production, handling, pooling, appraising, storage, distribution, marketing, and disposal of wool as may be conferred on the Board by this Act or by regulations made under this Act :
- (e) To advise the Government in relation to all or any of the foregoing matters.

The Wool Board in the past has been responsible for publicizing the value of wool, for attempting to secure continued markets, for wool research promotion, and for generally attending to matters concerning wool as a product.

(iii) THE WOOL DISPOSAL COMMISSION

The Wool Disposal Commission was established in 1945 as the New Zealand agent of what has become known as the Joint Organization, or the United Kingdom-Dominion Wool Disposals, Limited. This Commission was set up to facilitate the disposal of the enormous stock pile of 1,777,000 bales of New Zealand wool which had been accumulated during the war years without unduly affecting the price of current season wool offered each year. The Commission consists of eight members, four being representatives of the Government, one of whom is Chairman, three are representatives of the wool-producers, and one represents the Wool Brokers' Association. The three producer members are appointed on the recommendation of the Wool Board. All members serve a three-year term of office, and are eligible for reappointment. There is very close collaboration between the Wool Board and the Wool Disposal Commission. Under present arrangements the Wool Disposal Commission will be terminated when the stock pile of wool accumulated during the war years has been successfully disposed of.

(iv) THE DEPARTMENT OF LANDS AND SURVEY

This Department controls the tenure of land, land-settlement, and the leasing of Crown lands, and is the main authority for all matters in regard to land.

(v) THE DEPARTMENT OF AGRICULTURE

This Department is concerned with farming techniques. It has an advisory service for farmers and controls research into matters concerning farm animals.

(vi) THE DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

This Department controls most of the remainder of agricultural research—that is, other than animal research—and in particular controls research into grasslands which is carried out under the Grasslands Division of the Department.

(vii) THE SOIL CONSERVATION AND RIVERS CONTROL COUNCIL

This Council is responsible for a very wide coverage of powers in relation to soil conservation and rivers control and has been directing a considerable amount of research work into matters concerning both agriculture and land.

2. ORGANIZATION OF THE DAIRY INDUSTRY

Before dealing with what should be done in the sheep industry it is desirable to outline the organization of the dairy industry, which is a pastoral industry similar to sheep-farming. At the present time there is in the dairy industry—

- (a) A marketing authority known as the Dairy Products Marketing Commission ; and
- (b) An industry advisory body known as the Dairy Board.

(i) THE DAIRY PRODUCTS MARKETING COMMISSION

This Commission was set up in 1947, and is constituted as follows :—

- (a) Three representatives of the Government :
- (b) Three representatives of the Dairy Board :
- (c) An independent Chairman appointed by the Government after consultation with the industry.

The functions of this Commission are set out in the empowering Act, as follows :—

Section 11—

(1) The principal functions of the Commission shall be to acquire and market butter and cheese which is manufactured in New Zealand and which is intended to be exported, to determine as hereinafter provided the prices which it is to pay therefor, and to exercise and perform such functions, powers, and duties in relation to the marketing of butter and cheese in New Zealand as are conferred or imposed on it under this Act or otherwise howsoever.

(2) It shall also be a function of the Commission to report to the Minister from time to time concerning—

- (a) Trends and prospects in overseas markets in respect of dairy produce :
- (b) Movements in costs or prices, or other factors likely to prejudice the economic stability of the dairy industry.

Section 12—

In the exercise of its functions and powers the Commission shall comply with the general trade policy of the Government of New Zealand and shall comply with any general or special directions given by the Minister to the Commission pursuant to the policy of the Government in relation thereto.

(ii) THE DAIRY BOARD

The Dairy Board in the past has consisted of five members, four representing the producers and one the Government. This is, however, being altered, and on 1st July, 1949, the composition of the Board will be increased to eight members, these being one Government member, two producer members representing the New Zealand Co-operative Dairy Company, and five other producer members, one from each of five wards. In its system of election it is notable that the Dairy Board differs from the Meat and Wool Boards in that its members represent fixed geographical wards and the membership of the Board therefore represents a geographical coverage. On the other hand, the members of the Meat Board and of the Wool Board are elected nationally and the Boards do not necessarily have a district coverage. The dairy industry is organized on a co-operative basis, the suppliers owning the factories and electing at the annual meetings the company directors, who reflect the prevailing opinions of the suppliers. The members of the Dairy Board are elected for a ward by the dairy companies according to the tonnage output of dairy produce from each factory.

The functions of the Dairy Board may be briefly summarized as follows :—

- (a) Control of the Group Herd Testing Scheme and investigation into the dairying problems revealed by the testing scheme. This costs £20,000 yearly :
- (b) Collection of statistical information relating to the industry :
- (c) Management of the Cheese-crate and Butter-box Pools :
- (d) Joint management of the Dairy Research Institute, to which it contributes £17,000 yearly :
- (e) Joint administration of the Veterinary Services Council, to which the Board contributes £18,000 yearly :
- (f) Administration of the Bobby Calf Pools Central Executive :
- (g) Responsibility for conveying the views of the industry to the Government and partial responsibility for the industry's stability through the three members elected to the Dairy Products Marketing Commission :
- (h) Administration of the suppliers' zoning regulations.

Each year in each of the wards there is a Ward Conference, and representatives of all dairy companies in that ward attend, and the Board Chairman and other senior officers of the Board, as well as the ward member, are present. The Board members account for the Board's actions to this conference, which may pass remits for the Board's consideration. The representatives of the companies then account to the company directors, who in turn pass on the information to their shareholder suppliers. Thus there is a complete and continuous channel from the individual suppliers through the Ward Conference and the Dairy Board to the Government. This, we feel, is a most desirable factor.

3. PROPOSAL FOR SHEEP INDUSTRY BOARD

We consider that the dairy industry is the best organized agricultural or pastoral industry in New Zealand and that every effort should be made to promote the same degree of organization in the sheep industry. It must be realized, of course, that there are very many more difficulties in the way of promoting such an organization in the sheep industry than in the dairy industry. For example, one is dealing with many more classes of products, and these products themselves vary widely. Butter is the same commodity no matter where it is made throughout New Zealand, but wool varies very widely in all its characteristics. Under the wartime appraisal system there were no fewer than 955 types of greasy wool. Nevertheless, despite the difficulties in the way, we feel that the effort is worthwhile, and a start must be made immediately to reorganize the existing system to obtain an organization as efficient as that of the dairy industry. We recommend, therefore, the setting-up of a Sheep Industry Board. To effect this we suggest that the Meat Board, which is a marketing authority, should remain as such, just as the Dairy Products Marketing Commission is a marketing authority for the dairy industry. We desire to record our appreciation of the excellent work which the Meat Board has done on meat marketing. We consider that the present Wool Board should be reconstituted on a wider basis to form a Sheep Industry Board. This Board will, of course, include as an integral part of the sheep industry the beef cattle industry, as sheep cannot be farmed successfully under New Zealand conditions without the use of cattle for pasture control. The following, then, are our proposals for the Sheep Industry Board :—

(i) CONSTITUTION

We recommend that the Board be constituted of 11 members, as follows :—

- (a) Eight producer members representing eight wards divided as nearly as practicable on a sheep-population basis :
- (b) The Chairman of the New Zealand Meat Producers' Board, *ex officio* :
- (c) Two nominees of the Government, one of whom shall have a full knowledge of farm working conditions.

(ii) CHAIRMAN

One of the Ward members to be elected by the Board as its Chairman.

(iii) WARDS

The eight wards should be constituted as nearly as practicable on a sheep-population basis, and we attach hereto a map showing a suggested allocation of the eight wards at the present time. It is not practicable to divide New Zealand into eight wards with exactly the same sheep population as we do not consider it desirable to break such important factors as community of interest in a district, nor do we feel it expedient to cut across the organization of an existing branch of the farmers' own federation. Moreover, some districts are developing and will clearly have a much greater sheep population in the future. It will probably be necessary to redefine the wards periodically.

In each ward there should be set up an electoral college. The number of electorates could vary from ward to ward according to local conditions, but in each ward voting should be on the principle of one sheep, one vote, and the votes should be allocated on the basis of the last-published return of sheep-owners at the time the election is held. In each ward the electoral college will elect the ward member to the Board.

(iv) WARD CONFERENCES

It is apparent that the system of ward conferences has been very successful in the dairy industry, and we suggest that in each sheep industry ward there should be a ward conference every year at which a very thorough exhaustive survey can be made of sheep-farming in the ward. Such conferences should be attended by the Chairman and other members of the Board, by the officers of the Board, by senior officers of the Department of Agriculture, and by members of the electoral college for the ward.

(v) TENURE OF OFFICE

All members of the Board to hold office for four years.

(vi) FIRST BOARD

For the purpose of achieving continuity of policy in the appointment of the first Board, if there is a sitting member of the Wool Board, which is to be abolished on formation of the Sheep Industry Board, for any ward, then that member of the Wool Board will automatically become that ward's member of the new Sheep Industry Board. If in any ward there are two or more such members of the Wool Board, then an election shall be held between the sitting members to select the ward member of the first Board. If there are no Wool Board members in any ward, then an election shall be held to select the ward member.

In the first constituted Board the Southern and Northern members shall vacate office at the end of one year, and an electoral college shall be convened to elect their successors as provided for above. The Midland and Eastern members shall vacate office at the end of two years, the Wellington and Western members at the end of three years, and the Hawkes Bay and Canterbury members at the end of four years, thus ensuring the election of two producer members each year, and also a continuity of action and of policy between the existing Wool Board and the future Sheep Industry Board. We believe that this continuity is necessary in view of the fact that the existing Wool Board has commitments which obviously must be continued.

(vii) SECRETARIAT

The secretariat of the Wool Board to be continued in the meantime for the Sheep Industry Board.

(viii) FUNCTIONS

The following should be the functions of the Sheep Industry Board:—

- (a) To be an authoritative body to represent the sheep industry both to Government and to other interested bodies;
- (b) To be a correlating and directing body for research and improvement in the industry;
- (c) To have all the functions of the Wool Board suitably enlarged to cover the whole sheep industry, including the beef-cattle industry, together with any parallel powers possessed by the Dairy Board or considered to be desirable for the Sheep Industry Board;
- (d) To advise the Government in relation to all or any of the foregoing matters.

(ix) FUNDS

The present levy on wool of 2s. 6d. per bale levied by the Wool Board should be continued and levied for the Sheep Industry Board. In addition, the following levy on meat should be made additional to the levies at present made by the Meat Board for the Board's funds:—

On each quarter of beef exported: $\frac{1}{4}$ d. per quarter.

On each lamb and mutton carcass exported: $\frac{1}{2}$ d. per carcass.

These levies on wool and meat will bring in approximately £150,000, which is £30,000 more than the present revenue of the Wool Board. This sum should be sufficient for the initial expenses of the Board.

(x) PROPOSED WARDS

These wards have been allocated on the basis of approximately one ward for every 4,000,000 sheep in New Zealand. There are about 19,000,000 sheep in the North Island and about 14,000,000 in the South Island. It has proved necessary to divide one ward between the Islands. Wellington, therefore, will include a portion of the South Island in addition to a substantial portion of the North, but we have so allocated it that the area of South Island included with Wellington is such that the sheep-farming carried on there is similar in type to that carried on in the rest of the Wellington Ward. The Chatham Islands should be included with Canterbury Ward.

The wards should be--

(i) NORTHERN WARD

County.	Total Sheep,	
	1937.	1947.
Mangonui	58,172	58,882
Whangaroa	20,478	22,436
Hokianga	96,285	71,525
Bay of Islands	93,148	98,983
Whangarei	158,958	133,454
Hobson	119,176	122,863
Otamatea	106,960	109,834
Rodney	123,255	150,891
Waitemata	106,299	105,057
Eden	4,011	5,285
Great Barrier Island	12,127	11,156
Manukau	92,429	103,828
Franklin	127,240	145,399
Raglan	404,219	595,026
Waikato	113,097	192,961
Waipa	170,777	239,997
Otorohanga	134,500	192,724
Kawhia	77,645	102,495
Waitomo	398,550	550,786
Hauraki Plains	13,380	26,520
Piako	122,422	161,352
Matamata	171,693	331,557
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	2,725,021	3,532,951

(ii) EASTERN WARD

Coromandel	66,921	61,990
Thames	14,772	14,978
Ohinemuri	14,320	21,843
Tauranga	74,779	181,247
Rotorua	76,520	144,943
Taupo	14,476	36,426
Whakatane	60,118	74,156
Opotiki	96,896	91,709
Matakaoa	117,839	110,544
Waiapu	465,022	416,028
Uawa	235,432	219,375
Waikohu	647,140	572,512
Cook	780,971	679,550
Wairoa	666,963	650,874
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	3,332,142	3,274,177

(iii) WESTERN WARD

Taumarunui	144,177	188,274
Ohura	157,301	191,512
Whangamomona	77,014	89,883
Clifton	91,535	119,905
Taranaki	24,948	35,990
Inglewood	49,306	63,030
Egmont	24,663	22,619
Stratford	94,934	149,041
Eltham	76,467	81,181
Waimate West	9,469	9,534
Hawera	107,383	109,564
Patea	310,492	300,737
Kaitieke	96,560	115,736
Waimarino	301,533	327,132
Waitotara	230,767	214,862
Wanganui	498,537	444,085
Rangitikei	1,410,565	1,434,128
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	3,704,701	3,898,213

(iv) HAWKES BAY

County.	Total Sheep, 1937.	Total Sheep 1947.
Hawkes Bay	1,409,239	1,407,035
Waipawa	518,814	623,499
Waipukurau	179,291	199,639
Patangata	777,534	784,070
Dannevirke	358,240	418,048
Woodville	106,285	119,931
Weber	111,255	100,704
Akitio	300,635	266,231
Pahiatua	228,519	237,098
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	3,989,812	4,156,255

(v) WELLINGTON

Kiwitea	326,240	363,336
Pohangina	170,059	188,104
Oroua	276,740	263,316
Manawatu	211,311	194,310
Kairanga	162,899	169,457
Horowhenua	168,477	167,211
Hutt	132,885	121,934
Makara	76,718	77,186
Castlepoint	187,280	160,915
Eketahuna	172,616	200,760
Mauriceville	60,290	71,452
Masterton	557,148	460,864
Wairarapa South	248,613	254,358
Featherston	562,233	561,157
Waimea	295,675	296,902
Takaka	45,899	51,754
Collingwood	26,043	27,939
Buller	4,624	2,129
Murchison	53,633	42,760
Inangahua	14,763	19,097
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	3,754,106	3,702,941

(vi) CANTERBURY

Sounds	171,255	158,807
Marlborough	394,448	382,431
Awatere	366,297	283,966
Kaikoura	198,048	217,937
Grey	34,626	32,469
Westland	47,685	43,618
Amuri	406,987	345,387
Cheviot	209,875	209,747
Waipara	450,926	429,331
Kowai	92,888	102,977
Ashley	98,930	92,959
Rangiora	57,819	52,348
Eyre	86,462	74,376
Oxford	123,105	106,263
Tawera	109,933	94,298
Malvern	221,147	196,176
Paparua	63,278	55,335
Waimairi	7,458	4,467
Heathcote	13,989	9,142
Halswell	21,630	21,772
Mount Herbert	57,791	52,803
Akaroa	134,028	123,845
Wairewa	96,269	96,339
Springs	37,792	41,444
Ellesmere	126,145	112,043
Selwyn	298,264	232,347
Ashburton	1,217,142	1,138,032
Chatham Islands	100,561	121,788
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	5,246,778	4,832,447

(vii) MIDLAND

County.	Total Sheep, 1937.	Total Sheep, 1947.
Geraldine	393,789	387,437
Levels	259,814	274,176
Mackenzie	571,484	520,210
Waimate	715,522	719,144
Waitaki	741,567	746,549
Waihemo	163,149	159,633
Waikouaiti	99,036	105,462
Peninsula	15,961	23,105
Taieri	294,291	295,408
Vincent	472,810	419,985
Maniototo	469,763	407,346
Lake	292,579	232,289
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	4,489,771	4,290,744

(viii) SOUTHERN

Southland	1,917,905	2,561,022
Wallace	729,287	816,787
Stewart Island	3,716	4,100
Bruce	314,607	347,538
Clutha	540,639	671,185
Tuapeka	557,253	593,622
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	4,063,497	4,994,254

Maps of the proposed wards are included in the Atlas, Part Five, Maps Nos. 8 (i) and 8 (ii).

II. MARGINAL LANDS ADMINISTRATION

1. DEFINITION OF MARGINAL LANDS

Having dealt with the general organization of the sheep industry, we think we must give specific attention to the administration of the deteriorated or depleted lands, which our Warrant specifically requested us to examine closely. Generally speaking, we are very much averse to the creation of a large number of authorities, as we think that the more simple an administration is the more efficient and useful it will be. In view of the fact that the main trend of our recommendations is for the abolition of a considerable number of the existing authorities, we hesitate to suggest setting up a new authority. We considered whether or not the Land Settlement Board set up under the Land Act, 1948, would be in a position to administer the special problems relating to these marginal lands, in addition to its other duties. After discussing the matter very fully with the Permanent Head of the Lands Department, we have come to the conclusion that so specialized are the problems included under the general heading of "Marginal Lands," and so different must be the approach to the problem from the ordinary approach to land-settlement, there is no alternative but to set up a special authority to deal with marginal lands. We suggest, therefore, that there should be established a Marginal Lands Board to assist the Minister of Lands, and further suggest that this Board be administered by the Lands Department in the same way as the Land Settlement Board is administered.

That part of the sheep industry which is established on improved or good land is very well provided for under the present circumstances, so long as there is an equitable balance between costs and prices. Such an equitable

balance does exist under present conditions. We have found that, despite those favourable conditions which exist to-day, one portion of the industry is in a very unfortunate position in that, despite high prices for its produce, the revenue to the farmer is not sufficient to warrant his going ahead with a programme of development, or even in some cases of doing those things which are necessary to maintain his present level of production. This section of the industry we would group under the term "Marginal Lands."

There have been many arguments over the concept of marginal lands and many attempts have been made to provide a definition of "marginal." It appears to us, however, that most of the persons who have attempted to define marginal lands have gone astray by trying to define an economic concept in terms of pastures. The concept of marginality in economics was very thoroughly set out by Professor Marshall in his *Principles of Economics*, a work which has become the foundation of modern economic theory. Accepting Professor Marshall's definitions, we can divide lands in New Zealand into three types—economic, marginal, and uneconomic.

These three classes of land will be—

(i) ECONOMIC LANDS

Those lands which are economic for a farmer to develop and farm himself on his own financial resources, whether he has to borrow capital to effect the development or whether he has sufficient finance of his own on which to work. These lands, we consider, do not require any special assistance.

(ii) MARGINAL LANDS

Those lands which, over a long period of years, would yield sufficient production to constitute an economic gain to the nation if developed, but from which the return in the short period would not be sufficient to enable the ordinary individual farmer to carry out the development. These lands, we think, should be assisted by the Marginal Lands Board on the general principle that the State should pay the difference between the economic cost to the individual and the total cost. In final effect the State will recoup its investments out of the future production from the land.

(iii) UNECONOMIC LANDS

Those lands from which future production, under present-known circumstances, would never justify the cost of development. These lands should not be developed or helped until their possible production makes their development economic to the nation.

The definition of "development" work under (ii) should include work aimed at maintaining the present production of the land if that has a tendency to decline, and this should be eligible for assistance by the Marginal Lands Board. Productive development should also include all the costs of working or developing the land, cutting scrub or second growth, ploughing, tilling, sowing, top-dressing, fencing, stocking, erecting buildings, including farm-workers' dwellings and huts for scrub-cutters, musterers, and rabbiters, and all other things necessary for the farming of the land.

2. PROPOSAL FOR MARGINAL LANDS BOARD

(i) CONSTITUTION OF BOARD

We recommend the appointment of a Marginal Lands Board constituted as follows :—

- (a) Four permanent *ex officio* members: the Minister of Lands (Chairman); the Director-General of Lands (Deputy Chairman); the General Manager of the State Advances Corporation; and the Director-General of Agriculture.
- (b) One member appointed by the Minister of Lands for a period of five years who is a leading authority on grasslands development in this country. In this matter we recommend to the Minister consideration of the appointment of Mr. Bruce Levy as the first appointee under this section.
- (c) Two members appointed by the Minister of Lands for a period of five years, from a panel of names recommended by the Sheep Industry Board (or, pending the establishment of such a Board, by the Wool Board in consultation with the Dominion Council of the Meat and Wool Section of Federated Farmers) of persons with outstanding knowledge of the farming of difficult hill country.
- (d) One member appointed by the Minister of Lands for a period of five years to represent the lending institutions, to be selected from a panel of names submitted by the Associated Banks and the Stock and Station Agents' Association.
- (e) One member appointed by the Minister of Lands for a period of five years from a panel of names submitted by the New Zealand Workers' Union to represent farm workers on marginal lands.

(ii) SECRETARIAT

The secretariat of the Board to be provided from the Lands Department.

(iii) FUNDS

The legislation making provision for the constitution of the Board should also provide for the opening of a Marginal Lands Account from which advances can be made for the purposes of the Board. We envisage that very substantial sums will be required before any considerable improvement can be effected to marginal lands, but it is obvious that comparatively small amounts only will be expended in the first year. The whole question of availability of labour and materials must be taken into account in financing schemes, as it will not be desirable in all interests to authorize more than a limited amount of work in any year, otherwise there might be a tendency to divert labour and materials from other non-marginal lands. It is suggested that for the first year the sum of £250,000 should be transferred from the Consolidated Fund as the first contribution to the Marginal Lands Account. This will enable the Board to commence its activities, and at the end of the first year the position can be reviewed, when the Board will be in a position to estimate its further requirements. We should stress the fact that large sums will eventually be required, and in the national interests it is most desirable that they should be provided for the purpose of rehabilitating marginal lands.

(iv) POWERS

The powers of the Board should be made sufficient to enable it to carry out the scheme of work recommended for it.

3. METHOD OF ASSISTING MARGINAL LANDS

(i) SCHEME OF THE DEPARTMENT OF AGRICULTURE

Many suggestions have been brought forward from time to time for subsidizing the transport of fertilizers to make it economic to apply it to marginal lands. One such scheme was recommended by the Department of Agriculture following the report of the Parliamentary Agricultural and Pastoral Committee, which recommended that some scheme be commenced.

This scheme provided for a subsidy on fertilizer used for the development of marginal land. Marginal land was defined as—

(a) Unploughable surface sown pasture land so deficient in clovers that the growth response following the first and second applications of 1 cwt. to 2 cwt. of phosphatic fertilizer is very much less than that secured on grassland with a satisfactory grass-clover ratio.

(b) Land in scrub and/or fern to be sown in permanent grass after ploughing, disking, or surface sowing after burning.

This subsidy was to be administered by Marginal Land Committees. The Department of Agriculture was to draw up rules for good husbandry, and, using these rules, each county committee was to draw up local rules for marginal-land improvement covering the quantities and types of grass and clover seeds to be used, cultivation methods, kinds and quantities of fertilizers, and general advice on stock management to be followed on marginal land-improvement work. Certain limitations were to be made on the amount of fertilizer which was to be made available in each year. The amount of subsidy was to be from £4 to £5 per ton on fertilizer allocated under this scheme for the top-dressing of marginal land.

(ii) SCHEME OF MR. L. WILSON, OF TE KUITI

A further scheme for the top-dressing of marginal land by means of a subsidy on fertilizer was presented to us in considerable detail by Mr. L. Wilson, of Te Kuiti, and by Mr. Bull, at Hamilton. This scheme was based on the ability of a farm to pay for fertilizer. There would be a sliding scale for fertilizer-prices based on the gross production per acre for the previous year. The suggested scale was £2 per ton where the gross production was 40s. per acre or less, rising by £1 per ton with each rise in production of 5s. per acre. There was to be published annually an index to the production costs of various types of land.

(iii) METHOD RECOMMENDED

Without dealing with the details of these two schemes, we must say that both are in our opinion short of what is wanted, because they are based entirely on a scheme of assistance by a subsidy on fertilizers. This would be quite effective if the obstacle to improving marginal land was solely the difficulty of top-dressing, but to our mind the obstacles to improving marginal land are fencing, scrub-cutting, grassing, manuring, access (including bulldozed tracks to give access for top-dressing), houses for farm workers, and many other factors, including, of course, the existing position of the mortgages over the land. We cannot see then how any subsidy on fertilizer could remedy the position to an effective degree. It appears to us that the correct approach is not to tackle five or six different problems by placing a subsidy on one item. On the contrary, we think that the only approach to the matter is to draw up a complete plan for each farm in question and to base the assistance given on the whole plan. Only in this way will it

be possible to know that the assistance given will result in the ultimate establishment of that land as economic land and its transference eventually out of the sphere of operation of the Marginal Lands Board.

Apart from this major and, we consider, over-riding question of practicability of the two schemes submitted, we think there were difficulties in regard to detail in both schemes; notably in regard to the definition of marginal land in the scheme submitted by the Department of Agriculture (a definition with which we cannot agree) and in regard to the possibility of abuses in the scheme submitted by Mr. Wilson. However, in view of our general rejection of the principle on which both these schemes are based, we do not propose to analyse them further.

We recommend a system of advances by the Board from the Marginal Lands Account :—

- (a) Such advances to be based on a complete plan for the economic establishment of the farm in question :
- (b) These advances should be for productive development as we have defined it under the definition of marginal land :
- (c) To be free of interest or repayment for a period of up to five years at the discretion of the Board, or for longer periods if the Board thinks fit :
- (d) Power for the Board to write off all or any portion of any advance if it considers such course desirable, having regard to our recommendations that the State should pay the difference between total cost and economic cost to the individual :
- (e) The Board should be able either to make an advance or to have the work done if it considers it more economical for the Board itself to do it, either directly, or through the Ministry of Works, or through any other agency which may be convenient.

(iv) AMENDMENT TO TRUSTEE ACT, 1908

There should be an amendment to the Trustee Act, 1908, to enable trustees who control mortgages over marginal lands to reach an agreement with the Marginal Lands Board, including the writing-off of interest and/or the reduction of the mortgage if such a course is in the interests of establishing the land, and thus in the long-term interests of the beneficiaries of the trust though perhaps against their immediate interests.

(v) ADMINISTRATION OF SCHEME

We like the suggestion in the scheme of the Department of Agriculture which provides for Marginal Lands Committees, although we do not think they should be set up on a county basis, as this would involve altogether too many Committees and an over-elaborate organization. We consider the Board should have power to constitute any area a Marginal Lands Committee District and to alter or abolish such districts as it considers necessary. When any area has been declared a Marginal Lands Committee District, the Board should appoint a Marginal Lands Committee for the area, composed as follows :—

- (a) The Commissioner of Crown Lands for the District (Chairman) :
- (b) An officer of the Department of Agriculture.
- (c) Three farmers appointed by the Minister of Lands, after consultation with the Sheep Industry Board, who are successful farmers on the varying types of land to be considered by the Board in such district.

The Committee should have power to co-opt additional associate members without voting-power.

To qualify for assistance from the Marginal Lands Account a farmer should apply to the Commissioner of Crown Lands or to the Marginal Lands Board for assistance. The Field Inspector of the Lands Department, in company with the Instructor in Agriculture and at least one of the farming members of the Committee, should then inspect the property, discuss the position with the applicant, and, in consultation with him, draw up a proposed programme or plan for establishment of the farm on a proper economic footing. This would then be considered by the Committee and sent to the Marginal Lands Board with a recommendation, including, if necessary, particulars of any negotiation with mortgagees who hold interests in the farm. We think that this method of administration would be simple and practicable.

To execute the policy of the Board and to study the whole problem of marginal lands it will be necessary to set up in the Lands Department a special Division for such purpose. It will be most necessary in staffing such a Division to ensure that the personnel are fully acquainted with the whole problem of marginal lands, and also that they have a sympathetic understanding of the psychology of the farmer on such lands, in order to approach the problem in a realistic manner which will earn co-operation from the farmers concerned. It will probably be desirable that specialized marginal lands officers should be attached to the staff of the Commissioner of Crown Lands in each district.

Part VI of the Land Act, 1948, has made provision for the Land Settlement Board to make advances to farmers on Crown land for various purposes. We gave serious consideration to the possibility of all advances for marginal land being made under this Part of the Act, or by its extension to include freehold lands as well as Crown lands. All ordinary straightforward advances for land improvements on Crown land should be made by the Land Settlement Board under Part VI of the Land Act, 1948, and only those of a character which are uneconomic in the first instance and therefore deserving of more generous terms should be referred for consideration by the Marginal Lands Board. There may be some danger of overlapping between the two Boards, but both will be administered in the one Department, the Lands Department. It will be possible for that Department to administer advances on Crown lands as it thinks best—that is, under Part VI of the Land Act or from the Marginal Lands Account.

III. ADMINISTRATIVE DEPARTMENTS

Having examined the industrial organization, we now turn attention to administrative organization. We have said before that there are four principal administrative channels. We consider that there should be only three administrative organizations concerned with the sheep industry. Those administrative organizations should be—

- (a) The Department of Lands and Survey, which will have responsibility for all matters concerning land, its occupation, the financial position of the land-owner and his ability to occupy and farm the property, and for the conservation of land, its development and settlement :

- (b) The Department of Agriculture, which will be responsible for the study of farming techniques and the general improvement of methods of farming the land, including the general direction of agricultural research :
- (c) A Rivers Control Council, which will be responsible for the maintenance of rivers in set courses.

1. THE LANDS DEPARTMENT

(i) MARGINAL LANDS DIVISION

To give effect to the recommendations which we are bringing down in this report two new Divisions or Sections will have to be constituted in the Lands Department. The first of these will be a Marginal Lands Division to handle the work which we are suggesting should be entrusted to the Marginal Lands Board. This division will need to have a very wide and detailed knowledge of marginal land throughout New Zealand. It will require to study very thoroughly the economic position of such lands, and for the functioning of the Marginal Lands Scheme it will be required to estimate on a broad national basis whether or not, and to what extent, the development or rehabilitation of land is economic, both to the farmer on the land and to the nation as a whole. This is not work which will be accomplished in a very short period, and the Division will have to work out a long-term scheme of careful development programmes.

(ii) LAND CONSERVATION DIVISION

The second new Division will be an expansion of the Land Utilization Section to handle all matters of land conservation and utilization. There is at present a Land Utilization Committee, consisting of representatives of the several Departments interested, and we consider that this Committee should be the basis of establishment of a committee with interests wider than land utilization, and embracing also the whole programme of conserving the condition of the land. In this work the Lands Department will have to be careful that it does not clash with the work of the Department of Agriculture, but we are certain from the investigations we have made, and from what we have seen of the co-operation between these two Departments, that there will be full co-operation. The programme of land conservation should be carried out with the assistance of a departmental working committee as provided for in the Section following on Land Conservation.

2. THE DEPARTMENT OF AGRICULTURE

We consider that the Department of Agriculture should be the administrative authority on all matters associated with farming technique, farming methods, and farm production and improvement. It should also have the direction of all agricultural research, whether that research is done by the Department itself, by the Department of Scientific and Industrial Research, or by the University and Agricultural Colleges.

We have discussed the organization of this Department with the Director-General of Agriculture, and we think that the internal reorganization of his Department is a matter which we can best leave to him, although it will be necessary for some reorganization to take place if the Department is to fulfil the very responsible tasks which will be demanded of it.

In addition to the Live-stock, Extension, Horticulture, and Dairy Divisions, two strongly organized and ably directed divisions are necessary, as follows :—

(i) RESEARCH DIVISION

We have already said that the Department of Agriculture should be the single authority for all matters concerned with farming techniques and the improving of general farming methods. At the present time research into agricultural matters is done in many places and under the direction of many bodies. Some is done by special Institutes, such as the Wheat Research Institute ; other research is handled by the agricultural colleges ; some is done by the Grasslands Division of the Department of Scientific and Industrial Research ; some by other Divisions of that Department, and some by the Animal Research Division of the Department of Agriculture. It is most necessary to get co-ordination and correlation. All agricultural research should be correlated under the direction of the Director-General of Agriculture. This does not mean that the Department of Agriculture should do all the research work.

It is most desirable that other agencies should continue to do some of the work in order to bring many minds and many different approaches to the solution of the problems, but it is most important that the Director-General of Agriculture should know what research is being done and the results being obtained, because it is naturally to him and the officers of his Department throughout New Zealand that the farmers will look for information on methods of improving their farms, or the solution of their farming problems. The Director of this Research Division must have drive and energy, and the ability to correlate research.

(ii) SHEEP DIVISION

We also consider that there should be in the Department of Agriculture some liaison similar to that which has been evident between the Director of the Dairy Division of the Department of Agriculture and the Dairy Board and dairy industry. This has been wholly to the benefit of the dairy-farmer. We are of the opinion that the sheep-farmer is entitled to expect a similar service, and there should be as the Director of a Sheep Division an officer of the Department of Agriculture whose duties consist solely of matters relating to the sheep industry, and who will be in a position by his close contact with the industry at all times to know the current position of the industry, its economic position and problems.

Both farmers and Government will be able to look to the Sheep Industry Board and the Director of this Division for ideas and suggestions for the improvement of the industry and the solution of its problems.

In the past the Department has concentrated more on knowledge of pastoral conditions and animal or veterinary matters than on the general economic position of the farmer and his methods of farm-management. As a result we are of the opinion that many of the recommendations which the Department has been making from time to time for the improvement of sheep-farming methods have been impracticable, by reason of the fact that it was an economic impossibility for the farmer either to undertake the expenditure involved, or to have managed the improvements suggested as part of his practical management of the farm to give him an adequate living. We consider that if this can be corrected, and a strong Sheep

Division set up to do the work which we have outlined, then the Department of Agriculture should be much more effective in persuading the sheep-farmers of New Zealand to make the improvements which the Department has been recommending from time to time.

(iii) IMPORTANCE OF DEPARTMENT

The work of the officers of the Department is specialized work of great importance to the sheep industry. The Director-General has informed us that he finds it difficult to retain research staff of the highest qualifications because of the low salaries which he is permitted to offer in comparison with the salaries paid overseas. This being the case, the Government should instruct the Public Service Commission to increase immediately the salary scales of such officers. We cannot emphasize too much the fact that the leading industry of New Zealand requires the very best treatment which the Public Service Commission can devote to it.

We have been impressed by the knowledge possessed by the Department of Agriculture and its officers on all matters of farming practices and techniques, but we are concerned that this knowledge does not appear to be transmitted to the farming community as effectively as it might be. The *Journal of Agriculture* is an excellent publication, and we hope the position will soon be reached that every farmer in New Zealand not only gets a copy but reads it, because we consider that it is a publication to which farmers can look with a sense of security and confidence. Possibly the Department should give attention, however, to the methods of transferring knowledge. The articles in the *Journal* are expertly written from a scientific and technical point of view. If, however, the *Journal* were to make constant references to prices, costs, and returns, including notes on economic trends, and in all its recommendations to farmers show the farmers what the financial result might be in regard to the adoption of any plan, we are certain that the knowledge of the Department of Agriculture will be increasingly made use of by farmers.

IV. ADMINISTRATION OF SOIL CONSERVATION AND RIVERS CONTROL

1. THE NATURE OF EROSION IN NEW ZEALAND

No problem associated with the land has received more publicity in recent years than soil erosion, and we consider it right and desirable that the public should be awakened to any danger which threatens the land. The public, however, will be shocked to find that much of what has been spoken, or written, on the subject of erosion in New Zealand can only be described as misleading propaganda.

We think it imperative that erosion should be considered in its correct perspective. To do this one must consider two things. Firstly, the aim or objective we are attempting to reach in our land policy, and secondly, the geophysical development from which our land derives its contours.

(i) THE AIM OF LAND POLICY

There should be no argument over the aim, nor do we think there could be any such argument. The aim is to have as much of our land as possible permanently available in such a condition that it will give the maximum production. If the soil is carried away leaving only stones behind, the

position would be disastrous. It would be the same if good soil were eroded, leaving infertile soil behind which will not support pastures. But if what is left behind will support good, high-producing pastures, and will continue permanently to carry such pastures, there is no threat to future production.

Consequently, erosion is only a problem to agriculture when it leaves behind a deteriorated pasture or one that may deteriorate as a result of the erosion, or if it removes the soil and leaves the land infertile. This must be the basis of any classification of erosion as a problem. The causes of the deterioration of pastures are set out under "Condition of the Land" in Part Three of our report. In point of fact, we do not consider erosion to be a major cause of deterioration.

(ii) THE HISTORY OF LAND

The second factor is the geophysical development of the land. This is a process which began millions of years ago. It must be stressed that the process is not complete and the forces of Nature are still continuing to shape our land contours. If one could have viewed New Zealand immediately after the ice retreated from the land (which took a very long time), one would probably have seen a land of steep-sided mountains with narrow valley-floors. Our present rounded, undulating hills would have been non-existent. But as soon as the ice retreated the land was exposed to the natural forces of erosion. Rain, continually washing the soil, took the sharp tops from hills and left the rounded hill-tops that we know to-day. Rivers carried the soil away and deposited it at the foot of the hills to form the first plains. In the high mountains of the south the alternate heat of summer and frost of winter broke up the rock into shingle, and the rivers carried it down to the sea, where it formed the flats of the Canterbury and Westland Plains. This process of wearing down on the hills and building up the low country is not yet complete. All the forces at man's disposal throughout the world, if linked together, could not stop it. It cannot be overstressed that erosion is a natural force which will go on despite any attempts to stop it.

(iii) EROSION NOT A MAJOR FACTOR OF NATIONAL CONSEQUENCE

We have travelled widely throughout the country. We have inspected sheep-farms and the pasture coverage of the land wherever we have been. We have seen and examined the cases of erosion which it is claimed are destroying our heritage and prejudicing our farming future. Yet we would not place erosion as a major factor of national consequence to the sheep industry. Other than in the localized Poverty Bay - East Coast area, we have seen no justification for the flood of alarmist propaganda which has worked up public opinion.

We believe that the erosion which has occurred has been due more to the effects of deterioration and depletion than to any naturally erosive characteristics of farming in New Zealand. If the recommendations we have made as regards assistance to marginal lands, land utilization, provision of fertilizer, extermination of rabbits, and replacement of cover on depleted areas are all carried out, there will be no accelerated erosion on a national scale in New Zealand.

(iv) RIVERS CONTROL

The principal difficulty arises from the fact that rivers in building up flats have a tendency to flow in one channel for a period of years, then, when that channel is higher than the surrounding flats, to break into another channel and build that up. In such a manner over a period of hundreds of years, perhaps, they work back and forward across great areas. They do not show any consideration for the farmer who has to maintain fences, pastures, and buildings. He cannot move with the river. It is realized, therefore, that rivers control must be undertaken to save the farm lands along the river-banks. Even with such control, it must always be appreciated that the need for control work will be perpetual, owing to the necessity to maintain the river in a set course free from obstructions. This work of confining a river to a set course is known as rivers control, and we are of the opinion that it is necessary and should be continued, although administered in proper perspective. We see no reason for a national coverage of rivers-control authorities. It appears to us that the work can be handled satisfactorily by the counties in conjunction with the Ministry of Works, except in areas such as—

- (1) Lower Clutha basin (Otago);
- (2) Canterbury Plains (from the Waitaki to the Ashley);
- (3) Lower Manawatu basin (below the Manawatu Gorge);
- (4) Hawkes Bay (the Tutaekuri and the Ngaruroro); and
- (5) The Poverty Bay - East Coast area.

(v) SOIL CONSERVATION

It is when we come to soil conservation as distinct from rivers control that we cannot share the opinions of the Soil Conservation Council. The whole sheep industry is most apprehensive of the position that has developed. The high-country pastoralist is seriously alarmed at what he views as a threat to his very existence. The principal Departments of State controlling land and agriculture are also perturbed to think that sweeping authority in regard to land utilization should ever pass into the hands of local organizations. We can say unhesitatingly that we share the general fears. Where a small secretariat to the Soil Conservation Council might have performed good work through established agencies of the Lands and Works Departments, on lines of farming policy laid down by the Department of Agriculture, there has arisen a mushroom growth of Catchment Boards which has developed into a veritable empire within our shores claiming powers far exceeding those ever claimed by the Crown itself. It has been suggested that the Catchment Boards will have large technical staffs which we consider would be a duplication of the services of existing Departments. It was also suggested that the Catchment Boards wished to take over some of the high-country lands for soil-conservation purposes. At the same time we were told that Catchment Boards would tell the pastoralist what he would be allowed to do, but would pay no compensation if it affected the landholders' living. If present trends are allowed to continue there will result an unjustifiable multiplication of authorities and a duplication of staff and plant. There must be only one Government in New Zealand acting through its established official agencies, the Lands Department for land administration, and the Department of Agriculture for farming technique, with the Ministry of Works as engineers. We cannot envisage anything about soil conservation that these agencies cannot do. We repeat,

there should be only one administrator of land, and there should be no interference with any person's tenure of land save by the Director-General of Lands, who, we are convinced from our investigations, acts always in consultation with the Director-General of Agriculture. We strongly recommend to the Government that this should be made an absolute rule.

(vi) MISLEADING INFORMATION

We cannot traverse in detail all the instances of misleading information on soil conservation that have been brought to our notice, but one case stands out and should be mentioned individually. At Tekapo the South Canterbury Catchment Board, as a part of its prepared deliberate evidence, placed before us a map of the Orari basin, many parts of it being shown as severely eroded. From an examination of the map it appeared to us that the area was in a very bad condition. We were surprised, therefore, when before the end of the sitting one of the farmers whose property was the chief property in the area mapped challenged the information as being grossly untrue. Consequently we arranged to return later to the area, and rode over it on horseback. We took with us neither the Catchment Board nor the farmer, but we did take with us the Agrostologist of the Department of Agriculture and a prominent South Canterbury farmer with a thorough knowledge of local high-country conditions. We examined the pasture coverage closely, and found it in good order. While we saw some geological erosion we found no examples of accelerated soil erosion. In fact, we congratulated the owner on the generally good condition of his land. We must therefore fully uphold the farmer's claim that the map in question was grossly misleading. As this map was apparently based on an official map in Bulletin 92 of the Department of Scientific and Industrial Research entitled "Soil Erosion in the South Island," the accuracy of all such erosion maps is questionable.

We are concerned also about the bulletins on soil erosion which have appeared, and which we can only describe as propaganda rather than scientific fact. In particular we think that Bulletin 92 should be entirely revised. We view with concern the damage that may be done by copies of this bulletin held in libraries and by educational institutions, and recommend that it be replaced by the revised edition. For the future no bulletins on the subject of land and agriculture should be issued under the authority of Government unless they bear the express approval of the Directors-General of Lands and of Agriculture to the text, and both of these officers should satisfy themselves that the statements included are facts.

(vii) EFFECT OF PROPAGANDA

It appears that the press and the public have been duped by constant propaganda. We are amazed at the effect of this propaganda. People who do not understand anything about farming have come to us and said, "Oh, yes, I know about this erosion: it's terrible;" but they wouldn't worry about rabbits or the invasion of manuka on farming country, both of which are real threats. It is inconceivable that in our time the New Zealand public should have been so completely misled by propaganda. Yet, unfortunately, that is the case.

We do not blame the Government or the Legislature for this. We feel sure that in passing the Soil Conservation and Rivers Control Act the Legislature did not contemplate a huge organization which would speak of spending £200,000,000 as it has spoken of to us. We are convinced that the

Government itself must be uneasy about the position and that the established State Departments are opposed to some of the acts projected or being done. The policy of the Soil Conservation Council was submitted to us as follows :—

The main objective of the Council is the conservation of the soil and its fertility. To obtain this objective the Council aims at the best use of the land according to the country's needs and the capabilities of the soil, having due regard to the requirements of each particular catchment. To attain this end it is undoubtedly necessary to assist the farmer to conserve his soil. This assistance will have to be both financial and technical. The Council is also quite satisfied that, to attain its objective completely, rural life will have to be made more attractive, but it has not yet considered details as to how this should be done.

Reference has been made, in previous evidence, to the Soil Conservation and Rivers Control Act as "disastrous." This no doubt referred to the fact that the Act did not provide for compensation in the case where land is closed up for soil-conservation purposes or where other action leading to a reduction in farming operations is taken. Although no compensation can be claimed in these cases, the Council has every intention of assisting the farmer in every possible way to restore the fertility of his soil and the grazing-capacity of his land. There is no intention of loading the land, beyond its capacity to pay, for any kind of work be it soil conservation, rivers control, drainage, or any other work associated with soil conservation.

Simultaneous development of its conservation work in five closely related and inter-dependent fields is necessary.

Defining the Problems by Field Surveys.—The first essential step is defining soil-erosion problems and assessing the conservation requirements by field survey in each catchment. For this purpose soil-conservation surveys combining the findings of topographic, soil, type and degree of erosion, climate, and land use surveys are necessary. They provide data from which the land capability and conservation needs of each farm in relation to the entire catchment can be assessed. In many regions one or more of these surveys has been undertaken, but in most cases further survey work is needed to complete the inventory prior to collation of the data. Such data is also required for the implementing of the Council's soil conservation proposals and Catchment Board by-laws. The field-work will be organized through the different Departments, and the collation of data will be undertaken by the Council's staff.

Demonstrating Conservation Measures.—The second step is the establishment of demonstration farms on the major problem areas in each region. It is most necessary to have one in each Catchment District to give a lead to the Boards in developing positive action with their co-operation. Because of the necessity to modify many aspects of farming, of trying measures that have unknown effects and of maintaining continuity of records over long periods, the Council intends to purchase farm units for this purpose. Successfully demonstrated practices can be extended further in the farming community by co-operative demonstration, which is the most effective way of doing this phase of the work. It is necessary that this should be done in close association with, or by, the Catchment Boards and the Fields Division, Department of Agriculture.

Investigating Erosion Problems.—The third step is the investigation of fundamental erosion and conservation problems, the chief of which are the causes of the various types of erosion and the ways and means of preventing and controlling them. At the outset records must be kept over considerable periods of climate, comparative stream-flow, run-off, and soil loss by sheet, wind gully slip, flow and creep erosion, while records of changes in vegetation, soil fertility and stability to measure the effect of various conservation practices are essential. The investigation work necessary in erosion and conservation problems is of sufficient magnitude, importance and variety to involve team work of specialists in soils, grasses, biology, farming, and forestry. In order to do it effectively teams of specialists must work in the field together and be closely associated with laboratories. This involves accommodation and handiness to centres from which staff would be available. Accordingly it will be necessary to establish research stations near centres of population—say, in the Wellington and Canterbury Provinces. At such central stations basic research would be done on the erodibility of soils and related factors, on the reaction of small catchments to varied management and of vegetative and mechanical conservation measures. Local adaptation and trial of new practices could well be effected at substations on the regional demonstration and research farms—on other departmental experimental areas and on farms where soil conservation operations were being assisted by the Council.

Conservation Operations on the Land.—The fourth step of doing conservation work in the field has necessarily been guided by opinion and experience. To date, acquisition of land for conservation purposes has been confined to areas not suitable for farming. As there are very large and important areas not suitable for farming, the retirement of these for preservation, planting, or regeneration must become a major activity. Action to date in subsidizing tree-planting on eroded land and subsidizing soil-conservation works of a special character must be followed up with assistance to oversow, top-dress, spell, fence, and modify sheep and cattle ratios, in order to control erosion. More difficult, and even more important, is positive action to prevent the onset of erosion by adopting similar measures at an earlier stage.

Information Service.—The fifth step is the development of an information service to meet the needs of staff, Catchment Boards, educational institutions, and the man on the land. Part of this service has been inaugurated, and publicity by way of bulletins, film strips, movie films, and a mobile cinema unit and displays at agricultural shows has been undertaken, but as yet the surface only has been scratched. Information arising out of surveys and research work and experience from demonstration farms and field operations, as well as overseas experience and data, has to be selected, collated, marshalled, and distributed through the most appropriate channels to the people who need it.

There are four major projects involved in restoring the balance between land use, vegetation, soils, slope, and climate.

Progressive recuperative treatment of upwards of 14,000,000 acres of natural grasslands (the high- and low-country tussock), by spelling, seeding, rabbiting, fire-control, reduced grazing with more cattle and fewer sheep for a convalescent period at least, planting of shelter and wind breaks, and the greater production of supplementary feed to obviate overgrazing during lean periods. An approximate estimate of the cost of such a programme is £3 per acre.

Conservation treatment of upwards of 10,000,000 acres of North Island hill country by the introduction of suitable clovers and grasses by surface sowing and top-dressing, modified grazing and spelling, adequate fencing, a higher cattle-sheep ratio, and the production of supplementary feed, particularly cattle feed. Where the land can be top-dressed with phosphate the job will not be difficult, but on poorer, more inaccessible land slow rebuilding under a cattle economy and the introduction of lower fertility demanding clovers (*Lotus major*, trefoil, and strains of white clover) must be tackled. Regrassing of eroded land, stabilizing slopes by trees and grass, gully-control measures, and extensive planting of very steep land is essential. This may involve an average cost of up to £8 per acre, but a permanent carrying-capacity of the equivalent of one and a half sheep per acre can be assured on land treated.

Modified use of ploughable land : Upwards of half of all ploughable land in New Zealand is on slopes which suffer at various periods from sheet and wind erosion principally. Small losses from this highly productive land are in the aggregate probably more serious than from the aforementioned land. The land is sufficiently productive to carry the added cost of conservation measures, so early action to introduce the necessary modifications is essential. The work hinges on building up the fertility of the soil with fertilizers, lime, and soil restorative crops, grasses, and clovers in well-planned crop rotations, greater use of live-stock and the use of overseas contour cultivation, strip cropping and contour pasture furrowing, and adequate protected drainageways. Further drainage, irrigation, and flood-control work are also needed on much of this land. Probably as much as 6,000,000 acres requires treatment along the lines indicated above which will involve an outlay of from £8 to £20 per acre the greater part of which the land can well afford to carry though individuals may not be able to finance it directly.

Forestry and protection work : Owing to the very hilly mountainous type of land that dominates the topography of New Zealand, 52 per cent. of it being too steep or high for farming, the best utilization lies in the production of native and exotic forests and in its use for water-conservation purposes over an area of 34,000,000 acres. Large areas unsuitable for native or exotic forests, including mountain areas, must be planted for protection purposes or regenerated to native plant cover over an unknown area. In addition, at least 3 per cent. of each farm requires trees for shelter and farm uses, which will involve the planting of upwards of 1,000,000 acres of trees.

2. GENERAL RECOMMENDATIONS

(i) ABOLITION OF CATCHMENT BOARDS

Having regard to all the above considerations, we think that Catchment Boards have no essential functions to fulfil. We therefore recommend that Catchment Boards be abolished. In correcting one extreme, however, we do not wish to be carried away too far to the other extreme. The work of soil conservation must go on, but should be the responsibility of the Lands Department. As regards rivers control, we wish to say that the work already done is good and has been well done. It must be extended, but only in the limited areas where it is necessary and not to any extreme extent. We should mention the particularly good work done on the Otaki River and on the Waimakariri, the latter a continuation of the work done by the previous River Trust. Credit is due to the Minister of Works for the machinery which has been brought to river-work, and for the amalgamation of small River Boards.

(ii) DIVIDING LAND CONSERVATION AND RIVERS CONTROL

It may be asserted that soil conservation and rivers control are one integral problem, that they cannot be separated, and that they must therefore be administered together. If this were the case, then it must also be held that both are only a part of a larger integration of interests, land occupation. In that case the whole subject would be a matter for the single administration of the Lands Department, aided, as it always is, by the Department of Agriculture. However, we do not view soil conservation and rivers control as integral parts of one subject. We believe they are two separate subjects divided as follows :—

Soil Conservation.—The maintenance of the land in such a condition that it will maintain permanent productive pastures. We consider the correct term should be “Land Conservation.”

Rivers Control.—The maintenance of rivers in such set courses that they will not endanger farm lands or towns and cities.

3. METHOD OF ADMINISTRATION

The technical problems of erosion we will consider under clause (2) of our order of reference later ; we are here dealing with administration, to which end we recommend :—

(i) RIVERS CONTROL COUNCIL

The Soil Conservation and Rivers Control Act should be amended considerably. The questions of soil conservation and of rivers control should be divorced and a new Act should be a Rivers Control Act and the Council should become a Rivers Control Council. As probably by far the greatest proportion of the work of the existing Council is rivers control, and this work has been well done, we consider that the constitution of the Council should remain as at present and that it should have all the powers considered necessary to do rivers-control work.

(ii) RIVER CONTROL AUTHORITIES

In most areas throughout New Zealand we consider that adequate rivers control can be practised through the local county organizations and the Ministry of Works without any need for special authorities. In some areas, however, it is obvious that the task of confining rivers to their courses is

much greater, and in these areas we suggest the creation of a Rivers Control Authority with the specific powers necessary to handle the channelling and control of rivers in specified areas.

The main purpose of these authorities will be to decide what should be done and to levy the rates which will be chargeable on the lands being protected, and, as at present, Government grants should be available. We consider, therefore, that a Rivers Control Authority should consist of representatives of each County, Borough, or City Council in the area, presided over by the District Engineer of the Ministry of Works. As far as possible we consider the heavy engineering work should be carried out by the Ministry of Works, which will be in a position to use the necessary powerful machinery.

(iii) LAND CONSERVATION

The whole subject of land conservation should be placed under the administration of the Department of Lands. At the present time there is in the Lands Department a Land Utilization Section, and since the utilization of land and its conservation are naturally tied together, we feel the Land Utilization Section should be made into a full Land Conservation and Utilization Division, with a suitably qualified and responsible Director. The division, then, as an integral part of the Lands Department, will be responsible for the maintenance of the land in such a condition that it will carry permanent productive pastures and for the devising of any measures necessary to ensure such an end.

The programme of land conservation should be carried out with the assistance of a working committee, presided over by the Director-General of Lands or the Assistant Director-General, and comprising also the Director of Land Conservation, an officer of the Department of Agriculture, an officer of the State Forest Service, and two farmers, one from each Island, selected from a panel of names submitted by Federated Farmers. If necessary, an officer of the Ministry of Works should attend when any engineering matters are being discussed.

There is no doubt that money will be required for land-conservation work. This should be made available as required.

The local application of land-conservation programmes can be left to a local Land Conservation Officer attached to the staff of each Commissioner of Crown Lands, and this officer should have the assistance of a working committee consisting of the Instructor in Agriculture, an officer of the State Forest Service, local farmers, and an officer of the Ministry of Works, if required. Recommendations for grants for land-conservation purposes should be made by this committee to the Lands Department, which should be authorized to approve such grants.

(iv) SPECIAL POSITION IN THE POVERTY BAY - EAST COAST AREA

One district in New Zealand, however, on account of the nature and magnitude of its problems, will need a more extensive organization. Therefore, a special authority should be set up for this area alone, consisting of representatives of the State Departments concerned, the farmers, and the local authorities, and this authority should be charged with the specific task of recommending to the Lands Department the steps which are necessary in this particular area. The Chairman of this authority should be the Commissioner of Crown Lands.

The effects of erosion on the occupation of the land are stated in detail in the section of our report entitled "Condition of the Land" in Part Three following.

PART THREE--RECOMMENDATIONS ON FARMING PROBLEMS

I. AVAILABILITY OF LAND; II. CONDITION OF THE LAND; III. PRODUCTION DIFFICULTIES; IV. LABOUR AND COMMUNITY;
V. MISCELLANEOUS (LOCAL)

I. AVAILABILITY OF LAND

Special clause (1) of our Warrant: "The availability of land for sheep-farming and the opportunities available for taking up land for such purpose."

1. FORMS OF CROWN TENURE

(i) PRIOR TO THE LAND ACT, 1948

In considering this clause in our order of reference we have deemed it advisable, in view of the evidence placed before us, to review first the systems of tenure by which Crown land is made available for sheep-farming. At the date of our appointment, August, 1947, the following forms of Crown leasehold were in existence:—

Tenure.	Section of Land Act Under Which Title Issued.	Term of Lease or Licence.	Right of Renewal.	Right of Freehold.
1. Cash under Part III of Land Act	Part III, Land Act, 1924	..	..	When required improvements effected.
2. Cheviot Estate grazing-farms lease	Part IX, Land Act, 1924	Not exceeding 21 years	Same as S.G.R.	Same as S.G.R.; provided land not suitable for subdivision. (See No. 30)
3. Cheviot Estate lease in perpetuity	Part IX, Land Act, 1924, and Cheviot Estate Disposition Act, 1893	999 years	None	Up to 31st December, 1940, at original capital value for cash or by deferred payments.
4. Cheviot Estate renewable lease (agricultural land)	Part IX, Land Act, 1924	66 years	Perpetual	Same as for R.L. (settlement land). (See No. 27.)
5. Deferred-payment licence (auction)	Section 77, Land Act, 1924, and section 52, Land for Settlements Act, 1925	Various, up to 34½ years	..	At any time on full payment of purchase-price.
6. Deferred-payment licence (selection under Part III of Land Act, 1924)	Section 3, Land Laws Amendment Act, 1926	Ditto	..	Ditto.

I. FORMS OF CROWN TENURE.—*continued*
 (i) PRIOR TO THE LAND ACT, 1948.—*continued*

Tenure.	Section of Land Act Under Which Title Issued.	Term of Lease or Licence.	Right of Renewal.	Right of Freehold.
7. Education reserve lease ..	Section 22 (3), Education Reserves Act, 1928	Any term specified by section 5, Public Bodies' Leases Act	With, or without, according to terms under which lease offered	None.
8. Education reserve renewable lease under Land Act	Section 367, Land Act, 1924, or section 22 (2), Education Reserves Act, 1928	33 years ..	Perpetual ..	None.
9. Flax lease ..	Section 353, Land Act, 1924	33 years ..	One further term if provided for	None.
10. Kauri-gum district licence ..	Section 161, Land Act, 1924	(a) O.R.P., 25 years; (b) D.P., 15 years	None ..	(a) After 6 years by cash or at any time by deferred payments if conditions complied with; (b) at any time. If provided for.
11. Lease of lands of special value	Section 152, Land Act, 1924	As may be fixed by Land Board	If provided for ..	For cash or on deferred payments at original capital value plus difference between 4 and 5 per cent. actuarially calculated.
12. Lease in perpetuity (Land Act, 1892)	Section 157, Land Act, 1892	999 years ..	None ..	Up to 31st December, 1940. At original capital value for cash or by deferred payments. Same as pastoral licence under regulations. (See No. 18.)
13. Lease in perpetuity (settlement land)	Section 16, Land for Settlements Act, 1892	999 years ..	None ..	None.
14. Mining district land occupation lease	Part VIII, Land Act, 1924 ..	21 years ..	Perpetual, provided not required for mining purposes	None.
15. Miscellaneous lease (town land)	Section 131 (2) (a), Land Act, 1924	10 years ..	None ..	None.
16. Occupation licence	Section 347, Land Act, 1924	Not exceeding 7 years	None ..	None.
17. Occupation-with-right-of-purchase licence (tenure abolished for new transactions as from 9th September, 1926)	Part III, Land Act, 1924 ..	25 years ..	None; but licences expiring before 1st January, 1941, may be extended for 7 years	At original capital value if conditions of licence complied with—(a) for cash after 6 years; (b) at any time by deferred payments.

18. Pastoral licence	Part VI, Land Act, 1924 ..	Any term up to 35 years (usually 21 years)	Right to whole run if not required for subdivision; if subdivided, lessee has right to lease one lot. Also right of extension for 7 or 14 years	For cash or on deferred payments. If term of licence not less than 14 years, may be acquired after 7 years.
19. Pastoral licence (temporary)	Section 289, Land Act, 1924	Not exceeding 3 years	None	None.
20. Pastoral licence under regulations in mining districts	Regulations under Land Act, 1924, and Mining Act, 1926	21 years	One further term of 21 years in some cases, and perpetual in others	For cash or on deferred payments at any time during currency of licence at then value less present value of lessee's interest for unexpired period.
21. Perpetual lease	Land Act, 1885	30 years	Perpetual, for term of 21 years	At any time on compliance with conditions.
22. Provisional licence for purposes mentioned in section 347, Land Act, 1924	Section 351, Land Act, 1924	Not exceeding 3 years. Licensee may apply at any time during term of a 21 years lease	None	None.
23. Renewable lease, Crown land (rural)	Part III, Land Act, 1924 ..	66 years	Perpetual	For cash or by deferred payments.
24. Renewable lease (town land)	Section 131 (2) (b), Land Act, 1924	33 years	Perpetual	Ditto.
25. Renewable lease (D.S.S.) ..	Section 5, Discharged Soldiers Settlement Amendment Act, 1921-22	33 years	Perpetual	Same as S.T.L. (Crown land). (See No. 31.)
26. Renewable lease (small farms)	Section 5, Small Farms Amendment Act, 1939	33 years	Perpetual	None.
27. Renewable lease, settlement land (rural)	Section 54, Land for Settlements Act, 1925	33 years	Perpetual	For cash or on deferred payments at any time during currency of licence at then value less present value of lessee's interest for unexpired period. Area limit, 3,000 acres.
28. Reserve lease	Section 14, Public Reserves, Domains, and National Parks Act, 1928	Up to 21 years with or without right of renewal	One further term, if provided for, up to 21 years	None.

I. FORMS OF CROWN TENURE—continued
 (i) PRIOR TO THE LAND ACT, 1948—continued

Tenure.	Section of Land Act Under Which Title Issued.	Term of Lease or Licence.	Right of Renewal.	Right of Freehold.
29. Small farms lease . . .	Section 5, Small Farms Amendment Act, 1939	33 years . . .	Perpetual, for terms of 33 years	None.
30. Small grazing-run lease . . .	Part V, Land Act, 1924 . . .	21 years . . .	Right to whole run if not required for subdivision; if subdivided, lessee has right to lease one lot	For cash or by deferred payments at any time during currency of lease.
31. Special-tenure lease (Crown land)	Section 4, Discharged Soldiers Settlement Act, 1915	66 years . . .	Perpetual . . .	For cash or on deferred payments at any time at original capital value.
32. Special-tenure lease . . .	Section 4, Discharged Soldiers Settlement Act, 1915	33 years . . .	Perpetual . . .	For cash or on deferred payments at any time at original capital value. Area limit, 3,000 acres.
33. Special-tenure lease (settlement land under section 3, Discharged Soldiers Settlement Amendment Act, 1917)	Section 3, Discharged Soldiers Settlement Amendment Act, 1917	33 years . . .	Perpetual . . .	Ditto.
34. Temporary lease (O.L. or M.L.)	Section 147, Land Act, 1924	Year to year or not exceeding 5 years	None . . .	None.
35. Thermal-springs lease (or lands surrounding)	Section 366, Land Act, 1924	Not exceeding 63 years	None . . .	None.
36. Village-homestead allotments (renewable lease)	Section 220, Land Act, 1924	66 years . . .	Perpetual . . .	Cash or deferred payments.
37. Agreement for sale and purchase	Section 16, Land Laws Amendment Act, 1944	35 years . . .	None . . .	Freehold acquired by instalments over 35 years.

(ii) AS FROM 1ST APRIL, 1949

Since then the Legislature has passed the Land Act, 1948, which comes into operation on the 1st April, 1949. Under this Act the forms of Crown tenure are reduced to the following:—

TENURES UNDER THE LAND ACT, 1948

Tenure.	Section under Which Granted.	Term of Lease or Licence.	Right of Renewal.	Right of Freehold.
1. Renewable lease (farm or urban land)	62 (1) (a) and 63 ..	33 years ..	Perpetual for terms of 33 years	At any time for cash or on D.P., except in special cases.
2. Renewable lease (commercial or industrial land)	62 (1) (b) (i) and 63 ..	33 years ..	Perpetual for terms of 33 years	None.
3. Cash (farm or urban land)	62 (1) (a) and 63 ..	Up to 30 years ..	None ..	Freehold purchased by instalments.
4. Deferred payments (farm or urban land)	62 (1) (a) and 65 ..	Up to 30 years ..	None ..	Freehold purchased by instalments.
5. Pastoral lease	62 (1) (c) and 66 ..	33 years ..	Perpetual for terms of 33 years	None.
6. Pastoral occupation licence	62 (1) (c) and 66 ..	Up to 21 years ..	None ..	None.
7. Leases in special cases ..	67	Not exceeding 33 years	With, or without, according to circumstances	With, or without, according to circumstances.
8. Grazing licence	68	Up to 5 years ..	None ..	None.
9. Communal grazing licence	69	Not exceeding 33 years	With, or without, according to circumstances	None.
10. Lease of commercial or industrial land	62 (1) (b) (ii) ..	Up to 50 years ..	With, or without, according to circumstances, but the total term not to exceed 50 years	None.
11. Flax lease	166	Not exceeding 33 years	With, or without, according to circumstances	None.
12. Licence to remove minerals, timber, flax, &c.	165	Any term ..	None ..	None.

We consider the Land Act, 1948, effects a much needed simplification of the system of Crown tenures. The general position as it remains under this Act is satisfactory, but we have the following recommendations to make arising out of the representations of the High Country Committee.

The following four points were made in the presentation of its evidence by the High Country Committee. The Economist Secretary to the Commission summarized them in a question to Mr. Wardell of the High Country Committee, at Omarama :—

Mr. Woods.—If these four points you mention were attended to—the regrouping of runs with a view to the proper apportioning of seasonal country; the safeguarding to the tenant of the value of his improvements; a workable plan to encourage good husbandry; and the setting-up of a tribunal to protect the rights of the farmer—do you think this high country will come back slowly over perhaps twenty years without any special efforts?

Mr. Wardell.—I do. We know instances where the lease is falling due and the runholder has deliberately stocked that run in order to reduce the cover—reduce its appearance—so that when the run is being revalued he can get it back at a reasonable rental. Once you can show the farmer that good husbandry will be rewarded, I think we can go a long way towards bringing back our country; but at the same time we must have a certain amount of regrouping to enable that good husbandry to be exercised. If we can get rid of the rabbits, and have a system of regrouping and reward to the man who exercises good husbandry and suitable punishment for the man who hammers and neglects his country, we can go a long way. That, to my mind, is the line we should take rather than spend these millions of pounds through Catchment Boards.

We believe these four points are reasonable, and in our recommendations below we have tried to give effect to them.

2. ALTERATIONS TO TENURE CONDITIONS

(i) CLASSIFICATION

Under the Act pastoral licences are not automatically to be converted into pastoral leases, but only if they are considered to be economic units and, presumably, only if they are free from major depletion problems. On the other hand, it appears that small-grazing-run leases will become renewable leases.

It would appear that this is an inequitable situation for the pastoral-licence holder. It does not appear that it will succeed in effecting the desired objects of the Minister of Lands. We agree, and the evidence before us has proved, that many runs are uneconomic, and that boundaries will have to be adjusted to make economic units. However, there are as many small grazing runs in this category as there are pastoral licences, possibly more, in some districts. In addition, the problems of depletion are as great on many small grazing-runs, if not worse in some cases, as they are on pastoral runs. We are of the opinion, therefore, that withholding leases from the pastoral-licence holders is not achieving the required objects, and is creating an unfair situation as the licence-holder will be left in an insecure position.

We recommend, therefore, that all pastoral-licence holders should be given pastoral leases immediately if they desire to convert their licences, or on the expiry of their licence.

(ii) REGROUPING OF UNECONOMIC UNITS

The question of uneconomic subdivisions is an important one. The evidence of the High Country Committee was that regrouping was necessary, but that it should be done voluntarily. We agree that regrouping is necessary, but we consider that power will have to be given the Crown to effect such

regroupings compulsorily if they cannot be effected by negotiation, which in all cases should be first pursued exhaustively. We are also strongly of the opinion that no farmer should be put off his property without having another suitable property to go to unless he proposes to retire. This is a matter of overriding importance.

The problem is principally a South Island high-country one, brought about by faulty subdivision for which, in the main, the tenant was not responsible. It also applies to the North Island. We suggest that the Director-General of Lands should appoint one of the experienced South Island Field Inspectors, possessing a full knowledge of the position, to be the Inspector of Regrouping. It would be the duty of this Inspector to study any area where runs were considered to be uneconomic, to discuss the nature of the country and its difficulties with experienced runholders, and to draw up a scheme whereby boundaries could be adjusted to give economic units, and to devise possible methods of regrouping to effect such adjustments. His plan should be forwarded to the Director-General of Lands, who would discuss it with a special committee set up by the Sheep Industry Board to examine regrouping plans. When, finally, agreement has been reached with the Sheep Industry Board on what regrouping is desirable the plan should be adopted and handed over to the Commissioner of Crown Lands for the district to carry out as soon as possible, realizing, of course, that "as soon as possible" might be years later. The Commissioner will then see if any farmers will have to be displaced. If there are none, he may proceed to negotiate to put the plan into effect. If farmers are to be displaced, he and his officers should find alternative properties to offer to the farmers affected. At the same time the farmers should be told of the approval of the plan by the Sheep Industry Board (and presumably also by the Land Settlement Board), and should be told the exact amount that the Crown will offer as compensation for their loss. They should also be told that if they can buy another property themselves the Crown will finance them with the purchase of the new property. In this way we think it will not be long before suitable alternative properties are found. Alternatively, older farmers may prefer to retire, and an allocation of a State house in a town, together with an annuity, may prove wiser than compensation. In any case where dispossession of one or more farmers is a feature of a regrouping plan, the plan should not be carried out until alternatives as outlined above are available.

But if in the event of displacement, alternative farms are available, of which the Sheep Industry Board has approved, but a tenant still refuses we consider that the Director-General of Lands should apply to the Land Valuation Court for an order to put the plan into operation, and the Court should have power to make such an order. The approval of the Sheep Industry Board would, in our opinion, be a satisfactory security of fairness.

In all matters of such regrouping more is at stake than pounds shillings and pence. To root up home and local associations and to move elsewhere is a disadvantage to any tenant, and this should be recognized. The constant instruction to the Commissioner of Crown Lands in these cases should be "to be generous." In all cases of regrouping the tenant should be offered something that he will know is to his betterment. If that is done we feel the whole system can be carried out voluntarily, and with gratitude by the tenants towards the Lands Department.

(iii) IMPROVEMENTS

The second point made by the High Country Committee was security for improvements. If pastoral-run licences as we recommend are converted to pastoral leases under the 1948 Land Act, then the security for improvements will have been reasonably provided for.

(iv) ENCOURAGEMENT OF GOOD HUSBANDRY

We agree also that the third point of good husbandry must be encouraged. We are not satisfied with the present good-husbandry clause because we think that good husbandry can never be encouraged by restrictions. The present clause of the Land Act, 1948, reads:—

99. In every lease or licence under this Act or any former Land Act of farm land or pastoral land there shall be implied on the part of the lessee or licensee a covenant that he will throughout the term of the lease or licence,—

- (a) Farm the land diligently and in a husbandlike manner according to the rules of good husbandry, and will not in any way commit waste :
- (b) Keep the land free from wild animals, rabbits, and other vermin, and generally comply with the provisions of the Rabbit Nuisance Act, 1928 :
- (c) Properly clean and clear from weeds and keep open all creeks, drains, ditches, and watercourses upon the land, including any drains or ditches which may be constructed by the Commissioner after the commencement of the term of the lease or licence.

But why should a tenant practise good husbandry? If he improves the carrying-capacity of his run, his rent will be raised at the next renewal. Is this encouragement of good husbandry? Good husbandry can only be secured, in our opinion, by a definite policy that gives rewards for good husbandry and at the same time penalizes bad husbandry. The two must go hand in hand.

Moreover, we doubt the workable nature of the good-husbandry clause as it stands. What farmer in Central Otago could be expected to “keep the land free from rabbits?” If one rabbit is on the property, is the lease to be forfeited? It may be said that administration will have to be reasonable, but we believe that the whole clause should be redrafted.

As we have said, the important principle is—reward good husbandry, penalize bad. It should not be impossible for the Lands Department, in co-operation with the proposed Sheep Industry Board, to draft an effective good-husbandry clause to replace section 99.

(v) PROVISION FOR APPEAL

The fourth point was the establishment of a tribunal. The suggestion of the High Country Committee was:—

- A Magistrate as Chairman :
- A representative of the Lands Department :
- A representative of the Lessees.

In the meantime there has been established the Valuation of Land Court, which is a permanent Court of Justice, with the status of a Supreme Court. We consider that it should fulfil the purpose of the suggested tribunal. We cannot recommend, therefore, the setting-up of another body to do the same work.

3. REPRESENTATION OF TENANTS

(i) THE LAND SETTLEMENT BOARD

Under section 12 (i) (k) of the Land Act, 1948, provision is made for the appointment of "two other persons" to the Land Settlement Board. We recommend that one of these persons should be a representative of the Crown tenants and the other a representative of farming interests as a whole.

(ii) LAND SETTLEMENT COMMITTEES

Under section 14 (ii) of the Land Act, 1948, provision is made for the appointment of Land Settlement Committees consisting of the Commissioner of Crown Lands and two others. We recommend that one of these should be a representative of the Crown tenants. We also recommend that separate Land Settlement Committees should be set up to deal with high country matters.

4. OTHER LAND OCCUPATION MATTERS

(i) BURNING

Burning is necessary to farming operations, although it can also be dangerous if practised without discretion and good judgment. The 1920 Commission said, "The skilled sheep-farmer should know when to burn his run better than any other man." We agree with this statement, although there are other interests to be considered. We shall deal later with burning as a factor in depletion, and will recommend that on all Crown lands the consent of the Commissioner of Crown Lands should be obtained. On all other rural lands the County Council should control burning and be empowered to prohibit it during dangerous periods except with express permission. In addition, we must recognize the necessity of controlling burning as provided in the Forest and Rural Fires Act in areas adjacent to forests. Evidence was presented to us, however, that in some areas the forest-owners other than the State Forest Service made little or no effort to provide firebreaks. As a result the farmer was unable to burn at all because of the proximity of forests. We reiterate that burning is sometimes necessary, and the exotic-forest owners should co-operate with the farmer in the provision of facilities to burn under safe, controlled conditions. In the event of their failure to do this they should be estopped from claiming damages for the spread of fire to surrounding areas.

(ii) ENDOWMENT LEASES

Considerable evidence was placed before us on the subject of endowment leases. These are areas usually of pastoral land, set aside so that the annual revenues from them may endow such bodies as high schools, Universities Harbour Boards, River Trusts. Only a very few of these endowments are administered by the Lands Department. Of the remainder, most are farmed not for the good of the land, but to get the most revenue for the endowment. This is not in the national interest. We are satisfied from what we have seen and from the evidence tendered before us that all these lands should be resumed as Crown lands and leased and controlled accordingly by the Lands Department in the interests of the land and the farmer. The bodies concerned should be compensated or their revenues provided in other ways.

(iii) FARM TRAINING SCHEME

It has been stated in various places that something is lacking in the provision of adequate training for those anxious to take up farming. Furthermore, in many cases the difficulty in obtaining the necessary finance to-day for taking up such country debars the trainees from ultimately becoming farmers. Given adequate training on an approved property or on approved properties, with a regular review of their capabilities, those trainees, together with competent men already working on farms approved by the Land Settlement Board, should have available State assistance on similar lines to that of the discharged servicemen, but on land capable of development. At the outset the trainee would know that on proving his worth he had some prospect of being assisted to take up land for himself. On the other hand, the State would obtain a good type of settler. Farming is a business of national importance. Recruitment and training of farmers should not be haphazard. The better trained the young prospective farmer, the better our country will be farmed.

A comprehensive scheme was placed before us at Dannevirke by Mr. G. Frame, as follows :—

(1) The existing rehabilitation scheme be widened in scope to include boys who have satisfactorily completed two or more years at a secondary school.

(2) That on attaining the age of seventeen, a boy may contract with the Rehabilitation Department to engage in farm-work in any or all branches for a stated period, say eight or ten years.

(3) That no restriction be made regarding change of employer or district. Although a record must necessarily be kept, the normal freedom of that individual should be observed.

(4) That boys be boarded annually and given one week's (free) course of tuition at an agricultural college or training centre.

(5) That at the conclusion of the stated period trainees should become eligible for financial assistance to buy their own farms under the terms of the present rehabilitation scheme.

(6) That Federated Farmers undertake equal responsibility with the Rehabilitation Department in the administration of the scheme, and that the former Primary Production Councils be reconstituted for this purpose.

(7) That commencing wages be paid on a modest scale, with usual annual increments.

(8) That, in view of the critical shortage of labour in the back country, the scheme should apply in the first instance to those areas.

Reference was also made by the Chairman of the High Country Committee, Mr. D. McLeod, to this problem :—

Youths with an interest in back-country life should serve an apprenticeship, later to pass on to the stations, with the ultimate expectation of financial assistance to become the owners of their own properties. One of the detriments to young men undertaking this class of work is the fact that few of them can ever hope to have enough money to buy their own station, no matter how efficient they become. This discourages the finest type of youth who is energetic, ambitious, and eager to learn.

We consider that the fullest consideration should be given to this matter by the Land Settlement Board, which should consult with the proposed Sheep Industry Board. The Discharged Servicemen's Settlement Scheme has been good, and as it tapers off consideration should be given by the Land Settlement Board to the adoption of a permanent scheme of farmer training and settlement.

(iv) COMPENSATION FOR LAND TAKEN

We are dissatisfied with the position which exists when land is acquired by the Government and compensation is not paid till some considerable time after the land has been taken. When land is taken compulsorily from a farmer compensation should be paid before the man is deprived of the use of the land. When the taking of portion of a property upsets the economic balance of that property, the replacement of economic balance should also be effected if possible before any portion of the land is taken. To give effect to this we believe that land required by other Departments should be taken only by the Lands Department, which should satisfy itself that these conditions have been fulfilled before handing the land over.

5. AVAILABILITY OF LAND

(i) NEED FOR GOOD TENURE

The conditions under which Crown land is held for farming occupation are important in the availability of land for sheep-farming. If the suggestions we have brought forward are incorporated into the Land Act, 1948, we feel that these conditions will be satisfactory, and that therefore a very large area of Crown land will still be preserved for sheep-farming.

(ii) LAND-DEVELOPMENT

The next place from which land can be made available for sheep-farming is from the undeveloped land in the possession of the Crown. There are very considerable areas of these lands, the most important probably being the quarter of a million acres of developable lands in the central pumice plateau of the North Island. Here the Lands Department has adopted a successful policy of developing such small areas as it can handle satisfactorily, and it is concentrating on this development from the northern perimeter of the plateau to give the settlement continuous contact with the farming lands to the north. The policy adopted by the Lands Department is the correct one, and, considering all the circumstances such as the availability of materials, supply of labour, difficulties of supervision and of organization, and the shortage of superphosphate, we think that the Lands Department is doing as much as it could reasonably do at present towards land development in the area.

We spent some time examining one of the blocks being developed by the Lands Department at Mangakino, and wish to say that we were impressed with what we saw there. The work being done is a very great credit to the Department. It must be pointed out that this work is being done at high cost under present conditions, and that as a result a substantial write-off is necessary before the land is let out for settlement. Nevertheless, the work being done is worthwhile even under such circumstances, although we do not think the rate of development should be expanded until costs are lower in relation to values and the supply of materials and labour is much better. There is little doubt that a quarter of a million acres of land can be brought in for farming in the central pumice plateau, although it is probable that a substantial proportion of this will become dairying land.

There is also probably a quarter of a million acres of gum land in North Auckland which can be developed for farming purposes, but from the nature of the country and from the high costs involved this land will more probably be used by the dairy industry, for which it is best suited, and from which the cost will be more readily recovered.

Under present conditions the amount of virgin land which can be brought in for sheep-farming is necessarily restricted, and no great programme of expansive development should be undertaken until such time as the existing sheep-farming country is put into good condition. There is at the present time only a limited quantity of phosphatic fertilizer available, and if the existing sheep-farming country is to be maintained and improved in production much more fertilizer will be needed than is at present available. It would therefore be detrimental to the interests of the industry to embark on an expansive programme of land-development which would necessitate the use of great quantities of fertilizer—at least 9 cwt. an acre during the first year, and then not less than 2 cwt. an acre yearly to maintain the pumice lands in pasture.

Opportunities for the development of non-farming land in the rest of New Zealand are not great, except in South Westland, where we have recommended that a survey be made, and we think that the Lands Department will be capable of exercising discretion and judgment in deciding when and where development of such lands can be undertaken, both profitably and justifiably, in view of existing circumstances.

(iii) RESETTLING ABANDONED LANDS

Other lands which can be made available for sheep-farming are those which have been farmed at some time, but which for various reasons have reverted to scrub and fern. Great caution must be exercised in selecting the portions of these lands that can be developed. Some are on papa country which will make good farming land; others are on hard sandstone country where, with our present knowledge, farming is not likely to be successful. Where there is a reasonable chance of success, we think that the Marginal Lands Board might well consider placing suitably experienced and capable young men on farms in these areas, paying them a wage sufficient to allow them to live for the first year or two, the wage being reduced as soon as the farm begins to produce an income sufficient to maintain a living. We saw with great interest several cases where this had been done successfully during our examination of the industry.

We quote below the evidence of one such case where the farmer and his wife took up a completely scrub-covered ploughable property of 282 acres of light land in 1928. This farmer's evidence was:—

My aim was to work by contract in the district and put all the time I could into clearing the land, the proceeds of the property to go towards repayment of the mortgage. At this time the farm was in fern and scrub with patches of native grass carrying between 200-300 dry sheep part time of the year. These sheep clipped very little wool.

The idea at that time in that class of country was to burn and sow on the ashes, but this was a complete failure. After cutting the scrub, the stumping had to be left for more than twelve months to enable the stump to be grubbed out.

During this time I applied to the State Advances Corporation for assistance to enable me to plough the land which had been cleared. This application was refused.

The first piece of ground—viz., 4 acres—was ploughed by a neighbour in 1932, and he provided the fertilizer. I repaid this work by labour. The next area to be ploughed and cleared was 6 acres two years later. The result of this cultivating was very encouraging. After this my father-in-law assisted me with 30 acres in all over a period of several years until 1937, when I finally took the farm over. At this time the property was carrying 200 breeding-ewes.

I consider it would have taken me about two years to have cleared my place had I been able to afford to spend all my time on it. This I could not do. Being compelled to work out meant, therefore, that it took me six years to do instead of two years.

I have no doubt that a good man interested in farming this type of country could settle himself on an area of scrub land if he was paid a regular wage. I would suggest that he be given 500 to 700 acres, varying according to the particular type of land, with the aim of carrying 1,000 ewes when the area was finally developed. Wages to be paid would also vary according to the condition of the land, as some places would run some stock to begin with. Wages to be reduced as income improves. A wage of, say, £5 10s. weekly on present-day cost-of-living expenses is a suggestion, keeping in mind that the settler would eventually be the owner.

Sales of stock off the property for the year ended 31st March, 1948, are as follows :—

	£	s.	d.
47 sheep	78	9	9
706 lambs	982	13	3
22 bales of wool	636	6	11

It may be interesting to record the production figures for the property for the year ended 31st March, 1941, which are :—

	£	s.	d.
98 ewes, 20 hoggets	95	17	8
305 lambs	316	9	9
13 bales of wool	178	12	6

The stock on hand at 31st March, 1948, was—

200 four-tooth ewes,
135 six-tooth ewes,
125 four-year ewes,
185 five- and six-year ewes,
25 ewe lambs,
20 wether lambs,
20 rams,

710, carried on 282 acres of former scrub land ;

2 steers,
1 calf,
1 heifer,
4 dairy cows,
8 cattle, and
4 horses.

With the above production figures must be considered the facts that—

- (1) The three years preceding 1948 were droughty.
- (2) 8,000 rabbits were killed on the property during 1947-48.
- (3) Superphosphate was rationed and normal supplies were not available.
- (4) Had one bag of manure per acre been applied, and had there not been any rabbits, the property could have carried 800 breeding-ewes and 200 dry sheep.

This type of country should be made available to a suitable hard-working man, with a view to bringing the land into production to produce more, and to settle more men.

The net farming result from property for the year ended 31st March, 1948, was a profit of £816 9s. 6d.

I should also mention that of the 282 acres mentioned above approximately 200 acres only are ploughable.

We think that there are many instances where abandoned or scrub-infested lands can be reclaimed for farming in this manner. This could be done by the proposed Marginal Lands Board, although the Board will have to exercise the greatest discretion in choosing both the property and the man. In all cases we would suggest that only young men who can clear the scrub themselves without having to employ labour be put on this type of land, for the best capital which a man can invest in his property is the capital which he contributes by his own labour.

(iv) MAORI LAND

Another class of land suitable for sheep-farming which could be made available for this purpose is that owned by Maoris. Some of this land is already in use, but it is possible that much more could be made available for sheep-farming. The whole subject of Maori lands is a very difficult one. The position was very well set out in the evidence of Mr. J. A. Sutherland at Te Kuiti :—

The problems of land held under a Maori lease tenure are the same in all respects as that neighbouring country held under freehold or other tenure, with the exception of the very real difficulties arising from the terms of the Maori lease. The terms which are the difficulty are, primarily, the lack of any right of renewal or freehold and, secondly, the lack in many cases of any compensation for improvements.

These two omissions in the lease mean that the lessee has no continuity of tenure or adequate compensation for capital improvement which has not been expended at the termination of the lease.

In the past freeholding of leaseholds has been possible, but as the years go on the possibility of freeholding becomes more difficult, firstly, because of the increase in the number of owners, and, secondly, by a recent regulation by which the Maori Land Court will not grant a freehold if it involves any owner being left without some interest in land. Every Maori is thus under present law and regulation involved with land in some part of New Zealand from the cradle to the grave, and, with an expanding population and a diminishing area of farmed land, this policy must as time progresses lead to very great complications.

The reason for the expanding number of owners in property is that the whole system of individual ownership of land is a foreign concept to the Maori. Prior to the advent of the European, the Maori tribe or family or group had an inherited right to occupy a certain area. This area, if not disputed by neighbours, meant that the Maoris of the particular group had the right to use as they wished an area within certain often not well defined natural features. No individual Maori would think of claiming as his own any particular portion. It was a communal holding lived on and roamed over by the community, and any disputes with neighbouring tribes as to land ownership were the concern of every member of the group. This type of outlook is not the outlook of the European, and attempts have been made to consolidate Maori lands to as near private ownership as possible, and areas were set aside as belonging to an individual or a relatively small group. The communal outlook as regards land has, however, survived, with the result that a Maori normally dies intestate, not necessarily through ignorance but in the old tradition of communal ownership—everything except a few personal possessions formerly buried with him reverts to the community at his death.

This results under private ownership in the children getting the property or properties shared amongst them. With the large families common to the Maori the number of owners concerned with an individualized title of land compounds so that in a relatively few years the number of owners in a block will possibly approach the hundreds. The block involved is not necessarily large and cases as small as a one-acre section in the town are known which have a hundred owners and more. This, of course, means that the individual proceeds from the sale or lease of property are often very small indeed, and the effort involved in selling or re-leasing the property hardly justifies any trouble at all. In fact, Court costs and loss of wages and travelling-expenses to attend to the re-lease or sale of property often involve the owner in monetary losses by no means recompensed by the moneys received from his property.

To re-lease or to freehold it is necessary for the intending purchaser or lessee to obtain the signatures of all owners, any one of whom may veto the transaction without, of course, giving a reason. On occasions, if the number of owners failing to agree is very small, an area *may* be cut out of the whole block for the dissident individual or group. This results usually in a small area of Maori-held land occupying perhaps a frontage or being completely isolated from any access.

At present this presents a very real difficulty to re-leases. One owner hopes to occupy the house so withholds his signature, and when the lease expires he and his family move in. He is in possession of the house, but his interest in the property is in no way increased so that he is in no position to actually farm the property even if he had the necessary capital and ability. The Maori in possession of the house is actually in a worse position for doing anything constructive on the farm than the previous European lessee, as he, in occupying the homestead, has almost invariably antagonized other owners who had similar designs and are thus most unlikely to increase his equity in the property by exchange of property or sale of shares.

This results in the land falling completely derelict and rapidly becoming overgrown with at best bracken fern, but usually with gorse, blackberry, and broom. The rate of deterioration in the Waitomo County high-rainfall area is very rapid indeed once normal farming ceases, and dense bracken fern can easily be in possession three years after the removal of stock. This deterioration is sometimes assisted by the condition of the property when the lease expires. This is due to the complete or partial lack of compensation clauses in the lease. Properties are usually held in more than one block each with a different set or combination of owners and some blocks with a compensation clause and some without. As the blocks were surveyed prior to road formation, the compensated areas may have no access or be quite impossible to farm on their own due to contour, water-supply, fencing, &c., so that the lessee is often unable to take advantage of his compensation if, in fact, it is one of the terms.

Compensation is the value of the land at present, minus the rental which should approximate the unimproved value. The rental value has in many cases been reviewed, so that the present value is sometimes not more than the rental value. This is easily possible if all fixed assets, houses, buildings, &c., have been placed on a small portion of freehold. Further, compensation is never paid in cash, but as a reduced rental for a determined number of years.

A further point of importance is where a farm is held as part freehold and part leasehold. Often neither block is an economic unit by itself. Cases are known where the leasehold area comprising approximately half the total occurs as an island in the centre of the farm. Even in such obvious cases as these negotiations for re-lease may drag on so long and the uncertainty of possible re-lease is such that both areas cease to be a farm before finality is possible. Where both areas are necessary for the successful farming of the property, then, of course, the failure to renew the lease leads automatically to the loss of the freehold as a practical farming proposition.

The area in this country is not small. We have not been able to obtain an exact figure, but we can show that at least 8,000 acres of land at present being farmed within a radius of 10 miles of Te Kuiti is held under Maori lease and is all subject to the problems and probable eventual abandonment as outlined. This area was taken at random and could be multiplied in many parts of the county. Portions of the county are, however, not so heavily affected as the Te Kuiti area, so the 8,000 acres cannot be multiplied over the whole county.

The Maori-lease problem is a problem which benefits nobody. The lessee who has been in possession for a long period, perhaps since its inception, walks off with the knowledge that his life's work will soon be completely obliterated, and the farm which he has built out of the bush or fern and scrub will soon be lost under acres of gorse and blackberry while he must look elsewhere for land to farm.

The owners lose what rental they have been receiving and lose any equity that they had in the land due to its inevitable deterioration. An individual owner is in just as helpless a plight as the lessee is to freehold. The Maori Affairs Department already has more developmental work on its books than it can cope with for the next generation with the present staff and possible successful Maori farmers.

New Zealand as a whole loses completely, and at present cost-levels perhaps irrevocably, the production of good farming land. The neighbouring farmers lose amenities which come with closer settlement and are saddled with the extra rates which were paid, under European leasehold, but which remain almost invariably unpaid once the land reverts to the Maori. Moreover, the problem is an urgent one as the expiry date on the majority of properties has almost arrived.

The solution of the Maori-lease problem is simply to find a tenure satisfactory to the lessee and the owners. Such a lease must have a right of renewal, and value must be payable to the lessee for improvements. Leases of this type have been in existence for a great many years, but the Maori ownership brings with it problems of its own, and it was the recognition of these difficulties that has brought about the unique clauses in Maori leases that have caused all the trouble.

The reason for the lack of a right of renewal is the desire to prevent the land from becoming alienated from the Maori owner. It was recognized that the Maori had no farming background and normally was unlikely to be capable of farming his own land efficiently, but it was hoped that the Maori race would in the future produce farmers. As the years go by the Maori race is progressing remarkably, and already Maori farmers can on occasion measure up to European standards of efficiency. Thus future leases must, we feel, have some clause which will prevent the permanent alienation of the land from the Maori owner.

This leads to the payment of compensation for improvements. Unfortunately, the rural Maori has not become and shows little sign of becoming capable of accumulating sufficient financial resources to pay for improvements, and thus under the normal leasehold

tenure is unlikely to be able to exercise the right of the owner to repossess at the end of the period on payment of full compensation; the Maori would, in practice, find himself completely incapable of taking over. To get over this difficulty the land is let with either no compensation clause or, if compensation is allowed, then it is paid by extending the rental period so as to avoid the payment of cash. To safeguard the land the modern leases have stringent rules and regulations as to the condition of the land on the termination of the lease. This results at present in the land not being taken up at all or in the troubles previously outlined.

It is, we consider, much less satisfactory to force a man to maintain a property by regulation than to lead him to do so by making it a reasonable financial proposition. We therefore feel that compensation must be payable in cash to the lessee if the owner elects to take over at the expiry of the lease, but we also feel that the owner should be safeguarded in some way from the lessee who makes heavy capital improvements to make the payment of compensation difficult.

The finding of a suitable formula for a lease is then not a simple matter and we would respectfully suggest that the Commission recommend that the whole Maori-lands problem should be the subject of full inquiry by a further Commission specially set up for the purpose. We would further stress the urgency of the Maori leasehold areas. These leases are falling due in large numbers before the end of 1949, and a great many in this county will be completely out of production and deteriorated within a very few years of their expiry date, so that if a reasonable formula is not arrived at within a very short time this land will be almost impossible for the private lessee to reclaim, and its only hope will require the expenditure of large sums of public money by some Government Department.

Finally since leases have already fallen due and have not been renewed and a number of leases will be falling due within twelve months with the same start to inevitable deterioration, we suggest that where the owners cannot agree to re-lease, then they must undertake to farm the land themselves to a reasonable standard of efficiency. Failing this, the land will be taken under Part II of the Servicemen's Settlement and Land Sales Act and be balloted to a returned serviceman. A Maori returned serviceman should have preference if one is available with the necessary grading. Such land should be given preferably to freehold title or have the same terms as a Crown lease with perpetual right of renewal. We consider that with still half the A Grade returned soldiers still to settle, no land which is farmable and has been farmed up to this date should be permitted to deteriorate.

However, that is only one side of the case, and we have not heard evidence from the Maori himself. We do not believe that justice would be done unless the Maori were given the opportunity to state his side of the case. It has not proved possible for us under our order of reference to give consideration to this problem. Moreover, so intricate and difficult is the general subject of Maori lands that we do not consider ourselves competent to pass judgment on the position. We recommend, therefore, that a competent authority should be set up with powers of inquiry to investigate the problem of Maori lands with a view to bringing them all into production. There are certain principles which we think should be stated to such a Maori lands authority for its consideration. They are—

- (a) That all land in New Zealand, whether it is pakeha land or whether it is Maori land, must be farmed for the maximum production in the national interest. There should be no exceptions to this rule, either pakeha exceptions or Maori exceptions. We are suggesting measures to deal with the pakeha who does not farm his land. We think it is only just that measures should be introduced to deal with the Maori whose land is not farmed.
- (b) If a Maori owner does not wish to, or is not in a position to, farm the land himself, we consider the land should be handed over to the Maori Affairs Department for development under its development schemes, because in this case the land would be developed on behalf of the owning Maori, whose interests would be not only protected, but enhanced.

- (c) The evidence before us suggests that the terms of some Maori leases are such that they do not encourage the best maintenance of the land. We have stated that maintenance of the land is the prime consideration for the nation, and we think that leases of Maori land should conform to a type which provides reasonable security and welfare for both tenant and owner and which definitely encourages and secures the maintenance and improvement of the condition of the land.

(v) MACHINERY POOLS FOR PRIVATE-LAND DEVELOPMENT

To assist in land-development work on land which is owned privately and is being developed privately we think a great step forward can be taken with the establishment of machinery pools by the Ministry of Works, possibly in conjunction with the Marginal Lands Board. The average private farmer who has some development to do cannot afford to buy a machine for the job. When a private contractor buys the machine the cost to the farmer often seems to us to be too high. On the other hand, when the Ministry of Works buys the machine and operates it at cost, the charge to the farmer seems to be reasonable. We think that there is, therefore, an urgent need for several machinery pools to carry out work such as stumping, clearing the land, and making bulldozed tracks to give access to hill country for top-dressing purposes. In addition, a large amount of drainage-work could be done in this manner.

(vi) POWER TO TAKE BADLY-FARMED LAND

During the course of our investigations we have seen many areas of good farming land lying under a mass of scrub, gorse, and other noxious weeds. These are a direct loss to the nation. In addition, they are a menace to the surrounding farmers who are trying to farm their land well. We consider that where any farmable land is lying unproductive, or in such an impoverished condition that its production is far below the standard for that land, and good reasons do not exist for such a state of affairs, the Director-General of Lands should have power to purchase the property at a price set by the Valuation of Land Court. Action of this description should not be taken until the farmer concerned has had at least twelve months' notice of the intention to take over the property unless satisfactory improvements have been put in hand in the meantime by the farmer. If the landholder will not sell, the Director-General should apply to the Valuation of Land Court for an order for the transfer of the property to the Crown at that price, and the Court should be empowered to make and issue such an order. We consider that the Land Court will be in the best position to determine such matters. In all these matters the Director-General of Lands should only proceed with the approval of the proposed Sheep Industry Board.

(vii) RECOGNITION OF GOOD HUSBANDRY

In addition to the Department of Lands being given the power to penalize bad husbandry, there must be an application by that Department of a policy of rewarding good husbandry. The present policy of the Department definitely penalizes good husbandry inasmuch as the farmer who improves his land faces the prospect of having part of it taken away. The Director-General of Lands has told us that the exigencies of discharged-soldier settlement have forced the present policy of taking improved land

which is necessitated by the policy of the Rehabilitation Board. Every farmer must know that the only way he can remain in possession of his land is to farm it reasonably well. This means any farmer with a reasonably-sized unit who improves his land to the best of his ability should know that neither all nor part of his land will be taken from him during his lifetime.

(viii) RETURNED SERVICEMEN'S SETTLEMENT

We commend the Rehabilitation Board for the good work that has been done in settling returned servicemen, and we realize that many problems face the Board. However, there is one aspect of discharged-soldier settlement about which we think a different attitude could be adopted. That is the question of settling returned servicemen on partially-developed land. For on this land, with the prospect of improvement ahead of them, the men could look forward to earning more quickly, mainly by their own efforts, a much greater equity in their farms. We are convinced that some of the men themselves would prefer this. We have had returned men before us asking to be given a chance on such land. In reasonable circumstances not to give them a chance is to lose to the nation the opportunity of greater production and to foil the ambitions of men whose requests we support. We consider that returned servicemen should be given the opportunity to take up partially-developed land under rehabilitation aid, provided that there is reasonable chance of ultimate successful development. To this end the Board should purchase suitable partially-developed land in single units as it becomes available.

The question of the economic minimum for returned servicemen's units is important. To our mind, 800 breeding-ewes on good sheep country is the bare economic minimum. In average circumstances 1,000 ewes is the safer economic unit. To create a unit of fewer than 800 ewes is to sacrifice the settler's future, as we are sure it will not give a working margin in other than the best of times.

(ix) ECONOMIC UNIT IN THE SHEEP INDUSTRY

In the absence of satisfactory statistics for the industry there seems to be no clear idea of what is an economic unit in the sheep industry. We consider the most economic unit is that which allows as many sheep as one man can reasonably shepherd himself. For, since overhead charges are fixed for the unit, the greater the number of sheep, the lower the overhead charges per sheep and the greater the return for labour per sheep. This would place the economic unit at about 1,000 ewes on fat-lamb country and from 1,500 to 2,000 ewes on store country. We exclude from consideration in this paragraph the extensively-grazed high-country areas.

(x) CONDITIONS RETARDING THE SALE OF LAND

The general availability of land for prospective farmers is tied up with the prospects of the older farmers who would normally be selling their properties. We are convinced that much land would be available for sale if only conditions can be created which encourage an older man to sell.

The principal requirements of suitable sale conditions are :—

- (a) An adjustment of the treatment of live-stock as capital stock for taxation purposes, which we will treat under "Taxation" in Section III following :

- (b) An adjustment to give the retiring farmer reasonably acceptable accommodation. This is important, because to-day it is very difficult to secure a house, particularly in towns.
- (c) A farmer is paid in cash for his property when purchased by the Crown, whereas it might be better to offer him as an alternative an annuity based on his equity in the sale-price of his property.

As regards housing, this could be met by giving the farmer some reasonable priority in obtaining a State house, particularly as by retiring he may make way for a returned serviceman on his farm.

Secondly, some form of annuity must be provided whereby, in return for selling his farm to make way for a younger man, the ageing farmer will be able to face a reasonably comfortable prospect in retirement. This annuity should be an alternative to full cash payment so that he can elect which he prefers. We recognize the difficulties—the scheme must not encourage a man to squander his money and then look to the State for assistance, but an annuity based as above should prove satisfactory.

(xi) THE "LONG PADDOCK"

Although perhaps not a matter of immediate concern or of general application, we are of the opinion that the time must come when New Zealand will have to give consideration to what has become known generally as "the long paddock"—that is to say, the long areas of land which flank either side of the roads and railway-lines of New Zealand. In many of the older-established European countries fences have been moved out to the actual edge of the roadway in order that the greatest possible amount of land can be enclosed and put into production. In New Zealand in the past we have had plenty of land, and there has been no necessity to take such steps, but it is already apparent that the stage is being reached when the amount of land available is not sufficient to provide for all the settlers who desire to take it up. Although the stage has not been reached yet when further land cannot be brought into production it is foreseeable that in the future such a stage will be reached.

We do not consider that attention to the long paddock should be deferred until this stage has been reached. There must be already a large number of roads in New Zealand which are known to-day to be too wide for the actual purpose required for transport. On these road verges there flourishes a tremendous growth, often of noxious weeds, and the best method of controlling these weeds is to put the land into production. Apart from that, we believe that the time is rapidly approaching in our national economy when our need of production from every available piece of land is becoming so great that we must give attention to the long paddock. It is a matter which the Government should hold in view. Where roads are wider than is actually necessary for transport purposes and the movement of stock, the areas along the sides of the roads (and railways) might be enclosed and added to the farmable area. If there is some possibility that the land so used may be required for future roading development, then we consider that it could remain vested for such purposes, but the farmers should be given the right to enclose it and farm it until such time as it is needed for road purposes. If this were done not only would a very considerable area of land, amounting to thousands of acres, become available for production, but there would also be a considerable improvement in the position of noxious weeds on road edges.

II. CONDITION OF THE LAND

Special clause (2) of our Warrant: "The condition and possible improvement of any land used, formerly used, or capable of being used, for sheep-farming, and particularly the deterioration of any such land, especially high and hill country land, whether by erosion of soil, second growth of trees or plants, spread of noxious weeds, rabbits, depletion, or any other causes, and the methods of improving or regenerating such land."

(We have considered it best to deal with noxious weeds under Section III, and to include under this section the availability of fertilizer specifically mentioned in clause (3).)

We do not propose to comment on the condition of improved good pastures; they are an obvious credit to the farming community and a valuable asset to the nation. Their condition presents no grave problems.

It is necessary to consider the remaining pastoral lands in three groups under the headings "Deterioration," "Depletion," and "Erosion."

1. DETERIORATION

Deteriorated lands are those where there has been such a decline in fertility that improved grasses will no longer survive and the opened pastures are being invaded by scrub, fern, and weeds. The amount of deterioration varies from 100 per cent. over large tracts to small patches of second growth which expand every year. This invasion of land by second growth is a slow, ever-mounting tide which squeezes the farmer from prosperity to penury in the vain fight to halt it, then engulfs his land so that he walks off penniless, leaving behind the tragedy of abandoned lands, which are a loss to the nation as well as a heart-break to the farmer.

(i) CAUSES

The problem of deterioration arises from our inheritance of the basic conditions precedent to the establishment of our pastoral industries. At the advent of planned European settlement in 1840 possibly three-fifths of the land of New Zealand was heavily covered with forest. The remainder was mainly in tussock, with areas of scrub and fern where the bush had been burnt by the Maoris.

The original condition of the land at the establishment of the sheep industry is shown in the maps of each Island (No. 9). It is possible that some of the scrub and fern shown in the central North Island area was originally tussock, but it degenerated to scrub very quickly under the burning which was necessary to the depasturing of sheep on it.

Not much of the soil which lay beneath the forest covering was in itself sufficiently fertile to maintain pastures permanently. However, when the bush was felled and burnt the resultant wood-ash gave the soil a type of top-dressing, producing an initial high fertility. This was shown in the lush growth of English grasses such as rye-grass and cocksfoot, which came away remarkably well after the burn. Some of the land carried four to five sheep to the acre within a year or two of clearing. The sheep industry

boomed, prices of land rose, and the capital invested in properties became considerable. Little was known of soil fertility. Few cared while the pastures carried sheep well. Few dreamed that the fertility was entirely false, and that some day it would run out.

That day eventually came. For ten to twelve years the pastures had held well. Then the carrying-capacity declined slowly. After thirty or forty years the decline was becoming very noticeable. Some highly-capitalized properties could not pay their way, and many in the back country were often abandoned. Other farmers continued to carry the same number of stock, not heeding the ominous thinning of the pastures which was occurring. Into these opened pastures manuka and weeds came and spread rapidly. The fortunes of the first settlement crashed hard in the early "twenties" of this century. But the manuka country was not finished. The losses of capital were wiped out and farms acquired at a new and lower value. The manuka was cut and burnt, and the areas grassed. The cutting and grassing cost little and operations were quite successful, but only with very cheap labour. Now costs have risen and the labour is not available. It is no longer economic to cut manuka at regular intervals of a few years.

(ii) FERTILIZER : PRICE

The answer to deterioration is to raise the fertility again. This can be done by top-dressing with fertilizer (usually superphosphate) and at the same time introducing clovers to the pastures or by increased stocking with cattle. A few farmers have used one or other of these methods, and their pastures are holding to-day. But fertilizer in the back country costs up to £17 a ton to-day. To this cost must be added that of cutting the manuka and sowing grass and clover seed, and the average total cost is about £8 to £10 an acre. In addition, the farmer must spend at least up to 34s. an acre for the next two years on manures to establish the pasture, and then up to 17s. an acre each year maintaining it. Under such treatment with good husbandry manuka should be beaten more or less permanently so long as top-dressing at the rate of 1 cwt. to the acre is maintained annually.

Taking a long-term view, it is in the national interest to maintain production by carrying out this top-dressing. Over a period of years it is certainly an economic proposition. But it is not economic from the farmer's short-term view which is necessitated by realities. The farmer is not a philanthropist; he must continue to make a living. The unjust point is that the low-country farmer gets his fertilizer for about £9 a ton, and his land is usually better land. The man who must have the fertilizer to survive must pay up to £17. The man who pays £9 gets the same return from top-dressing as the man who pays £17. All this is wrong from a national point of view.

We said in our first interim report:—

As to price, the farming community has viewed with considerable alarm recent increases in price, and we share the industry's concern. We realize that these actions were taken with the very best intentions, but, nevertheless, we feel that an error of judgment was made; that the increased price, while perhaps fully recouped to some farmers, is only partly recouped to the store-sheep breeder; and that the change has resulted in a practice of diminished manuring of marginal country, which can only lead to rapid pasture deterioration. Such deterioration should be viewed as a national disaster to-day.

A new scheme has been introduced for subsidy on the cost of lime, and we consider that this scheme should be tried before further consideration is given.

We consider that the price of superphosphate should be brought back to a relatively cheap price, and we consider, further, that under present conditions such price should be £7 per ton ex-works. As this figure is below the present cost of manufacture, we recommend the reintroduction of a subsidy scheme to reduce the current price to £7 per ton, the cost of such subsidy to be a charge on the pool accounts of the farming industries. This will create a desirable cycle of increased production, which will in turn put increasing surpluses into the pools.

We are aware that some farmers are satisfied with the present arrangements, but we are confident that farmers generally will place considerations of national welfare, and the particular necessity of maintaining our hill pastures as a national asset, above other sectional considerations. The faith and aim of the New Zealand farmer has always been in the maintenance of pastures, and we hope and trust that this will continue to guide his decisions.

We consider, also, that some additional assistance will be required by the back-country farmer on marginal land to reduce his high costs of transport of fertilizer, and that such assistance should be paid out of the Consolidated Fund; but we prefer to leave the recommendation of a scheme until we have seen typical examples of all such conditions throughout New Zealand on which to base our consideration.

As the rate at which deterioration was setting in alarmed us, we said in our second interim report:—

The amount of return which can be expected from applications of manure will be relatively the same from similar soils and under similar conditions, no matter whether near to or distant from a fertilizer-works. The result is that, no matter how prices are varied, the hill-country farmer will always be at a disadvantage in endeavouring to increase his production.

Four methods of affecting a reduction in transport costs have been presented:—

- (a) A standardized price of, say, £8 10s. per ton throughout New Zealand so that the nearer farmer pays part of the costs of the distant farmer; or
- (b) Classification of the land which is marginal, and the application of a graded subsidy accordingly; or
- (c) The establishment of free railage points, as has been done in the South Island; or
- (d) The application of a freight maximum.

Alternative (a) is probably the ideal method, but we do not feel that it is practicable in the present conditions of fluctuating and uncertain costs of both manufacture and transport, as both these costs must be known, and also more facts in regard to the application of manure in various districts than are at present known.

Alternative (b) was recommended by the Agricultural and Pastoral Committee of the House of Representatives, but we do not consider it practicable to classify marginal land as recommended by that Committee. If it is not possible to classify such land easily and simply—and we cannot see any such possibility—the scheme becomes impossible of application.

Alternative (c) of free railage points does not solve the problem in the North Island, although it is reasonably satisfactory in the South. Except where there is a good railway network of both trunk and branch lines, free railage points would mean a premium only to lands near railways. As the bulk of the cost is road haulage, this would effect little improvement.

Alternative (d) of a freight maximum is simple of administration, though it means that some rich low-country lands will be included with the hill country. However, we feel that this anomaly is too small to constitute a defect in the scheme, and we consequently recommend it.

We recommend, therefore, the fixing of a maximum freight charge of 30s. (thirty shillings) per ton to cover the combined road, rail, and sea cost of transport on artificial fertilizers, the farmer to pay the full costs of transport and to be reimbursed to the extent of any payments made exceeding 30s. per ton on production of his receipts, such payments to be a charge on the Consolidated Fund.

We are disappointed that the sheep industry has rejected our proposals, and that, following the industry's rejection, the Government has felt disposed to take no action. We do not consider the decision of the Dominion Council of Federated Farmers to be compatible with the true views of the industry, if those views were put to a majority vote based on a sheep-population basis. We are confident that on such a basis a majority of the industry would support our proposals.

On full consideration, having examined the industry from one end of New Zealand to the other, having met thousands of farmers, many on their own farms, we reiterate all that we have said in our interim reports.

We said that a standard price for fertilizer was the ideal method, but that the then prevailing conditions (June, 1948) made it impracticable of application. Since then conditions have stabilized considerably and there is prospect of a rapid return to normal conditions at the phosphate islands. The Director-General of Agriculture has told us that he believes it may be possible to introduce a standard price. If there is any prospect of being able to do so, we say emphatically that it should be done.

Consequently we recommend that a standard price of £8 10s. per ton on the farm should be introduced on and from 1st July, 1949. There are prospects of reduced costs in the future, and such a fixed price as from 1st July, 1949, might require a subsidy of up to £500,000 in the first year, a subsidy of probably not more than £100,000 in the second year, and thereafter no subsidy. These subsidies could well be provided by the Government, with the farming industries contributing half this sum from the annual interest on the pool accounts. We realize that this will benefit the North Island more than the South Island, but this should counterbalance the advantage of the South Island with the existing lime subsidies.

There is a further point of considerable importance. Any change in the price of fertilizer should be effected always as from 1st July. Last year appeals were made to farmers to take delivery of their fertilizer early in order to assist transport. Many did so, knowing they would have to store the superphosphate at considerable difficulty until later in the year. Then the price was reduced and not made retrospective to 1st July. The net result was that all those patriotic farmers who responded to the appeal to order fertilizer early paid £1 a ton more than the unthoughtful ones who took no heed. The response to any future appeals of this nature is certain to be poor as a result.

(iii) FERTILIZER: QUANTITY AVAILABLE

So much for the price of superphosphate, but what quantities will be available? First of all, what quantities will be required?

It has been impossible in the past to forecast with any accuracy what amounts of fertilizer would be required in New Zealand to develop all reasonable farming land for production. Such an estimate could only be based on the results of the soil survey which was complete for neither Island at the time of our appointment. Thanks to the energetic co-operation of the Director of the Soil Bureau, Dr. L. I. Grange, and his staff, the survey

has been pushed ahead, and in December, 1948, it was possible for the North Island figures to be placed before us. We wish to express our thanks to Dr. Grange for his assistance. The results of his survey are as follows:—

POTENTIAL LAND USE FOR PASTORAL PURPOSES
(North Island only)

Class 1—Flat and Rolling Land (Ploughable) That is, or Can be Converted Into, High-quality Land

	Acres.
(a) Without fertilizers	475,000
(b) With use of fertilizers	2,783,000
(c) With drainage	311,000
(d) With fertilizers and drainage	1,135,000

Class 2—Flat or Rolling Land That is, or Can be Converted With Fertilizers Into, Fair- or Medium-quality Land

(a) Limiting factor, summer moisture	550,000
(b) Limiting factor texture, structure, elevation	3,015,000

Class 3—Flat and Rolling Land That has Severe Limitations to Productivity

(a) Very infertile brown loams	104,000
(b) Low-fertility pan soils	120,000
(c) Peat soils, low fertility	324,000
(d) Plateau soils of fairly high elevation, mainly about 2,000 ft.	638,000
(e) Very dry sandy, gravelly, or stony soils	323,000
(f) Saline soils	10,000
(g) Wet soils, not peaty	38,000

Class 4—Hilly or Steep Land That Will Maintain Pasture Without Top-dressing

(a) With little or no erosion	1,309,000
(b) With slight to moderate erosion	1,773,000

Class 5—Hilly or Steep Land That Will Maintain Pastures if Top-dressed and Carefully Managed

(a) Top-dressing includes basic phosphates	894,000
(b) With little or no erosion	2,211,000
(c) With slight to moderate erosion	1,372,000

Class 6—Hilly or Steep Land That Has Severe Limitations

(a) Low-fertility soils deficient in phosphate and lime	698,000
(b) Low-fertility soils under high rainfall	202,000
(c) Is or is liable to be severely eroded	8,385,000
(d) Gravelly soils that dry out	255,000

Now an analysis of these figures reveals the following position:—

	Acres.
(a) Land which can be farmed without fertilizers	3,868,000
(b) Land which can only be farmed well with fertilizers	11,960,000
(c) Land with severe limitation for farming	11,102,000
	26,930,000

It must be realized that much of the land which can be farmed without fertilizers is being top-dressed at present and definitely yields higher production with top-dressing. If we allow for 3,500,000 acres at present being top-dressed in the North Island, and apportion this as 1,500,000 acres in Class (a) above, and 2,000,000 acres in Class (b), (an arbitrary assumption, but one which appears reasonably accurate), we are left with approximately 10,000,000 acres of potentially good farming land in the

North Island, not subject to severe erosion nor too steep nor too high for farming, which can be brought into full production only by top-dressing. In addition, there are 11,000,000 acres which will always have severe limitations for farming. Some of this is in bush and scrub (about 5,000,000 acres) but some is at present being farmed. Comparatively little can be done on a national plan at present to assist the remaining 6,000,000 acres of this land. Let us concentrate on bringing into full production the 10,000,000 acres of potentially good land that needs mainly fertilizer for development.

(iv) DEVELOPMENT PLAN

We cannot develop 10,000,000 acres in one year. We could neither grass it nor stock it if it were developed. But having regard to our seed-production and the natural increase of stock, we should be able to develop 250,000 acres of this each year. This will take forty years to achieve full production in the North Island on our potentially good farming lands. We believe this should be set as a programme and every effort made to achieve it, with stronger emphasis on the development of lands at present occupied, leaving the development of unoccupied lands until later. The principal requirements to such a forty-year plan each year would be—

Labour—

Management	Already available on occupied land.
Scrub-cutting, fencing, top-dressing	1,000 (based on 1 man to 250 acres).
Seed (25 lb. per acre)	3,000 tons.
Fertilizer—3 cwt. each first three years; thereafter 1 cwt. annually	First year, 37,500 tons; second year, 75,000 tons; third year, 112,500 tons; fourth year, 125,000 tons, increasing by 12,500 tons each year to reach 450,000 tons annually.

This fertilizer would be required in addition to the present usage of 450,000 tons, making a total requirement forty years from now of 900,000 tons of fertilizer for the North Island. And this has allowed only 1 cwt. per acre annual top-dressing after establishment, and no further extension of manuring on soils which will maintain pastures without it. Allowing for these, and some fertilizer which will be used on the lands with severe limitation, it is reasonable to fix the eventual demand of the North Island at 1,000,000 tons.

What of the South Island? At present it uses 150,000 tons. Because of the limitations imposed by rainfall, the general response from fertilizer is less than in the North Island except for some coastal areas and areas under irrigation. The South Island demand for fertilizer is not likely to be as great as that of the North Island. In the absence of the completed soil survey, let us put the ultimate usage at 500,000 tons. This means an over-all position as follows:—

	Present. Tons.	In Forty Years. Tons.
South Island	150,000	500,000
North Island	450,000	1,000,000
	-----	-----
	600,000	1,500,000

From where is New Zealand to get this quantity of fertilizer ? Assuming that the rock will be available (which we are assured is likely), the existing works cannot produce the quantity needed. The present capacity is (superphosphate and basic slag) :—

	Output 1947-48.		Ultimate Capacity.	
	Tons.	Tons.	Tons.	Tons.
New Zealand Soluble Slags, Huntly ..	30,000		30,000	
Challenge Phosphate, Otahuhu ..	108,000		160,000	
Kempthorne Prosser, Westfield ..	78,000		100,000	
New Zealand Farmers, Te Papapa ..	69,000		90,000	
Kempthorne Prosser, Wanganui ..	74,000		90,000	
New Zealand Farmers, New Plymouth	88,000		120,000	
<hr/>				
Total, North Island		447,000		590,000
Kempthorne Prosser, Hornby ..	52,000		55,000	
Burnside	34,000		38,000	
Ravensbourne	59,000		80,000	
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Total, South Island		145,000		173,000
<hr/>				
New Zealand total		592,000		763,000

It is obvious that additional works will be required. The proposed works at Napier will probably add another 80,000-100,000 tons, and if a works is eventually constructed at Whangarei for grinding rock, another 50,000 tons will be available, bringing capacity to just under 900,000 tons. Other works will probably be required in the North Island, notably to serve the central plateau area.

Transport, however, is an equally important problem. At the present time our transport system is unable to carry our present fertilizer needs. Long hauls from the works to the farms need to be reduced, and in planning new works the reduction of lengthy hauls should be a vital consideration.

The whole position needs constant and inspired planning. The Director-General of Agriculture should give a lead, and the whole responsibility should be his to see that all the steps are taken now to ensure that all the fertilizer needed is available when required in the future and that there is a transport system which will enable its speedy delivery on the farm. At present he has only part of the responsibility. It should not be left entirely to the farmers to take the initiative ; that should be taken by the Director-General of Agriculture. The position calls for boldness and vision.

In our first interim report we said :—

We are of the opinion that it is necessary that lime and fertilizers should always be available to the New Zealand farmer in sufficient quantity and at a relatively cheap price. We realize that the question of quantity is governed at present by restrictive circumstances arising out of the war, but we recommend :—

- (1) That a special technical committee be appointed forthwith to examine in detail the possibilities of increasing the supply of manures, and, if found possible, of locating additional works throughout the country to reduce the present high costs of transport from works to farm.
- (2) We suggest respectfully that such committee should comprise the Director-General of Agriculture, or his nominee, as Chairman ; two nominees of Federated Farmers, one to represent the dairy industry and one the sheep industry ; a nominee of the manure-manufacturers ; the Secretary of the Department of Industries and Commerce ; and a fully-qualified and experienced agricultural economist as Secretary.

- (3) Further, we suggest that such committee should be asked to submit to the Government as early as possible, but not without full consideration of all the issues involved,—

(a) A report covering the estimated requirements of fertilizers in New Zealand in the coming years;

(b) A statement of the present available supplies;

(c) A practical plan calculated to make available to farmers at the earliest opportunity all the fertilizers they will require; and

(d) A plan for the urgent development of aerial top-dressing of hill country.

- (4) This committee should be fully directed on the importance to New Zealand of making provision for all the fertilizer required as a prime maxim of State policy, and that an increasing ration of fertilizer must be made available to farmers on marginal land who are improving their land.

We most energetically reiterate this recommendation. We put it forward a year ago as the position was urgent then. With nothing done in the first year, the position is much more urgent now.

(v) LIME

We consider that the increased use of lime will prove as important in raising production as the increased use of fertilizer. We have had explained to us by representatives of the Lime Committee the proposals which are being finalized in regard to lime subsidies. These proposals are satisfactory, and we consider we can best leave to the Lime Committee the completion of this scheme and other details with regard to lime production and distribution.

(vi) COMPOST

It appears to us that the provision of superphosphate should be augmented by the production of compost on a national scale. The production of compost has now gone well beyond the inquiry stages—it has become a practical fact at Dannevirke, where Mr. H. A. Truman introduced a scheme for the Borough Council. This is Mr. Truman's description of the Dannevirke scheme:—

In 1943–44 small-scale municipal composting was started on the Dannevirke Domain, using slaughterhouse and fish-shop wastes, hotel garbage, and garden wastes from the domain.

The compost produced gave excellent results when used on the domain flower-beds.

It was obvious, however, that considerable modification would be required to the technique used in this experimental work before such materials as fish waste and offal could be safely handled. Further, no sludge could be used at this site.

In October, 1946, further experimental work was commenced on a large scale. At the new site the whole output of sludge and effluent from the borough's one septic tank can be gravitated to the heaps.

It should be stressed that although the present operations have been most successful, nevertheless, they are still definitely in the experimental stages.

The system was evaluated primarily as a means of disposing of difficult organic wastes. However, the possibility of producing an organic fertilizer with a market value was also envisaged.

At this stage it is apparent that the scheme has definite economic possibilities, also that it affords a most satisfactory and hygienic means of disposing of three unpleasant and refractory municipal wastes—*i.e.*, sewage sludge, town refuse, and slaughterhouse wastes; also that a valuable organic manure results, which is readily saleable.

(a) *Type of Materials Used:—*

Abattoir and slaughterhouse waste.

Fish-shop garbage.

Hotel and boardinghouse garbage.

General town refuse.

Sewage sludge and effluent from borough septic tank.

Street grass and cleanings.

Dead animals—*i.e.*, horses, cows, cats, dogs, &c.

Skin pieces and trimmings from wool-stores.

Waste paper from departmental stores and shops.

Sawdust and shavings.

Domain refuse—*i.e.*, lawn clippings, leaves, weeds and hedge clippings, &c.

Wood-ash.

In fact, anything which is organic in its origin. All the above wastes have been successfully composted in the Dannevirke scheme. Of particular interest in this connection is the disposal of omasums, or more commonly known as "bibles" or "books," these being the third stomach of a beast and occur in slaughterhouse wastes. Normally these are particularly difficult to dispose of and cannot be successfully destroyed by ordinary burial or burning. Omasums were exhumed after six years of burial and were found to have undergone very little change in structure during that period, whereas when disposed of by composting were completely decomposed, as were dead horses, cows, and fish-shop garbage, in six weeks.

(b) *Methods Adopted.*—The basic idea behind composting is that raw material is decomposed outside the soil, an imitation of soil conditions being arranged in the heap or pit. The conditions are: aeration, non-acidity, moisture, but not sodden wetness, warmth and nitrogenous food for the bacteria. The various schemes for composting are based upon the provision of these favourable conditions. The great advantage of the compost heap over decomposition within the soil is that the heap can preserve, even in winter, very much higher temperatures, so that the speed of humus production is much accelerated. Raw organic matter in the soil will be very slowly decomposed during the winter months. Generally, the method used is an adaptation of the Indore system as pioneered by the late Sir Albert Howard.

(c) *Costs of Sales.*—The cost of establishing and operating the scheme to date is as follows:—

	£	s.	d.
Labour	549	19	1
Plant and materials	435	14	9
Miscellaneous cost	29	4	9
	<hr/>		
	£1,014	18	7
	<hr/>		

It should be pointed out that the above costs cover a considerable amount of experimental work. In order to improve the working conditions and generally increase the efficiency of the plant it is proposed to expend a further £1,000. The whole of this expenditure is in the form of capital expenditure and is of a non-recurring nature.

The material is selling very readily both in the borough and the surrounding district. Actually an offer has been received from a mercantile firm to take the whole output. The present selling-price is £2 per cubic yard or 5s. per manure bag, both prices including delivery within the borough. There are approximately twenty-four bags to one ton, and ton-lots are being sold at £5. It is expected that some 600 to 800 cubic yards will be manufactured this year. When it is possible to organize for the collection of the whole of the available organic refuse in the borough the annual manufacture will be in the vicinity of 1,200 to 1,600 cubic yards.

(d) *Agricultural Aspect.*—The results obtained by the use of the compost as an organic manure have been very satisfactory, the author himself having obtained good results in both the vegetable and flower garden. This experience is shared by others in the town. Also tests carried out in the growing of lettuces from seed by the Soil Survey Division of the Department of Scientific and Industrial Research, Wellington, proved that Dannevirke composts gave quick responses far in excess of those given by equivalent quantities of dried blood or sodium nitrate.

The stock of fully-matured compost available at the commencement of the current planting season was somewhat limited; consequently sales were also limited. It is, however, anticipated that a heavy demand will be made on the product in the autumn, particularly by farmers in the Central Hawkes Bay area.

(e) *General.*—From the results so far obtained it is quite apparent that the venture will earn a return for the ratepayers, which return should more than cover the expenditure incurred in the collection and composting of refuse and sludge.

Some criticisms have been made of the scheme, one being that selected refuse is being used. This is incorrect, as any and all kinds of organic refuse are being used, as will be seen from the list given earlier. Another and more general criticism is the amount of nitrogen recoverable by municipal composting. It should, however, be pointed out that it is the production of humus which is of importance.

The physical and bacteriological condition of humus may well prove to be of greater importance than its chemical composition. In any case it is an acknowledged fact that fertilizers cannot take the place of humus in soil fertility, although they may be required to supplement it.

Further, the chemical aspect of composts is not as yet well established.

Again it is not a question of how much or how little humus or compost can be produced; the vital point is that by existing methods of disposal huge quantities of organic matter are being wasted at a time when it is known that humus is required for soil fertility. Why, then, should municipalities be permitted to go on pouring sewerage into the sea and rivers and burning or burying refuse at considerable cost to the ratepayers when these materials could be utilized and a financial saving made for the ratepayers—apart from any consideration of the likely benefit to the land and thus to animals, plants, and humans. This latter aspect is incidental to the main issue, but none the less important. Further, pouring of sewerage into the seas and rivers has led to pollution, and the burning of refuse is likely to create a smoke nuisance.

Progress, or the less controversial term, “natural evolution,” causes changes of habit, while prejudices which are of significance in one age become music-hall jokes of another.

(f) *Conclusions.*—From the experience gained in Dannevirke the position can be summarized as follows:—

- (1) Municipal composting provides a sound and hygienic method for the disposal of difficult organic wastes.
- (2) Municipal composting improves both public amenities and sanitation.
- (3) Municipal composting should earn a return for the ratepayers.
- (4) Municipal composting makes it possible to return to the land both town refuse and town sewerage, by way of available organic manure, which should be the ultimate aim of all who are responsible for the disposal of these valuable wastes.
- (5) Municipal composting appears to be a practical possibility for most towns.

We have seen the Dannevirke scheme, and we have seen its products tried under garden conditions. It appears to us that while compost might prove too bulky to be distributed on hill country, it could be used on market gardens in place of blood and bone, and would release all of that type of manure for its return to the country from which it came, the lands of the sheep industry. Compost might also release superphosphate from dairy-farms nearer towns. Dannevirke has already produced 300 tons annually, and its capacity has been stated to us at 550 tons. Dannevirke has a population of 4,400. On the basis of 550 tons from 4,400 people, if every town with a population of more than 1,000 composted all its wastes, there would be available 129,000 tons of compost. Actually the larger industrial towns will have more waste, and the amount of compost available should be not less than 250,000 tons if all organic wastes were reclaimed.

Scientific evidence was presented to us in Auckland by Professor Chapman, who appeared for the Auckland Suburban Drainage League, and we were very impressed by the case he presented. We also saw compost being produced on the farm of Mr. D. Gill. Without commenting on the Auckland scheme, which is now before another Commission, we would like to say that we agree that something should be done.

We think the matter has gone beyond the inquiry stage. There can be no doubting the nation's need. We must increase the fertility of our land or perish. We consider that all organic wastes should be used for this purpose ultimately. We think, therefore, that all local authorities should be encouraged and assisted by the Government to reclaim all such wastes and process them into compost for the agricultural industries, particularly vegetable-production. We realize that time will have to be given to make the change, but Dannevirke has shown that it can be done economically. Enough information is available for any local authority to go ahead with this work immediately.

(vii) CATTLE-STOCKING

We have said that fertilizer is the chief answer to the problem of deterioration. It is, however, not the whole answer, for better stocking practice is also a factor. We think it is now generally recognized that stocking with cattle is vitally important to pasture improvement. It has been shown to us in evidence that a farmer stands to gain financially from a well-judged policy of reducing the number of sheep carried and increasing the number of cattle carried, for the remaining sheep will do better and fleece-weights will be increased. There are still, however, numerous cases where insufficient cattle are being carried. To the farmers concerned we can only say, "You will ruin your pastures unless you cattle more." We hope that officers of all Departments in all their contacts with farmers will stress and encourage heavier stocking with cattle in both islands.

2. DEPLETION

(i) DESCRIPTION

Deterioration is the introduction of unpalatable plants into the pastures, such as scrub and fern. Depletion is the reduction of all plants of the grassland, both the palatable and the unpalatable species. In its worst form depletion leaves bare ground. Depletion is mainly a problem of the South Island, and there practically a problem of the tussock grasslands. The 1920 Commission on the Southern Pastoral Lands (which we will refer to as "the 1920 Commission") set out the condition of those grasslands as follows, in terms which we fully endorse:—

First of all, it must be certainly understood that the South Island mountain sheep pastures, even in their original condition, were far from being of uniform composition. This lack of uniformity was due, in large measure, to the extreme range of climate experienced by the pastures. Then there were also soils differing greatly in fertility, especially the two distinct classes of those overlying greywacke and those of mica-schist.

As for the climate, this depends, in no small measure, on the rainfall; or, better still, on the annual number of rainy days and also their seasonal distribution. These matters concerning the rainfall are governed by the situation of any pastoral area with regard to the north-western rain, and to a lesser degree by the situation with regard to the downpour from the south-west. At a definite distance to the east of the Southern Alps there is a line, marked by forest, which denotes the average eastern limit of the north-western rainfall. So, too, there is another limit, but not necessarily forest, which marks the northern average limit of the south-western rainfall. Further to the east, or the north, of these lines the climate becomes gradually drier, until, at a certain distance from the east coast, easterly rain comes into play. From the above it can be seen that there are two extreme classes of pasture—the "wet" and the "dry"—while between these two are all kinds of intermediates. Nor is this matter of north-western and south-western rain all, for the latter is much colder of the two and more liable to bring snow.

Besides the average amount of rain to which any piece of pasture is exposed, considerable modifications exist through the effect brought about by change of latitude in passing from the north to the south of the South Island. Finally, altitude plays a most prominent part.

As for soil that of the mica-schist is of extreme fertility. The limestone soils which occur here and there, but rarely continuously over wide areas, are also excellent. Far poorer than either of the above are the soils overlying greywacke rocks, while these rocks themselves, so readily disintegrated, long before man came to New Zealand, had formed on the dry mountains those great masses of unstable stony debris known as "shingle slips."

Coming next to special climates dependent upon the lie of the ranges, there is that of Central Otago where rain from all quarters is precipitated on the mountains bounding that district, while in the area itself an extremely dry climate exists in the river-valleys, intermontane basins, and lower hills. Higher up, say at above 2,500 ft. altitude, the rainfall is greater, but not nearly equal to that of the South Island mountains in general. Other dry areas, but not so arid as Central Otago, occur in the Mackenzie Country (Canterbury) and in the Clarence and Awatere Valleys (Marlborough).

From the above brief account of the climate of the pastoral country of the South Island it can readily be seen how diverse must be the pastures and how certain causes leading to deterioration, or even depletion, must be greatly assisted, or retarded; and how, in considering remedies for improving the grassland, the climate of each area to be dealt with must be considered. In other words, the problem of improvement is complex enough, nor can hard-and-fast methods be suggested, since evidently each special pasture must be considered on its merits.

The main constituents of the sheep pastures are a number of indigenous grasses having one important character in common, the tussock-form. Evidently this particular form of growth, as it originally was dominant over all the South Island, east or north of the forested area, is highly suited to its environment. This statement is strongly supported by the fact that, even after the pastures have been grazed without intermission for about seventy years, the tussock, except in certain localities, dealt with further on, still dominates in the pastures.

According to the evidence given before us a large number of the witnesses spoke of tussock as if there was only one species which they called the "white tussock." This name refers not to one species, but to the following two quite unrelated species mistaken for one another—viz. the poa-tussock (*Poa cæspitosa*) and the fescue-tussock (*Festuca nova-zelandiæ*), this latter being by far the more common at above an altitude of 1,000 ft. Also there are two more tussocks of about the same size as the fescue-tussock—the tall blue-tussock (*Poa intermedia*) and the blue-grass (*Agropyron scabrum*). There is also a smaller tussock, close related to *Poa intermedia*—the small blue-tussock (*Poa Colensoi*). Next come two much larger tussocks—the snow-grass (*Danthonia flavescens*) and the red tussock (*D. Raoulii* var *ruba*) also called "snow-grass" by a good many. It is necessary to be quite clear about these various tussock-grasses, since they are frequently mentioned in what follows, and the correct determination of each is of great importance in determining the feeding-value of a pasture.

Besides the tussocks there are, in the mountain sheep pastures—taking only the more common into consideration—at least three hundred species of indigenous plants together with some forty species of introduced plants—mostly European—so that no pasture is anything like so pure as are even the most weedy artificial meadows of the lowlands. Of these indigenous plants probably only a dozen can claim to be of any feeding-value; with the introduced plants it is different, for, at any rate, some fifteen possess degrees of palatability from the very highest—e.g., meadow-grass (*Poa pratensis*) and cocksfoot (*Dactylis glomerata*) to that of rather poor feeding value limited to one season of the year—e.g., sweet vernal (*Anthoxanthum odoratum*).

(ii) CAUSES

Of the causes of depletion, Dr. Leonard Cockayne, one of the greatest experts on tussock grasslands New Zealand has ever had, wrote in terms which we also endorse:—

As at the time of its first occupation by the sheep-farmer there was all over the area that continuous close covering of tussock-grassland which had been there for hundreds of years, the subsequent disappearance of the latter is plainly due to those new conditions to which it was exposed through the operations of sheep-farming. But the treatment to which it was subjected was identical with that of the whole of the tussock-grassland of the South Island since its first occupation; yet, generally speaking, depletion, in the sense of that of Central Otago, has not come about. Plainly, then, the sole difference for the pasture here being considered under the methods of pastoral occupation lies in its special climate—the most arid, and, except in winter, the hottest in New Zealand. That the aridity of the climate, above all else, governs depletion is clearly shown by the fact that in the arid area itself as the rainfall gradually increases so does depletion gradually decrease, and that the sunny face of even a quite shallow gully will be fully depleted, when on the opposite darker face there will be more or less tussock. This can readily be observed again and again in proceeding, say, from Cromwell to Lindis Pass. It was, then, sheep-farming, as originally practised—and the methods are not greatly changed since its inauguration some seventy years ago—which first of all laid the foundation of depletion.

In order to render their harsh feed palatable for sheep the tussocks were burnt not merely in winter or early spring, but at all seasons. Now in an arid climate or situation a tussock can barely tolerate burning, even during a moist period, and the subsequent eating of the young leaves is highly detrimental to its well-being, while burning during hot dry weather spells certain death. Also, consider the effect of a second burning on tussock not fully recovered from the first attack of fire, and then think of the result of indiscriminate burning year in and year out.

These lower slopes, thickly covered with their primitive, close grassland (but now depleted to the utmost) would appear to offer an inexhaustible supply of feed. There alone could the sheep be wintered, nor could they be sent to the high pastures till well on in the spring; hence, in no few instances, would this grassland be greatly overstocked. So, what with the burning and overstocking, more and more bare ground would gradually appear, the palatable plants would be eaten out, and the tussocks themselves become smaller and weaker.

Then, in the early "eighties" of last century, the rabbit arrived from the lowlands and, as the food-supply decreased, crept higher and higher up the mountains. With an eminently favourable climate, abundant food, and a soil suitable for burrowing, or rocks in plenty for their homes, these animals increased enormously, so that with them and the sheep the country became greatly overstocked. Every plant at all palatable was eaten to the ground; the depleted area ascended higher and higher; those perennials alone could survive which either were not eaten at all or were furnished with far-extending underground stems, and possessed the power of rapid growth after being cropped close. Then there were the annual species, which possessed great and rapid powers of increase by means of seed, or, in the case of such plants as die yearly to the ground, by far-creeping subterranean stems. It is the addition of the three latter categories to the pasture—mostly foreign plants, with sorrel and wild-geranium the most important as feed, whose advent in quantity was made possible by the new bare ground—which has rendered the sheep-runs still productive, bringing in, accidentally—if Nature's methods can be so called—far more good feed than the general aspect of the depleted areas would lead one to imagine. Also, it is the composition, distribution, behaviour, and history of this new flora which first of all brings in a ray of hope for the solution of the regressing problem.

The 1920 Commission listed the following causes of depletion:—

- (1) Burning the tussocks, especially at the wrong season of the year.
- (2) Overstocking with sheep.
- (3) Continuous grazing for seventy years without attempt at improvement.
- (4) Allowing rabbits to become extremely numerous.

This latter is the most potent cause of all.

(5) The tenure under which the land has been and is held and some of the conditions of such tenures.

With regard to deterioration of the grasslands it must be pointed out that the climate, in conjunction with burning, overstocking, and rabbits, is the deciding factor as to how far depletion will proceed. Thus in the extremely wet areas, though there may be great deterioration, no phase of depletion is to be seen.

Greater dryness leads to hints at depletion, but it is not until the really dry areas are visited that the maximum of depletion is apparent. In this regard that portion of Central Otago already defined has the misfortune to stand first, but there are areas in the Mackenzie Country, Upper Waitaki, and the Clarence and Awatere Valleys where depletion has long ago reached the scab-weed stage, and where the evolution of depletion can readily be investigated.

The effect of a gradually increasing rainfall is well exemplified in travelling from Clyde to Dunedin. Up to Omakau the railway passes through country of a maximum depletion. But at that point the altitude has considerably increased, the rainfall consequently is rather higher, so tussocks once more put in an appearance. Proceeding onwards there are large and small pieces of depletion here and there, but by the time the Maniototo Plain is reached no depletion such as that near Clyde or Alexandra can be seen. On the slopes of the Rock and Pillar there are isolated areas of depletion, but there is no scab-weed. Further on depletion ceases altogether, and foxglove (*Digitalis purpurea*), a weed of a wet climate, appears in quantity. Even in Central Otago itself the sunny face of a shallow gully may be altogether depleted while the shady face is still covered with tussocks; this occurs again and again.

Another kind of depletion appears on the greywacke mountains of Canterbury and Marlborough. This rock, as already stated, disintegrates rapidly. Once remove the plant-covering and the stony debris beneath is quickly laid bare. Burning tussock near shingle-slips has thus led to their extension. Many such slips once covered with tussock have been again denuded, and, moving downwards, have buried the grassland below. But this matter receives further consideration under the heading of "burning."

Of rabbits the 1920 Commission said:—

Great unanimity is to be seen in the evidence given by our witnesses regarding the control of rabbits. With but one or two exceptions the witnesses are strongly of opinion that there is one way alone in which rabbits can be reduced to a minimum, or indeed eradicated. This method is by poisoning. On the other hand, trapping is almost universally condemned. With these verdicts we unanimously agree.

And of burning it said :—

During comparatively recent years the question of burning tussock has led to much discussion. One section of the runholders favoured burning, while another section considered that burning should never be practised. Those opposed to burning made out a sufficiently strong case for the Lands Department to take action, so that in the present Acts are sections to the effect that burning tussock—the kinds are not defined—shall take place only in the late winter and early spring (July, August, September) and that snow-grass is to be burnt under no circumstances. Stated briefly, the reasons for burning and the contrary are as follows :—

For Burning—

- (1) Unburnt tussock (poa and fescue) is unpalatable, so burning must be practised, as it favours the production of young palatable leaves.
- (2) Non-burning leads to a rank growth of the tussock with many dead leaves and stems which choke out the neighbouring palatable plants.
- (3) Burning in early spring does no harm to the tussock.
- (4) Burning owes its bad reputation to its having taken place at the wrong season of the year—*i.e.*, during hot, dry periods when the tussock may be killed outright.
- (5) If burning is not practised, accidental fires at the wrong season of the year will sweep over the country and do irreparable damage.

Against Burning—

- (1) Constant burning weakens and gradually kills the tussocks.
- (2) The presence of the tussocks is necessary for the protection of the ground-vegetation between them.
- (3) The food supplied by the new growth after burning is only available for a comparatively short time.
- (4) Burning destroys not merely the tussock, but also the valuable palatable plants which grow between them.
- (5) Burning leads to extension of bare ground and consequent erosion. To the above it might be added that burning leads also to the spread of unpalatable plants, a point already stressed.

Taking the evidence before us together with our personal experience, we are strongly of opinion, so far as evidence and experience go, that burning tussock is desirable. The following two reasons may be adduced in addition to those already cited in favour of burning :—

- (1) Even if poa-tussock or fescue-tussock is killed, and in consequence the ground becomes occupied by more palatable plants, burning is beneficial. Thus the danthonia pastures of Marlborough and areas of meadow-grass (*Poa pratensis*) in many places have replaced tussock after burning greatly to the benefit of the pasture through its increase in palatability.
- (2) Burning is a most valuable adjunct to surface-sowing.

Now, in supporting burning it must be understood that we are altogether opposed to *indiscriminate burning*. Burning indeed requires carrying out with the utmost discretion. First and foremost comes in the matter of climate, and in this regard it may be stated that the danger of damaging the pastures increases in proportion to an increase of dryness in the climate. Thus it is absolutely safe to burn near the forest area of the west and most dangerous to burn in the extremely dry areas.

The matter of burning is indeed closely wrapped up in climate. It would be dangerous to propose any hard-and-fast rule regarding burning as is done in the Land Act. Each district and, in some instances an individual run, should have its special rules regarding burning. In other words, the skilled sheep-farmer should know when to burn his run better than any other man.

But the above dictum must be modified by the fact that not sufficient is yet known regarding burning *per se*. Experiments are urgently demanded, so as to really learn what burning does with regard to the tussock itself and its accompanying plants. For instance, the following questions await an answer: How frequently can one and the same tussock be burnt? What amount of feed is produced after burning? To what extent and in what proportion do palatable and unpalatable plants come into new ground? Other questions suggest themselves, but the foregoing will suffice. Above all, adjacent sheep-stations where burning and non-burning is carried out require comparison, as also those on which different degrees of burning take place. These and other matters we suggest as subjects for investigation by the Department of Agriculture.

As to the circumstances under which burning should take place we advise as follows:—

- (1) Burn when the tussock has become more or less choked out by its dead leaves and stems.
- (2) Burn only in the early spring when the ground is damp. But here it must be remembered that spring comes in at different times on a mountain sheep-run. It is entirely a matter of aspect and altitude and not of the season of the year as defined in the almanac. Thus there can be no hard-and-fast date for burning even on one and the same run.
- (3) Burn snow-grass (*Danthonia flavescens*) with caution, and this rather for the purpose of providing tracks for the sheep and not food, for the large snow-tussocks make valuable shelter for stock and in time of snow serve as food.

Equally, if not more important, than the right methods of burning, are the circumstances under which burning should *not* take place. These are as follows:—

- (1) Do not burn off sunny faces in an extremely dry climate.
- (2) Do not burn when the tussocks are greatly reduced in size.
- (3) Avoid burning where it is likely to bring in an excess of unpalatable plants.
- (4) Do not burn on greywacke mountains in the vicinity of shingle-slips or where the soil is shallow and slips are readily made.
- (5) Do not burn in a dry climate where rabbits are numerous, and so provide food for these pests.
- (6) Do not burn in the neighbourhood of rabbit-warrens.
- (7) Do not burn near the sources of shingly rivers and bring out an excess of shingle which may raise the river-bed and bury well grassed river-flats. From what has been said regarding burning it is evident that the sections of the Land Act regarding this practice require greatly modifying.

(iii) DEVELOPMENTS SINCE 1920

Developments since 1920 have been summarized by the Agrostologist to the Department of Agriculture (Mr. S. H. Saxby) as follows:—

The work carried out in this connection can be subdivided as follows:—

Individual Runholders.—Throughout the high country individual runholders have made many experimental sowings ranging from offals from seed-cleaning plants to the sowing of small areas of specific grass and clover seeds. In general there is no indication that any major over-all improvement has resulted. There are, however instances where deliberate sowings have been wholly successful. For example, in some favoured areas cocksfoot has been established with success. In others, and perhaps more widely, yarrow has been introduced providing permanent and useful cover. On some of the poorer and depleted country such as is in Central Otago various runholders have from time to time sown out various introduced grasses. Little general benefit seems to have resulted from the latter.

Department of Scientific and Industrial Research.—The work of this Department has been carried out chiefly by the Botany Division, who have concentrated their efforts mainly on Molesworth Station. Detailed records have been kept regarding vegetative changes as the result of closing up, surface sowing, and the performance of individual introduced species.

Department of Agriculture.—Although considerable investigation was carried out by this Department prior to 1920, this will not be dealt with as only that subsequent to 1920 is desired.

In 1922 Dr. L. Cockayne was engaged by the Department of Agriculture to carry out an investigation into the montane tussock country of the South Island. During the course of his investigations he conducted trials with introduced grasses, &c., as well as observing the effects of grazing and spelling tussock land in various areas.

While much valuable information was secured, particularly in Central Otago, the factor that was found to overrule the significance of various plants was the presence of grazing animals, the most important of which was the rabbit. As soon as any area was opened for grazing it was rapidly eaten out and became of little significance. Nevertheless, certain introductions that were made many years ago persisted (in a depauperated form) to the present time.

Of the various experiments carried out by Dr. Cockayne the one which has provided the most information is that on the Northburn Run, near Cromwell. These areas of about an eighth of an acre were enclosed with rabbit-proof fences and sown with a variety of pasture plants. These areas were at various altitudes and on all aspects.

In more recent years an area was set aside on the Pisa Flat where further investigations have been carried out. Much of the work confirmed the results secured from Dr. Cockayne's plots on the Northburn Run. However, much additional information has been secured with regard to useful species. Of the large number tried out comparatively few have been able to stand the test of both climate and grazing. The most promising of these are being sown this autumn on a 100-acre block of depleted country. This will be an endeavour to put into practice the results of at least twenty-five years investigations.

The grasses which show promise include:—

- Tall oat-grass.
- Blue wheat-grass (*Agropyron scabrum*).
- Phalaris tuberosa*.
- Danthonia pilosa*.
- Crested wheat-grass (to a limited extent).
- Cocksfoot (to a limited extent).
- Brachypodium phœnicoides*.
- Poa pratensis*.
- Tall fescue.

In addition to this, several plants other than grasses are being sown.

In Canterbury, trials have been conducted in the Mackenzie Country since 1921, when they were laid down by R. McGillivray and F. E. Ward. Several of the species sown have persisted well and show promise of being valuable. Further trials have been laid down during the last year or two.

More recently investigations have been commenced in the Cass area of Canterbury. Up to the present, investigations have been restricted to a detailed study of the native vegetation with regard to its reaction under the influence of stock, fire, and spelling. Preliminary results of this investigation were published in the *New Zealand Journal of Agriculture*, September, 1948. In the summer of 1948-49 an area of 2 acres has been fenced off for the purpose of testing out promising pasture plants.

Tussock country is extremely variable, with the result that information secured at one place may be valueless on a different soil type in another district. For example, the fertile and free soils of Central Otago will support plants such as *Poa pratensis* and cocksfoot, which are of very little use on the acid soils in the vicinity of Cass.

In general it appears that the grasses most likely to be of value in regressing the tussock country will be introduced ones that have been evolved in an area subject to grazing. Most of the native grasses are susceptible to both grazing and burning. The tussocks as a whole increase very slowly. The important exception to this is blue grass, one strain of which is very promising.

Unaided Introductions.—With the changed conditions of grazing and burning a number of exotic grasses have become established throughout the country and have replaced the indigenous plants. Notable amongst these are Yorkshire fog, sweet vernal, chewings fescue, brown-top, and various annuals such as the hair-grasses. Of these, Yorkshire fog and sweet vernal are valuable. Even though they produce little feed, the feed that they do produce is useful and they associate well with the tussocks.

Edible Herbs for Arid Country.—This aspect has not been fully explored. Over a period of years a number has been investigated, but there is a wide field yet to be explored. Trials are being commenced this autumn in Canterbury in connection with edible shrubs for the control of Nassella tussock.

In some of the drier districts herbs such as yarrow, sainfoin, sheep's burnet, and chicory all show promise of being valuable where stock cannot concentrate on them. On the comparatively dry tussock country of parts of Canterbury the rather despised catsear provides useful but limited feed.

Salt bush was tried out about twelve years ago, but results were conflicting. Several areas failed to survive. One, however, established and is now satisfactory. In view of this, various types of salt bush were ordered from Australia and will be sown out this autumn.

Regeneration of Tussock Country.—On account of the great variations in the tussock country it is quite impossible to generalize, particularly with regard to regeneration. Spelling for fifteen to twenty years of country that is carrying a fair cover of tussock would almost certainly result in regeneration to a great extent, if it were completely spelled from fire and grazing and not aided by man.

On the seriously depleted country it is almost certain that unaided regeneration would not take place in fifteen to twenty years.

Careful observations made on fairly poor tussock country at Molesworth over several years and in Canterbury over a period of three years show no improvement at all.

On the depleted country of Central Otago, areas that have been closed up for twenty-five years with only short periods of grazing show no regeneration of tussock. There has been some ingress of introduced plants.

The regeneration of the depleted country of Central Otago appears to be not a matter of unaided regeneration of native plants, but one of deliberate aided and possibly expensive revegetation by man with introduced plants that are able to withstand farming conditions.

We have quoted extensively from the report of the 1920 Commission, and from Dr. Leonard Cockayne and Mr. S. H. Saxby, because the causes of depletion are scientific matters very ably expressed in these excerpts.

(iv) DEPLETION IS DUE TO LOW RAINFALL

We can say without fear of contradiction that the cause of depletion has been that the tussock grasslands have not stood up to the grazing to which they have been subjected under the low-rainfall conditions prevailing in the depleted areas. The most damaging part of this grazing has been from rabbits.

(v) RABBITS

The 1920 Commission (and earlier investigators) pointed out the menace of the rabbit, yet to-day, twenty-nine years later, the same problem confronts the country. We cannot avoid the conclusion that over these twenty-nine years the Department of Agriculture has failed in one of its important tasks, rabbit-destruction. We cannot, of course, absolve farmers from their share of the blame. To-day a more realistic approach is being made, and the Rabbit Destruction Council has taken over the direction of this work.

We say that rabbits must be exterminated, gigantic though the task may be. Reduction and control are not sufficient, for rabbits breed up quickly. Extermination is the only safe answer to this national menace. We have examined the plans of the Rabbit Destruction Council and found them to be good. We believe the Council should be given the fullest possible support in its campaign. Finance must be made available as required. It is pleasing to note that this is being done. In areas where the pound-for-pound subsidy is not sufficient we wish to point out that this extra finance must be made available continuously, particularly for the high country of the South Island, most of which is Crown land. Ten or twenty million pounds would be a small price to pay if rabbits can be exterminated. This programme must have the support of every farmer.

Four maps in the Atlas (Part Five) show the present coverage of New Zealand by Rabbit Boards (two maps) and the estimated distribution of rabbits in 1946 (two maps). The policy of rabbit-destruction needs a complete coverage by Rabbit Boards, and we commend the steps being taken by the Rabbit Destruction Council to complete the establishment of the remaining Rabbit Boards. Had it not been for the establishment of the Rabbit Destruction Council it would have been necessary for our report to have dealt much more fully with this problem.

The rabbit is the chief factor in depletion, and it is of little use taking any steps to re-establish a soil cover before the rabbit has been cleared. All possible research, however, should be undertaken so that when the destruction of the rabbit is complete the Department of Agriculture will have a range of plants with which to reclothe the ground, that it will know

from research how to go about such re-clothing, and that there will be available all the seeds necessary to do the job. We are not satisfied with what is being done at present in agricultural research. The present scattered efforts are not in proportion to the national magnitude of the problem.

(vi) BURNING

While some burning of tussock is necessary to maintain it in a grazable condition for stock, and to prevent the occurrence of accidental fires, we are satisfied it has been very much overdone in the past. We agree with the 1920 Commission that "the skilled sheep-farmer should know when to burn his run better than any other man." On the other hand, we agree that in some seasonal conditions burning is not desirable, and must be controlled to some extent. On all Crown lands, both pastoral lands and renewable leases, the consent of the Commissioner of Crown Lands should be required. On freehold lands the consent of the County Council should be obtained as provided in Section II above. The Lands Department should see that each landowner has a copy of the recommendations of the 1920 Commission on the burning of tussock, and that landowners are encouraged to carry out these recommendations.

(vii) OVERSTOCKING

Overstocking of sheep as a cause of depletion is a very difficult matter on which to recommend action. There is no doubt that overstocking has occurred in the past and has contributed to depletion, but although it does occur to-day, it does not contribute to the same extent. Where it does occur, the good-husbandry clauses of leases should be used to control it. The greatest control, however, is education of the landowner and a wider recognition of the evils of overstocking. We think this recognition has become very wide, and we are confident, therefore, that overstocking will not be prominent in future.

3. EROSION

Repeating what we have said, the erosion which has occurred has been due more to the effects of deterioration and depletion than to any naturally erosive characteristics of farming in New Zealand. If the recommendations we have made for assistance to marginal lands, land utilization, the provision of fertilizer, the extermination of rabbits and the replacement of cover on depleted areas are all carried out, there will be no accelerated erosion on a national scale in New Zealand.

The first step is to clothe the land with a good pasture cover and to graze it in such a careful manner as to maintain it. If, despite such a cover, erosion continues, it will be due to one of three factors:—

- (a) Too high rainfall, causing earth movement (slipping, slumping, and gulying).
- (b) Too much exposure to winds.
- (c) Earth movement started by earthquakes, subsequently accelerated by (a).

In all these cases spaced or close planting of trees should assist stabilization. Debris dams will be necessary to control gulying in some areas. Some more difficult areas may have to be afforested. As we have said, we consider that such areas would be relatively small.

Care must be exercised to differentiate between erosion and the occasional slips which occur on steep hillsides. These latter are due to sudden deluges of water such as cloudbursts, and no one knows when or where these are likely to occur. These slips usually grass over again with time, and this regrassing can possibly be accelerated by the deliberate manuring and sowing of slips, a matter into which the Department of Agriculture could make further research.

III. PRODUCTION DIFFICULTIES

Special clause (3) of our Warrant: "The production of the industry and methods of maintaining and increasing such production, whether by better management, increased top-dressing, improved pastures, or by any other means."

We have already dealt with top-dressing and improved pastures under Section II. There remains to be discussed a further series of difficulties hindering production. The first of these is pests.

1. PESTS

(i) RABBITS

We have already considered rabbits under "Depletion," Section II, 2 (v).

(ii) PIGS

Loss of production because of pigs results both from the damage to pastures which are rooted over and from the loss of stock, mainly lambs, which are killed by the pigs. The estimated distribution of pigs is shown on maps 11 (iii) and (iv) in Part Five. Reductions in lambing percentages of up to 25 per cent. have been reported from pig-infested country.

Where pigs are injurious to farming interests they should be destroyed by the Wildlife Division of the Department of Internal Affairs. The Under-Secretary for Internal Affairs has said:—

Actually this Department includes wild pigs within the scope of its operations only when such pigs are either damaging native forests or are contributing to soil erosion.

Although the difficulty occasioned by the incidence of wild pigs on farm properties is recognized, it is considered that this is purely a local and economic problem. It is felt that such problems can be minimized with the assistance of the Department of Agriculture who not only subsidize (on a pound-for-pound basis) County Councils who are engaged in pig-destruction on occupied lands, but also pay a bonus of one shilling per snout on all pigs destroyed by incidental hunters.

We disagree with the Under-Secretary that this is a local matter for the farmers. The pigs are frequently not on his own land. They are often on Crown land, from which they venture forth at night on to the farmer's land, retreating again with first light in the morning after causing considerable damage. We think the Department of Internal Affairs should adopt a positive policy of helping the farmers by destroying those pests which hinder production. Pigs should definitely be placed on the Department's list of pests and destroyed when injurious to farming interests.

(iii) CANADIAN GEESE

These birds have become very numerous in some parts of the South Island. Originally imported as a game bird, they foul great areas of pastures, and in some cases make it impossible for any winter turnip crops to be grown.

They are found mainly in the mountain regions of the South Island from Wanaka to the Rakaia. At present they are protected, except in the Ashburton and South Canterbury Acclimatization Districts. All protection should be removed throughout New Zealand, and where they become particularly troublesome the Department of Internal Affairs should arrange for their destruction, which may be more easily accomplished at moulting-time than at other periods. Unfortunately, this period conflicts with the busy season on the farm, when farm labour cannot be made available.

(iv) KEAS

Considerable evidence has been presented to us on the widespread damage done in the high country by keas. We realize there has been a lengthy controversy as to whether the kea is responsible for the damage attributed to it, but, having carefully considered the evidence before us, it is incontrovertible that serious damage does result. It is not every kea which is a killer, but frequently birds develop a habit of killing, and during certain months may kill hundreds of sheep. Kea losses on some stations have been stated in evidence on several occasions to be as high as 500 sheep in a year. We think, therefore, that steps will have to be taken to protect the sheep-farmers against losses from this cause.

At the present time a runholder has the right to destroy keas on his own property. The trouble is that much of this sheep country adjoins national-park areas where the keas breed and from where they begin their forays into sheep country. We do not suggest that a runholder or any other private person should be given the right to destroy keas in national parks. We are of the opinion, however, that where damage to sheep is occurring on country adjacent to national-park areas the Department of Internal Affairs should clear the keas from the country adjoining such sheep runs.

There is a subsidy on kea-beaks to assist destruction of keas on sheep country. The present subsidy is at the rate of 10s. a beak, a sum which has been fixed for some considerable time. Of this amount at least 2s. 6d. is paid by the runholder, 2s. 6d. by the County, and 5s. by the Government. A few years ago this amount was sufficient to encourage people to kill the keas where they were dangerous. At the present time, however, 10s. is not sufficient to encourage kea-hunting, as the work is very difficult and the number of beaks obtained in a day is not great. Consideration should be given, therefore, to an increase in the subsidy to assist in the destruction of the kea.

(v) OPOSSUMS

Of recent years opossums have become very prevalent in both Islands. For many years their destruction was controlled and permits were necessary to undertake trapping. A short time ago the permit system was abolished and now there is an open season. However, the prices of opossum-skins have fluctuated, and in recent months they have been very low. We have been informed that in the future prices may continue to be low. Since this pest is at present doing great damage, we fear that opossums will multiply at a much greater rate in the coming years as the low price for skins will discourage their reduction. Already damage to native forests is extensive and in many cases farmers have found that they cannot plant trees at all because of the destruction by opossums. In other parts of our report, we have stressed the need for planting trees for shelter purposes and for conserving any land liable to erosion. This practice of tree-planting is

important but we doubt if it can be effected until the number of opossums has been reduced greatly. Maps 11 (v) and (vi) show the estimated distribution of opossums. We recommend, therefore, that opossums be placed on the list of pests the destruction of which is supervised by the Wildlife Division of the Department of Internal Affairs and furthermore that a destruction campaign should be organized and actively pursued by the department.

(vi) DEER

Some years ago deer became a very serious menace to farmers in back-country areas and to our native forests. Control was instituted by the Wildlife Division of the Department of Internal Affairs, under the direction of Mr. G. F. Yerex, and as a result of the control-measures taken the menace to the sheep industry has been held in check and should not become threatening again unless the deer are again allowed to get out of control. We would like to express our satisfaction at the very good job which has been done by the Wildlife Division, particularly the field officers in the bleak hinterland country where deer-destruction has been carried out. The success of their efforts has been outstanding and, provided the control measures are continued and not relaxed, the farmers can be reasonably satisfied that deer will not again menace their pastures. That deer should have become a menace is an example of the care which should be exercised in importing and liberating game animals and game birds. Maps 11 (ix) and (x) show their estimated distribution at the present time. It will be seen that careless introduction has made it necessary to institute costly control-measures, and while in the case of deer the excellence of these control measures has removed the threat to the industry, it would have been much better if the deer had not been introduced at all. We are of the opinion, therefore, that the Department of Internal Affairs should issue no permits whatever for the introduction of animals or birds for release by acclimatization societies or others unless the Boards representing the primary industries—the Dairy Board and the Sheep Industry Board—have indicated the consent of the farmers.

(vii) OTHER PESTS

There are several other forms of pests which should be controlled by the Department of Internal Affairs. The distribution of chamois, thar, and wallaby is at present localized to particular districts (mainly in the South Island), being shown in map 11 (xi). They are, however, beginning to spread. Goats, which are found in both Islands, are distributed as shown in maps 11 (xii) and (xiii). While in most cases they should be destroyed as a pest, it should be pointed out that in some areas (for example, those marked A, B, and C on the North Island map) they have been successfully introduced and reared for the control of blackberry, in which they are doing good work.

(viii) AMMUNITION

It used to be the practice for the Department of Internal Affairs to sell to farmers at a cheap rate surplus ammunition released by the armed forces. During the war this supply ceased. In the future, however, every consideration should be given to reinstating this supply if available.

2. WEEDS

During our tour of New Zealand sheep-farms we were impressed by the need for taking adequate steps to cope with weeds. It is distressing to find in the midst of good farmable country great areas of land where production has been almost completely strangled by gorse, broom, brier, blackberry, and other weeds. There are some areas (for example, swamp areas and very poor land) where weeds have grown and where we realize it is not economic to remove them until there is some use for the land. We refer, however, to the very considerable areas of potentially good land on which weeds have become established. In no part of New Zealand was this more distressing to us than on Banks Peninsula, where the soils are fertile and excellent pastures can be maintained even without top-dressing. Yet areas of the splendid pastures of the peninsula have disappeared under tracts of gorse, and it appears to us that comparatively little effort was being made by the local authorities to effect any improvements. We do not wish to suggest that this was the only area in New Zealand where we saw such instances. We saw plenty of gorse on good farming land in the Wairarapa and in the Taranaki and Wanganui districts as well as in many other parts of both Islands.

It is obvious that the strongest measures will have to be taken to cope with noxious weeds. A committee was set up in 1945 to study this problem. The members of this committee were :—

- Mr. E. J. Fawcett, Director-General of Agriculture (Chairman).
- Mr. H. R. Denize, representing the Live-stock Division of the Department of Agriculture (Deputy Chairman).
- Mr. J. W. Woodcock, representing the Fields Division of the Department of Agriculture.
- Mr. W. D. Armit, representing the Department of Lands and Survey.
- Mr. A. F. Blackburn, representing the Department of Maori Affairs.
- Mr. A. J. Healy, representing the Department of Scientific and Industrial Research.
- Messrs. W. A. Lee and H. C. B. Withell, representing the New Zealand Counties' Association.
- Mr. Lloyd Hammond, representing the New Zealand Farmers' Union.
- Mr. R. McGillivray, representing the Canterbury Progress League.

The Committee reported as follows :—

In the course of the deliberations of the Committee the present and past measures for the control of weeds, together with statutory powers available for this purpose, were thoroughly reviewed. At its final meeting on the 21st August, 1946, at which all members were present with the exception of Mr. McGillivray, Canterbury Progress League, the Committee came to the unanimous conclusion that effective control of the weed problem in the Dominion could only be achieved, in the main, by local authorities undertaking the administration of the statutory powers in respect of all lands (including Crown and Native) and by the Government providing substantial financial assistance by way of subsidy on moneys collected by means of rates for weed-destruction or actually expended in that connection by a local authority.

To give effect to the proposal of local authority control, the Committee recommends that :—

- (1) The local authority administering the Noxious Weeds Act or a Committee set up within the local body, together with a person appointed by the Minister, shall constitute a Committee which will give consideration and recommend to the appropriate Ward Committee set up by the Counties' Association, the amount required by such local authority by way of subsidy on moneys expended in any financial year.

- (2) The New Zealand Counties' Association set up a Subsidy Allocation Committee which shall consist of the Counties' Association Executive Committee and a person appointed by the Minister. The functions of this Committee shall be to receive applications from local authorities through the Ward Committees for subsidy required, consider same, and forward them with its recommendation to the Minister.
- (3) Financial assistance will be made available to all local authorities administering the Act as follows :—
 - (a) Where the local authority levies a rate for weed-destruction work in accordance with the provisions of the Act it will be paid a subsidy of not less than £1 nor more than £4 for every £1 of such rate-moneys actually collected in any financial year.
 - (b) In the event of a local authority not electing to levy rates for weed-destruction work under paragraph (a) but decides to expend moneys out of its County funds for weed-destruction work in accordance with the provisions of the Act, it will be reimbursed by the Crown to the extent of not less than 10s. nor more than 16s. for every £1 of County funds so expended in any financial year.
- 4) The Noxious Weeds Act, 1923, be amended to enable local authorities to exercise jurisdiction over the Crown and Native lands in relation to noxious weeds, and for this purpose an annual grant to be made to local authorities.
- (5) For the purpose of securing concerted action within a particular land region, two or more local authorities may be empowered to combine for purposes of weed control.
- (6) Where any local authority fails to carry out the provisions of the Act, the Minister may resume the administration of the Act.
- 7) The County Councils be empowered to allow fences to be built by adjoining farmers up to the road-line without incurring any liability for obstructing the road. Occupiers of land are responsible for control of weeds up to the middle of the road-line, and in many instances this would be facilitated by allowing farmers to enclose road verges and carry out control measures in conjunction with farming operations. Provisions should be made for review of this privilege to the landowner annually, or at least biennially, to prevent abuse.

REVISION OF EXISTING NOXIOUS WEEDS ACT

In this connection it is recommended :—

- (1) That the term "noxious weed" be dropped, and the term "weed" substituted; the term "noxious" has come to be used almost entirely in the legal sense, rather than from the viewpoint of actual seriousness of a weed, and has contributed to an apathy in dealing with plants scheduled under the Act. The Act would then be entitled "Weed Act," and reference to weeds contained therein could be to "declared weeds" or "scheduled weeds."
- (2) That section 10 (1) of the Noxious Weeds Act be amended by inserting, after "threshing-machine," the words "Header harvester, mobile seeds-cleaning plants," and that section 10 (2) be deleted, and the following inserted in place thereof: "Cleanings, &c., from seed cleaning or dressing plants and all residue from baling-machines shall be destroyed or otherwise disposed of as directed by the Inspector or Weed Officer."
- (3) That the Minister of Agriculture be given power to add on the recommendation of the Counties' Association Executive Committee and the Department of Agriculture, after due inquiry, to the Schedules of the Act without the necessity of promoting an Order in Council.
- (4) That the Act be amended to enable local authorities to exercise jurisdiction over Crown and Maori lands in relation to noxious weeds.
- (5) That a concise definition of "Crown" and "Maori" lands be written into the Act. (NOTE.—There does not appear to be any definition prescribed in the present Act in regard to these lands.)
- (6) That section 11 (2) of the Act be repealed and replaced by a clause laying the onus on the occupier of any lands on which there are weeds to clear such areas as the Inspector may direct to be cleared within a fixed period. (NOTE.—This section, as at present constructed, appears to be ambiguous.)

- (7) That the First Schedule of the Act be amended by deleting "Californian thistle." That the Second Schedule be revised. That the Third Schedule be deleted, and that noxious seeds be redefined as the fruit and/or seeds of the plants mentioned in the First and Second Schedules.

(The Committee are of the opinion that the definition of "clear" as defined in the Noxious Weeds Amendment Act, 1934, is unsatisfactory. The Committee have considered this aspect and have no suggestions to make whereby the present definition can be improved upon.)

In view of the above specific suggested amendments to the Act, it is visualized that it will be necessary to overhaul the present Act in order to give expression in the proper manner to the intention of this report.

GENERAL RECOMMENDATIONS

(a) That the task of periodic inspections of areas adjacent to ports where ballast and merchandise packing is dumped be assigned as a definite responsibility to a specific officer. This is essentially the work of a specialist officer. The sub-committee is of the opinion that there is a grave danger of the introduction of foreign plants, some potentially serious weeds, per medium of ballast and merchandise packing, and an attempt should be made to check these invaders in their initial stages rather than wait until they become widespread. The question of inspection of areas used by visiting military forces should be covered also.

Some inquiry into the possibilities of newly introduced horticultural plants being dangerous weeds should be made prior to their actual importation, and appropriate measures adopted. This suggests close co-operation between the Department of Scientific and Industrial Research and the Horticulture Division of the Department of Agriculture.

(b) That the research programme now initiated in regard to methods for the control of weeds be continued and expanded.

(c) That the results of the above research programme and that of similar work carried out overseas (deemed applicable to New Zealand conditions) be disseminated to all persons involved in the actual control of weeds.

(d) That a policy of education on matters concerning all aspects of our weed problem be instituted, and use be made of lectures, radio talks, field-days, and practical demonstrations of control measures, weed-displays, and leaflet and bulletin issue to achieve the desired results. It is considered that the pursuing of such a policy would achieve more than widespread use of legal measures, and in the proposed new organization outlined above these legal measures and Court proceedings would be used only as a last resort with recalcitrant landowners.

(e) That three special weed officers be appointed by the Department of Agriculture and under the control of the Director of the Live-stock Division of the Department of Agriculture (one principal weed officer and two subsidiary weed officers each in the North and South Islands respectively) to co-ordinate all weed-control work carried out by the local authorities. They will also serve as liaison officers between research workers engaged on methods of weed-control on the one hand and the local authorities on the other.

(f) That encouragement be given to local authorities to plant trees on selected areas with a view to controlling the spread of weeds and the ultimate eradication of same. Where such work is to be undertaken by a local authority and paid for out of its funds it should be eligible for subsidy under the Act.

We have considered very carefully the recommendations which this committee made, and we endorse them with the following additions and amendments :-

- (1) We consider that any amendment to the Noxious Weeds Act should provide that the Director-General of Agriculture in the annual report of the Department should make specific reference to weeds. In particular, he should name the position of noxious weeds in each county at the beginning of the year, the steps taken to secure an improvement during the year, the position at the close of the year, and whether or not he is satisfied with the progress made in each county.

- (2) The Committee recommended weed control officers for each Island. We consider that there should be a specialist weed control officer in each of the districts of the Department which is under the control of a fields superintendent—that is to say, officers at Auckland, Palmerston North, Christchurch, and Dunedin. Officers should be chosen for their suitability to co-operate with the County Councils to see that adequate work is done on weed-control and to compile the notes on which the Director-General of Agriculture can base his annual report.
- (3) Attention should be drawn to the fact that many weeds are spread by the County Council placing gravel on the roads, the gravel having been taken from pits where weeds are abundant. We know of many cases where the spread of weeds in a district has resulted from this cause, and the attention of County Councils and the Railways Department should be drawn to this matter. In such cases in the future these authorities themselves should take immediate steps to have the weeds removed before they have become a nuisance.

We are very gravely concerned at what we have seen on the tour (it might be considered a shameful effect of one hundred years' occupation) that so many weeds should appear on the landscape. Unfortunately, little can be done quickly as far as eradication is concerned, but the work must be steadily pursued from established perimeters of clear ground gradually working towards the final objective of total elimination. This will involve close supervision and keen administration. We realize that it is difficult to provide for sustained enthusiasm over a long period of years, but sustained enthusiasm is essential. We feel that the best way of ensuring attention is to make it necessary for the Director-General of Agriculture to comment in detail on the position in each county in his annual report to Parliament each year and to trust that the representatives of the people in Parliament will continue to be sufficiently appreciative of the evil effects of weeds that they will ensure that constant effective pursuit is made of weed reduction.

While we were in the Nelson district evidence was brought to us by many farmers that they have made a practice of gorse-farming, and they believed that in their area gorse was a most suitable pasture plant. There is no doubt that they were feeding their sheep on gorse, that if the lambs were kept on gorse from birth they ate it and survived. We would not like to say that we thought from what we saw that the sheep were thriving on these conditions, and we cannot endorse a system of gorse-farming, even in the Nelson district. It is a system of impoverished farming which yields doubtful economic returns to the farmer, while the constant burning which is necessary to maintain the gorse in palatable condition will ruin the fertility of the soils. It is a means of securing a meagre subsistence at the expense of the land. It must be admitted that great areas of the land are very poor in any case, so poor that they may not support better pastures. There is scope for investigation into how far improved methods can be employed, and we recommend that special attention be given to this problem during

the course of the land-utilization survey which we recommend later in our report for the Nelson district generally. Gorse, however, should be a noxious weed throughout all New Zealand and should be eradicated except in controlled hedges.

3. ACCESS ROADS

There is no more important aspect of settlement in New Zealand than roading, and we do not think there can be any challenge to the statement that the settlers in the back-country areas are entitled to better access than many of them have at the present time. The objective should be to provide all-weather access to all farms, and in all future land-settlement schemes, all-weather roading should precede settlement. We visited numerous localities where the settlers have been for many years without an all-weather access. In some of these cases the settlers had been forty to fifty years with only a long clay road as their connection with the outside world, and in the high-rainfall conditions which prevail the road was traversable for only a few weeks of the year. In one district in the middle of summer and at the end of a long dry period we found the clay road almost impassable for our cars, but we were informed that for that road it was in a reasonably good condition. At the present rate of progress it will be another thirty years before the last of the settlers on this particular road has the road gravelled to his gate. Such conditions are shocking in our time. We cannot see why any settlers should be expected to remain on the land under these conditions. Production is necessary, and if production is reasonably assured and a farm can be kept in order then we think roads should be made available. Those who call for more production should see to the back-country roads first. These roads should in all cases be all-weather roads.

Consequently we recommend :—

- (1) That the Works Department, in conjunction with the County Councils, proceed immediately to gravel all the clay access roads in the back-country areas. Every effort should be made to carry this out with expedition.
- (2) That a survey should be made of all roads in the back country with a view to their being put in order by the Works Department, which has the necessary machinery, or by grants to County Councils. This should be done without placing undue burden on the settlers.
- (3) There should be a readjustment of county boundaries, to eliminate the necessity which exists to-day in some areas of one county having to travel over miles of roads of another county to service its portion of a road.
- (4) The system of riding accounts should be abolished by an Act of the Legislature. As this will cause hardship in some counties which have a large area of back-country roads, such abolition should be accompanied by generous grants to maintain back-country roads in reasonable condition.
- (5) To encourage increased production from the back country more of the moneys allocated from the Consolidated Fund for roading should be applied to back-country roading rather than on main highways eliminating corners and easing gradients.

- (6) We view with concern the effect which increased loading limits on the new improved roads will have on the back-country roads and bridges. The policy of the Commissioner of Transport appears to be to permit increased loading. Many of these trucks leave the main highways and travel up county roads which are not built to take the heavy axle loads permitted on the new highways. We think that a problem of considerable difficulty may arise in the future if the present policy of raising the loading-capacity of improved highways and raising the permissible axle-loads should be continued without taking adequate steps to improve the back or county roads to the same extent. Obviously the cost of improving the county roads cannot be loaded on to the ratepayers of the counties, and it will be necessary either to reduce permissible axle-loads or to provide very considerable grants for back or county roads to bring them up to the standards for which the Commissioner of Transport has been approving axle loads.

There must be the fullest co-operation between the Commissioner of Transport, who has to enforce loading limits, and the Main Highways Board, which has to maintain the roads. We would suggest that the Commissioner should always lay his recommendation for axle-loading limits before the Main Highways Board for approval in order to ensure correlation of activities before putting such limits into effect. The Commissioner would have a very difficult task in preventing heavily-loaded vehicles from running on roads with lighter load-limits. Unloading or partial unloading before travelling on the lighter limit roads is not only difficult for the carriers to carry out, but, we fear, also would increase costs and would need a constant policing, which might not be practicable. The best policy seems to be co-operation in fixing mutually agreed axle-load limits.

4. SNOW LOSSES IN HIGH COUNTRY

In our first interim report we said :—

We have also considered evidence placed before us in regard to losses in high country areas largely arising from snow risks. We believe that the tussock grasslands of the South Island form an important part of the sheep industry and that the high-country farmer cannot be expected to continue farming his land under conditions which give him little prospect of continued security. The insecurity arises partially from the losses due to the heavy snows which come periodically in hard winters. It is known that in the years of such snows some farmers will face heavy losses of stock. These losses are reflected in either (a) heavy financial outlay to replace lost stock in the comparatively rare instances where replacements are available, or (b) diminished returns or even recurring financial losses over a few years until he can breed his flock up again.

We are of the opinion that a high-country farmer liable to snow risk should be able to offset his losses by setting aside some of his profits in good years in order to minimize insecurity arising from snow losses. To enable this to be done we recommend :—

- (1) That the High Country Committee of Federated Farmers and the Director-General of Agriculture should, upon application, draw up a list of the high-country farmers liable to suffer snow losses of sufficient magnitude to warrant assistance, and that such list, when agreed upon, should be submitted to the Commissioner of Taxes and the Director-General of the Post and Telegraph Department.
- (2) That the farmers on such list should be enabled to open a special Snow Losses Reserve Account in the Post Office Savings-bank, and be authorized to pay into such account at any time such sums as they deem desirable, provided that the total of the account should not at any time exceed 10s. per sheep as returned at 30th April nearest to the date of authorization.
- (3) That such accounts should receive ordinary savings-bank interest.

That any sums paid into such accounts should be free of taxation in the year in which paid in.

- (5) That in any year, and for the purpose only of covering any loss of stock or revenue due to snow losses, the farmer should be able, upon making a statutory declaration that snow loss has occurred and as to the extent thereof, to withdraw any portion or all of such account, such sum withdrawn becoming thereupon ordinary taxable revenue for the year in which withdrawn.

In the above recommendations we would include under the term "farmer" any partnership or limited-liability company undertaking solely the management of a high-country farm.

In view of the relatively low prices received for fine wools during the war years by high-country farmers we think that this provision should be put through immediately in order that some of the high revenue received from the good wool-prices this year should be applied during this taxation year, if possible, to the offsetting of future snow losses.

We are disappointed, in view of the urgency which we considered inherent in the present position, that no action has been taken. We understand that the Commissioner of Taxes thinks he should not be called upon to make concessions to one section of the people in New Zealand to assist them and that they should be assisted in some other way. Insurance has been suggested. However, anybody who knows the South Island high country will know that insurance is impossible for snow losses. In order to insure, one must be able to measure the definite loss which can be proved as resulting from the risk at some point of time. You can insure against floods because you can go round after the flood and measure the damage such as loss of stock drowned, damage to fences, regrassing of pastures, which can be proved as due to the flood. Similarly, you can insure against earthquake or a fire or damage to pastures by grass-grub, or any other damage to pastures, buildings, or animals which can be measured and proved due to the risk involved.

But in the case of snow the losses are not always immediate. Some sheep are killed, but others live on in a weakened condition and may die as a result when the spring grass comes away. Not all sheep which are constitutionally weakened die. Instead, the lambing percentage is often reduced from 70 per cent. to as low as perhaps 30 per cent., whereas at least 50 per cent. is needed to maintain the ewe flock. This means that the flock will be reduced considerably for a few years while the flock builds up again. In the meantime the station shows a loss for one or more years as other sheep suitable to that class of country are not obtainable. Then, again, another result of snow may be a reduction in wool-weights, which may be down considerably. A loss of, say, 2 lb. of wool for each sheep represents the loss of the average station's profit for the year. This again shows loss, although the death-rate is not abnormal.

It would be difficult, if not impossible, in any of these circumstances to prove that the losses were caused by the snow, which would be necessary for insurance. For example, the loss in wool-weight could be caused by many factors other than snow. Similarly, other factors could cause the death of sheep and lambs, and in a year of financial loss it would be difficult, without costly inquiries, to determine what had caused the loss—price-fluctuations, other causes, or the snow. Clearly the risk is indeterminable, and therefore not insurable.

We think it is wrong to take away from the high-country farmer who suffers periodic snow losses money which does not represent a true profit, but which is merely a temporary surplus necessary to provide replacement stock and income later on when snows occur. Admittedly, losses can be

carried forward, but only for three years. The principle of carrying losses forward is not as good a farming practice as making provision for losses which it is known must occur in that particular class of country. It is not, therefore, a question of making provision through taxation for the general support of the industry; it is a question of making taxation just. It is a question of not taking away from the high-country farmer in taxation money which is necessary to be held to give stability and continuity to the industry at a later date after the occurrence of snows.

The fact that this money has to be put aside and left untouched, save in snow years, will be an adequate precaution that the position will not be abused. We must, therefore, strongly endorse the recommendation contained in our first interim report.

5. AERIAL TOP-DRESSING

The top-dressing of hill country by hand presents many problems, and it is very questionable whether the labour will be available to carry this out on any extensive scale. It is impossible on hill country, of course, to use the distributors which have proved so effective on flat and undulating country. It appears to us that a promising possibility of top-dressing the hill country lies in the development of aerial top-dressing.

At the present time a committee is directing experiments which are being conducted by the Air Force. This committee is under the general direction of the Soil Conservation Council. The future of top-dressing is one of the basic considerations for the future of farming, and we think that research into top-dressing methods should therefore be under the direction of the Department of Agriculture.

We have some diffidence about the type of work which is being done. An attempt is being made to find methods of distributing large quantities of fertilizer from heavy aircraft. The opinion has been expressed to us by one of the members of the Aerial Top-dressing Committee, Mr. L. T. Daniell, at Masterton, that it is necessary to find a machine which will lift a very substantial weight. Mr. Daniell envisages carrying both lime and superphosphate.

We think that for the general North Island hill country to confuse the position in regard to lime and superphosphate would be unfortunate. Lime may be beneficial, but superphosphate is a necessity, without which the hill country cannot be retrieved into full production again. We believe the important matter is to get superphosphate on to this class of country; not to worry about lime in the meantime. We are not impressed with the idea of using heavy aircraft to take big loads from airports and scatter them over the steep hill country. We consider the farmer is able to get his superphosphate on to his own property—that is, to his homestead or farm centre. The problem is getting that superphosphate distributed from his farm centre on to the hills.

The practicability of any system of aerial top-dressing must depend finally on its cost in relation to the extra value derived from the resulting production. At the present time the cost factor seems to be a greater prospective difficulty than finding an aircraft to do the actual work. It would be courting disappointment, therefore, to hope for too much too soon. Suitable aircraft have yet to be found, and after that it is possible that the cost of aerial top-dressing may yet prove insurmountable. However, research must be pursued in the first instance towards finding a suitable

plane, and developing the right technique. It should not be assumed that only a heavy aircraft can do this work. It is possible that a light helicopter lifting about half a ton may prove suitable because of its adaptability for use from many farm centres or homesteads. This possibility should not be overlooked in the search for a suitable plane. We have said the main problem is distribution of fertilizer from the farm centre, homestead, or manure-dumps to the steep hill-faces. That point must not be lost sight of in this research work, and we commend it to the Air Force for consideration.

We consider that the Department of Agriculture should pursue its investigations into the granulation of fertilizer and the incorporation of seeds with fertilizer pellets for hand-sowing as well as for aerial top-dressing. We congratulate the Department on the work already done, which has shown the practicability of this method.

We were able to see, during our visit to the Wairarapa, one of the first trials of a lime-blower which was demonstrated to us by the engineer to the Wairarapa Catchment Board, Mr. Campbell. We consider that there are great possibilities for this machine, particularly as it can be mounted, so that it can either be dragged up the valleys to blow lime up the faces or, alternatively, dragged round the ridges with a tractor to blow lime down the faces. If this can be done successfully with lime it should be possible to develop a machine for spreading superphosphate in a similar way. The invention is one of considerable merit, and we understand that it is being developed for commercial production. It is a development that is worthy of attention, and we hope that continued efforts will be made to improve this blower.

6. FENCES

No farm can be run without fences, and, unfortunately, fences are not structures which will last for ever. Under earlier conditions in New Zealand when fences cost up to £80 per mile, the replacement of fencing was no great problem. At the present time, however, with fencing costing £500 a mile or more on hill country, the replacement of fences has become a very difficult problem.

Fences are essential round the boundary of a farm to keep stock on the property, and subdivisional fencing is necessary to give control of grazing. We agree with Mr. Bruce Levy's contention that smaller-sized paddocks give better grazing control which is beneficial to pastures. When new fencing costs £500 a mile and there is a questionable supply of materials even at that price, very little subdivisional fencing can be undertaken.

The position is serious, as most farm fences have been standing for forty to fifty years and many need replacement. A detailed investigation into the supply of permanent fencing-materials should be made immediately. On flat country the concrete post is a big advance, and though not perfect it is a big step forward and is being widely adopted. Concrete posts, however, are very heavy, and it is impracticable to transport them on to the line of many hill fences. Iron intermediates and standards have been used, particularly in the South Island, and these have proved ideal where stocking is mainly with sheep. However, they do not stand up well under cattle stocking. In the North Island there is at the present time no alternative to timber posts on steep hill country. Only certain timbers are suitably durable for use as posts, and, unfortunately, the supply of these timbers has become very short.

We recommend, therefore, that the State Forest Service should grow fencing-post timber in all suitable localities to sell to the farmers as required. It is difficult for many farmers to grow their own fencing-posts. To provide good posts, careful selection is necessary of the variety of tree planted, and its correct culture is essential. Some timbers prove durable when grown under some conditions and not durable under other conditions. There is, in fact, a great deal to be known about tree-growing if the trees are to provide durable timber, and it is unlikely that many farmers will be able to grow their own timber satisfactorily. We think it would be much more economical from a national viewpoint for the State Forest Service to plant fencing-timber plantations in all suitable localities.

In particular we think the State Forest Service should give attention to the planting of such timbers as totara, kauri, puriri, and hard red beech (*Nothofagus fusca* or *N. truncata*). We are aware that some attention is already being given to the subject. We had the opportunity of inspecting the Waipoua Forest and seeing the work on durable timbers suitable for fencing requirements which is being carried out there by the officer in charge, Mr. Moore. We would like to say that, having been shown what Mr. Moore was attempting to do, we came away feeling that the programme of growing hard, durable timbers on which Mr. Moore has set out should be energetically pursued and encouraged. We cannot praise too highly the work which is being done. The State Forest Service should give every possible support to the study of the timbers we have mentioned which are now being grown at Waipoua. They should be planted out wherever suitable. The fact that they take a long period to develop, perhaps up to one hundred years, is no reason why they should not be planted, because at the present time there is no known suitable alternative for durable fencing-post timber. The longer the delay in planting hardwoods, the longer the time before New Zealand can obtain a reasonable supply of timbers required on farms. The need is already urgent, and hardwood plantings, particularly of New Zealand timbers such as totara, kauri, puriri, and hard red beech or durable exotic timbers such as macrocarpa, should be encouraged wherever possible.

In the introduction to our report we stressed the benefit which farmers are likely to derive from a programme of tree-planting. In dealing with fencing requirements here we again stress to all farmers the desirability of undertaking a progressive programme of tree-planting, both for shelter purposes and for the purpose of planting rough areas in trees which will suppress any tendency for an increase of weeds.

We have discussed with the Director of Price Control the price of concrete posts which cost now up to £42 10s. a hundred. We have pointed out to him that it appears to us that the price of timber posts rises in proportion to the price of concrete posts. We realize that the price of steel has risen considerably, but, nevertheless, we think that an investigation should be made into the prices at present being charged for posts. We also consider that every effort should be made to achieve a standardization of concrete posts.

For South Island conditions it is highly desirable that the old intermediates and standards as manufactured before the war should again be available

7. IRRIGATION

During the course of our study of the industry we were able to see the outstanding results which have been achieved from sheep-farming on irrigated land, and we fully realize the importance of this aspect of the industry. We consider that, wherever reasonable, irrigation schemes should be prosecuted energetically. Very substantial progress has been made in Canterbury and in Central Otago by the Department of Agriculture and the Works Department, in co-operation, in the development of irrigation schemes. We consider that this should be pursued and expanded as rapidly as experience dictates.

There are several matters concerning irrigation to which we consider special attention should be given. First, where portion of a high-country run is irrigated and the run's production is raised, care should be taken that the irrigated part is not all detached from the run. The irrigated portion will have its greatest value as an adjunct to the high country which will then be made economically stable. On the other hand, we must record the opinion, while stressing the value of irrigation of small areas on high country, that it is impossible to winter all of the sheep on high-country stations on winter feed. There seems to be some opinion in New Zealand that this can be done, but persons experienced in high-country farming will know that if the whole of the flock is fed during the winter it will hang back later on waiting to be fed and in this way cause almost irreparable damage to the country and lose its value as a high-country grazing flock. The advantage to high-country stations, therefore, is not that winter feed can be grown for the purpose of feeding all of a high-country flock, but can be used to feed rams, hoggets and cattle. Hay can also be saved as an insurance against a hard winter.

We are not yet certain of the final results which irrigation may have on the light Canterbury soils which lie on gravel sub-soils. If, as some people fear, the constant application of water has the effect of leeching these light soils, there may be, if the position is not carefully watched, a deterioration of the land. Consequently subdivision should be effected with great care under these conditions until it is certain as the result of experience and experiments now being carried out that no such deterioration is likely to occur.

In the allocation of water from irrigation schemes we consider it very wrong that some properties should get preferential treatment over other properties merely because they originally held rights for water under the Mining Act. In our opinion, the provision of water-rights under the Mining Act has outlived its usefulness. Such rights should be abolished so that water can be made available equally to all farmers requiring it in proportion to their just needs, and not in proportion to some archaic rights acquired at almost no cost under the Mining Act. One case in point was brought to our notice in the Central Otago district in the Lindis Valley, where some settlers alleged that they were charged for water under an irrigation scheme, but that sufficient water was available for delivery only during months when it was of no use to them. Under these circumstances adjustments should be made in the charge for water until such time as the Works Department is in a position to fulfil its contract satisfactorily. We quite agree that to make an irrigation scheme a practical proposition the farmer must be charged an annual rate for the water whether he uses it or not, but the water must be available to him during the season of the year when he requires it.

8. TRESPASS

Considerable evidence was placed before us in various parts of the country as to the damage which is done by trespassers and the difficulty of taking any action under the existing laws. We record our opinion that the great national heritage which is available to our people in the hills and mountains should not be cut off so that it cannot be used by all. The encouragement of young people particularly to spend their holidays in open country is most laudable. It is wrong, however, that in enjoying the beauties of the countryside they should be permitted to damage the property of the landowner. It appears that this damage is mainly done by persons carrying rifles. Usually the landowner is prepared to give consent for the regulated shooting of deer and pigs on his property. The persons who cause the damage, however, are not those who obtain permission. They are usually the irresponsible persons who come on to the property without leave, and if they do not find pigs and deer readily available, in some cases shoot sheep, cattle, or horses.

We realize that this is a difficult matter to stop. The position is provided for in State forests, where it is necessary for a person carrying a rifle to obtain the permission of the State Forest Service. This should be extended, and no person should be permitted to carry a firearm, other than a shot-gun, on private property without written permission from the occupier. To make it workable it would be necessary for landowners or occupiers to be reasonable in granting requests for permission to shoot deer and pigs whenever such requests can be reasonably granted.

9. DREDGES AND THE MINING ACT

We view with concern what we have seen throughout New Zealand of the effect of dredging and sluicing operations under the Mining Act. It would appear to us that, in Central Otago at any rate, more has been contributed towards soil and river erosion by dredging and sluicing under the Mining Act than has been contributed in any act of omission of the landowners since the development of the country. The damage which is done by dredging and sluicing was recognized some years ago when the Austral-Malay Company was granted permission to erect a very big dredge in the Lowburn area of Central Otago. We understand the condition of their permit was that the top soil was to be replaced. The effects are alarming, and it is difficult to understand why the responsible Departments have allowed the position to continue. No effort, whatever, is being made to replace the top soil, and already many acres of land which could otherwise have been developed by irrigation are now left as heaped masses of shingle and boulders. The company concerned should be compelled to replace the top soil, and should not be permitted to pay a fine or extra royalty in lieu of replacement or allowed to avoid its responsibility in any other way. The time has come when the Mining Act requires overhaul, as it interferes with farming operations. There may have been a time in New Zealand's development when gold-mining was a matter of national importance. The output of gold to-day, however, is a minor part of our national production. It will be readily agreed that the welfare of the land must come first. If our land is to be maintained and if farming is to be considered of more importance than gold-mining, then the time has arrived when further dredging and sluicing should be rigorously controlled.

We are concerned at the permanent destruction for immediate gain of land from which future generations should be able to obtain production in perpetuity.

We recommend a thorough overhaul of the Mining Act in the light of these conclusions.

10. DISPERSAL OF STUDS

Evidence was presented to us in the South Island as to the unfortunate effect which the dispersal of long-established Merino studs is having in the high-country sections of the industry. Some studs have been dispersed although we are convinced that already too few Merino rams are available. Since we have found that it is in the interests of the preservation of some types of country that Merino studs should be preserved, we recommend that every encouragement be given to retain existing studs and help to establish new ones.

The present shortage of Merino rams is being made up to some extent by imports of stud and flock rams from Australia. This source of supply should be carefully preserved in the interests both of the high country itself and of our local woollen-manufacturing industry.

In our opinion, special care should always be exercised when considering the acquisition of land on which valuable stud flocks and herds are depasturing.

11. TRAINING OF LEARNERS IN SHEARING

Evidence was presented to us in many places that more should be done towards encouraging learners in shearing, and the provision thereby of a better supply of shearers. We have found, however, that the matter has already been taken in hand by the Department of Labour and Employment in conjunction with the Wool Board and the Department of Agriculture, and we are informed by farmers that the new scheme of training learners is promising. We would like to express our congratulations to the parties concerned and the New Zealand Workers' Union for its willing co-operation, for having instituted such a scheme, and our hope that it will continue and expand. Owing to the continuing shortage of shearers, we recommend the strict enforcement of the provisions of the shearers' award relating to learners.

12. RESEARCH

(i) STILL-BORN LAMBS

Research is needed into the matter of still-born lambs, and the apparently declining fertility of many of the Romney rams and ewes, particularly in the North Island. We were given considerable evidence on this point, and the trouble seems to be very widespread.

(ii) TRACE MINERALS

More research is necessary into the subject of trace minerals and their effect on animals. The discovery of cobalt, and its importance in the cure of bush sickness, has already made it possible to run sheep and other livestock in large areas of the North Island where it was not possible to run stock previously. Probably there is very much more to be learned in the field of trace minerals in general, and the study of this may make it possible, either to run more sheep on the country which is at present carrying few sheep, or to carry the same number in very much better condition and with greater production per sheep.

(iii) RABBIT-DESTRUCTION

Continued research is required into possible methods of destroying rabbits. The methods of poisoning have not changed very greatly over many years, but in view of the seriousness of the problem it is necessary to devote all possible attention to the devising of new methods of rabbit-destruction. Despite the dangers it involves and the care which must be exercised, further research into biological control should be pursued.

(iv) TIMBER-PRESERVATION

Research is required into the matter of a cheap and simple process of timber-preservation. Although the concrete post will provide a permanent fencing-material on easily accessible land, its great weight and difficulty of packing across broken country makes it inconvenient to use for back-country fencing where the terrain is rough. In view of this, timber will have to continue to be the main material for fencing in this type of country. At the present time a good post can be expected to last not much more than twenty-five years, and there is a great shortage of timber which will last even that length of time when partly buried in the ground. In the past, when fences cost not more than £80 a mile, the replacement of posts every twenty to twenty-five years was not a grave matter, but with the cost of fencing having risen to £500 a mile or more in this class of country it becomes urgently necessary to get the greatest possible life out of fencing-posts in the interests of economy. Further research, therefore, should be made into possible methods of preserving timber to get a longer life out of fencing-posts.

(v) TUSSOCK INSECTS

Considerable evidence was placed before the Commission on the subject of insects infesting the tussocks and possible damage which they have caused. We were able to examine large areas in some places where the tussocks appeared to have been eaten out at the roots by a grub. We were not in a position to give a sufficiently thorough examination to show whether the insect attacked only such tussocks as were in a weakened condition through other causes, thus being a secondary cause of deterioration, or whether the insect itself attacked healthy tussocks and was a prime cause of deterioration. The matter, however, is one which does not appear to have been sufficiently investigated, and a full ecological study is required.

(vi) PASTURE PLANTS FOR HIGH COUNTRY

Continued research is required to find suitable grasses or other plants for use in the drier areas of the South Island high country. No great progress can be made in regrassing this country until such time as the rabbit infestation has been reduced considerably, but when this point is reached it will be necessary to have grasses and/or other plants which will improve cover and provide palatable feed for this area. At the present time no such grasses or plants have been sufficiently tested, and continued research is required.

(vii) BLOWFLY-STRIKE

Research is also required into the question of blowfly-strike in sheep, especially the shoulder and back strike. This trouble has been both persistent and sporadic, being particularly associated with humid conditions.

There is probably some predisposing reason for the strike, possibly a skin-disease, and research should be directed more to the prevention of the conditions which give rise to this strike than to curing the strike itself, which can be done at present.

(viii) DEFORESTED BEECH COUNTRY

Requests have been made to us that an investigation should be made of the deforested beech country throughout New Zealand. We have had it pointed out to us that wherever the original bush cover was beech forest the country appears to have been left in an impoverished condition, as farming has either failed on it or has continued after a very hard struggle. It appears to us that the position should be investigated to see what factors cause the poverty of the land which has been under beech forest.

(ix) EXPERIMENTAL STATION FOR EAST COAST AREAS

Requests have been made for an experimental station on the East Coast country of the North Island as this area is one which is subject to droughts. It has been pointed out that the research station in the North Island located at Palmerston North is in a well-distributed rainfall-belt, and that the plants introduced and bred there are mainly for such favourable rainfall conditions. It is considered by farmers that their suitability and value are very restricted. An experimental station is thoroughly justified in addition to the existing station at Palmerston North.

(x) NEW STRAINS OF LOW-FERTILITY-DEMANDING GRASSES

Very considerable advances have been made in the breeding of new strains of grasses and clovers such as rye-grass, both perennial and short-rotation. These, however, are suitable only for very fertile soils, and in many respects only where top-dressing is economic. There is a need for similar research into the evolution of better, more palatable, and more nutritive strains of such poorer grasses as danthonia brown-top, Yorkshire fog, sweet vernal, *Poa pratensis*, which will thrive under the dry and less fertile conditions which prevail in much of the hill country. Consideration might also be given to the breeding of a strain of cocksfoot more tolerant of these conditions. It must be recognized that it is not going to be possible in the near future to top-dress all the country throughout New Zealand, and that therefore only a proportion of the land can be put in a condition to grow the very good new strains of grasses and clovers which have been evolved. Consequently, immediate research is required to produce improved strains of the poorer grasses for the remainder of the country which cannot be top-dressed.

(xi) MANUKA BLIGHT

Considerable interest has been shown throughout New Zealand on the subject of manuka blight. The following description of the blight was provided for us by the Agrostologist of the Department of Agriculture:—

During the winter of 1948 a two months' survey of the incidence of manuka blight was carried out by an officer of the Department of Agriculture. In the Ashburton district an intensive study of the "blight" has been made by an entomologist of the Department of Scientific and Industrial Research. These combined investigations show that the "blight" is a fungus which lives on the sticky exudate of a scale insect. Many plants act as hosts for a fairly large number of scale insects, the varying exudates supporting different fungi. In most species of plants the blight has only a weakening effect.

In the *Leptospermum* species two scale insects are commonly found:—

On *Leptospermum scoparium* (red manuka), the scale insect is *Ericoccus*.

On *Leptospermum ericoides* (kanuka or white manuka) it is *Ceolostomidia Wairoensis*.

The insect on the manuka is associated with the complete death of the plant, whereas that on the kanuka is associated with a weakening effect only as a rule, although occasionally dead plants can be observed.

All the evidence available indicates that the scale insect is the cause of the death of the manuka-plants.

The survey shows that the kanuka blight is relatively common in New Zealand from South Canterbury northwards.

The manuka blight is confined to a relatively small area in Canterbury extending from Fairlie to Cheviot, and is present on both the plains and the foothills.

Many attempts have been made to transfer the blight from the affected area to areas in which it is not present.

As far as can be gathered the earlier efforts at transference were almost wholly unsuccessful. This was probably due to efforts being made to effect the transference while the insects were immobile. Investigations have shown that the insect is mobile during the late winter and early spring. Consequently it is at that time that transferences of infected portions of plants should be made.

During the last six months or so a considerable number of infected plants have been sold to farmers in various parts of the country. It is too early yet to be able to judge the effect of these transferences. It has been reported, however, that an affected area is extending in the Northern Hawkes Bay District.

In view of the great increase in production which would result if manuka could be eliminated from farm lands throughout New Zealand, the greatest possible research should be carried on into methods of distributing this blight. We are well aware that in some districts there is a danger of other noxious weeds, such as gorse and blackberry, taking the place of the manuka, and we have seen cases where this has occurred. Farmers should be required to keep these weeds in check. We are also aware that taking the cover off some land may expose it to possible erosion. In these cases other planting may be necessary. Nevertheless, having considered the whole position in the light of the invasion of pastures by manuka which has occurred throughout New Zealand, we feel that the blight will be a blessing to the country, and that any disadvantages are more than offset by the advantages to production which will occur. All possible research, therefore, should be made into studying and distributing it.

(xii) WEED-DESTRUCTION

More intensified research by full-time qualified specialists is necessary into methods of destruction of all weeds.

(xiii) HIGH-COUNTRY EXPERIMENTAL STATION

A properly equipped research station is necessary in the South Island high-country area, preferably in a low-rainfall district. In the past various experiments have been made, but their value to a great extent has been minimized because of their small, scattered nature, and because of the fact that there has not been a continuing close supervision of the areas. This can only be achieved by setting up a well-equipped research station, which will be permanently staffed. We would point out that regeneration of the existing cover, or the establishment of new cover in such areas, is a slow matter, and results can hardly be expected from this research for a number of years. The long period of time required makes it all the more necessary to have the constant supervision of research officers.

(xiv) KIKUYU-GRASS

Evidence was presented to us by the Director of the Grasslands Division, Mr. Bruce Levy, that this grass would be very suitable for planting to stop erosion in Hawkes Bay and other districts. We were consequently very concerned when farmers in other districts in New Zealand informed us that the same grass was a menace and should be outlawed. We examined carefully some pastures which had become overrun by this grass at Dargaville, Opononi, and Bulls. Having seen what happens when the grass gets away, we consider that it is very dangerous, and despite the advice given by the Director of the Grasslands Division, we strongly recommend Hawkes Bay and other farmers not to introduce it. It is a matter to which the Director-General of Agriculture should give more attention. We know it is considered by scientific workers that the grass is manageable, but having seen it under the conditions mentioned in North Auckland particularly, we very much doubt whether that is so. We think it wiser not to introduce a grass which has such dangerous tendencies.

(xv) WEIGHT OF SEED SOWN

We were particularly interested by the results obtained by Mr. F. K. Pearce, of Upper Waitotara, from sowing a rye-grass - clover mixture drilled in 7 in. rows at the rate of 10 lb. to the acre. It appeared to us that the result was quite as good as that obtained from a 35-40 lb. sowing and would involve a great reduction in costs. We were informed that the lighter sowing would require to be well husbanded until thoroughly established. This is a matter on which the Department of Agriculture could make further trials before it can be recommended for general application.

(xvi) CASTING WORMS

Evidence was presented to us in several places about the value of casting worms in raising fertility. This was particularly demonstrated to us by Mr. A. Ashmore, of Raetihi. At the present time the Department of Agriculture is collecting information on this subject, and these investigations should be pursued. There is a division of opinion among farmers whether the worms actually raise the fertility or whether they follow when fertility has been raised. This is a matter which can only be established by research.

(xvii) GENERAL SURVEY

The foregoing examples of problems requiring research have been brought to our notice, although we believe there are many more. The proposed Sheep Industry Board, in collaboration with the Director-General of Agriculture, should make a complete survey of the industry to define the problems needing research and place them in their relative order of importance. Then the staff available for research can be allocated to the best advantage. This has already been done in the dairy industry, and has given a valuable lead to those directing research in that industry. A survey is now required to give similar information about the sheep industry.

13. IMPORTATION OF WEED-SEEDS

Despite all precautions, it appears that weed-seeds are still being imported into New Zealand. We have had evidence that the seed of saffron thistle was found in shipments of fowl wheat, and that the thistle has already made its appearance in some areas where the wheat was fed to fowls. We realize

the difficulties involved in supervising all entries which are liable to contain weed-seeds, but, nevertheless, the Department of Agriculture must provide this supervision by specialist Inspectors at the principal ports. Our farming heritage is too important to be jeopardized by the careless introduction of the seeds of a weed like saffron thistle in a shipment of fowl-wheat. The Department of Agriculture should take all practical steps to make it impossible for weed-seeds to enter this country in any imported lines.

14. LAND-TAX

Land-tax was originally imposed to force closer settlement by breaking up the big estates. It was a graduated tax for that purpose. If subdivision is required to-day, there are alternative means of doing it other than by the land-tax, which has become redundant. It offends against one of the fundamental principles of good taxation in that it is not levied according to the ability to pay. In fact, those land-holders who perhaps could pay most, pay little at all, while struggling farmers on third class-land necessarily held in large areas are saddled with bigger payments. The amount of tax collected is approximately £1,000,000, of which half is paid on farming land. If the tax is removed, the greater portion of it will be recovered again in income-tax. We recommend, therefore that the land-tax on farming land be abolished.

15. INCOME-TAX

We fully support the principle that taxation should be levied fairly over all the people, including farmers. However, we believe that the method of levying income-tax must be such as to encourage sufficient being put back into the land to maintain it in good "heart" and to increase our national production. It is to ensure this that we make the following recommendations about the anomalies in the present method of tax assessment:—

(i) DEDUCTIBLE ALLOWANCES FOR MAINTENANCE

We would like to draw attention to the following provision in the Australian legislation:—

Section 75, Income Tax Assessment Act—

Allowance as a deduction of certain classes of capital expenditure—namely, expenditure incurred on:—

- (a) The eradication or extermination of animal or vegetable pests from the land.
- (b) The destruction and removal of timber, scrub, or undergrowth indigenous to the land.
- (c) The destruction of weed or plant growth detrimental to the land.
- (d) The preparation of the land for agriculture.
- (e) Ploughing and grassing the land for grazing purposes.
- (f) The draining of swamp or low-lying land where that operation improves the agricultural or grazing value of the land.
- (g) Preventing or combating soil erosion on the land otherwise than by the erection of fences.
- (h) The construction of dams, earth tanks, underground tanks, irrigation channels, or similar structural improvements, or the sinking of bores or wells for the purpose of conserving or conveying water for use in carrying on primary production on the land, and
- (i) The construction on the land of levee banks or similar improvements having like uses.

Dates of provision:—

- (a) to (f) granted by Bruce-Page Government, 22/12/27
- (g) to (i) granted by Chifley Government, 3/7/47.

Under existing New Zealand law not all of these allowances are made. We recommend the adoption of the Australian clause, which would be fair to all and most reasonable. To the Australian list (a) to (i) should be added :—

- (j) The bull-dozing of tracks to give access for manuring, fencing, and general maintenance.

We realize that abuses must be avoided, and recommend that these deductions should be allowed only to the genuine farmer actively farming his land.

(ii) CONTRIBUTIONS FOR ROADING

Contributions are sometimes made by a farmer to his local authority in excess of rates levied, for the purpose of obtaining road access, and this is often the only way of obtaining a road. These payments to a local authority for such purpose should be deductible allowances in the same manner as rates.

(iii) PLANTING OF TREES

The planting of trees for shelter purposes and for erosion-prevention is most necessary. It should be treated as a maintenance expenditure, including the fencing off of the young trees.

(iv) FLOOD DAMAGE

The repairing of exceptional flood damage should be a maintenance expenditure. The present position is that moneys spent on repairing exceptional flood damage are regarded as capital expenditures—that is, as taxable income. We regard this as unjust.

(v) NEW FENCING

The erection of new fences is classed as a capital expenditure, and should qualify for special depreciation in view of its enormously inflated costs to-day.

(vi) RABBIT-FENCING

The conversion of a fence into a rabbit-proof fence should be classed as a maintenance expenditure.

(vii) LOSSES

Losses can be carried forward for three years under the existing legislation, but the evidence before us suggests that it may take four to five years to recoup losses in many cases. The period should be extended to five years.

(viii) AVERAGING OF INCOMES FOR TAXATION PURPOSES

Considerable evidence has been placed before us on the need for averaging of incomes. This is a matter, however, that is much wider than the sheep industry, and we can only commend these submissions to the Government with the recommendation that all the implications of widely fluctuating incomes should be closely investigated.

(ix) FARMERS' BREEDING-STOCK SHOULD BE CAPITAL STOCK

The present position is governed by section 16 (1) of the Land and Income Tax Amendment Act, 1939, which states :—

For the purpose of this section the term " trading stock " includes anything produced or manufactured and anything acquired or purchased for the purpose of manufacture, sale, or exchange, and also includes live-stock, but does not include land.

We do not agree that a farmer's live-stock should be regarded as trading stock, which is how it must be classified according to the above section. A farmer acquires his flock of sheep or herd of cattle for the purpose of obtaining from them products for sale. It is from this production that he gains his revenue, or income. He does not buy or sell live-stock for the purpose of buying or selling them, as he would if they were trading stock. Instead, when his ewes become too old, he fattens them and sells them to the works. With the proceeds he purchases new breeding-ewes to maintain his flock. Clearly these stock are his capital which is necessary to produce his goods for sale in the same way as the capital of the manufacturer whose machines produce his revenue. Similarly, the breeding-ewe produces the revenue for the farmer. The same position obtains for the store breeder as for the fattener. The former rears his ewe lambs as replacements for his capital or breeding-stock and has for sale wether lambs and culled ewes from which he derives his revenue. The latter derives his revenue from the sale of old ewes and lambs, less the cost of buying replacement ewes. We consider that a farmer's permanent breeding flock or herd is his capital stock and should be treated accordingly.

Treatment in this way will substantially increase the availability of land for servicemen and younger farmers. At present when a farmer sells his property the difference between the book value of his stock and their market value is added to his income for the year in which he sells. This difference may amount to thousands of pounds. Income-tax is levied on this, in addition to the ordinary taxable income for the year, thus taking away a substantial portion of his capital. The result is that he will not sell and remains on his farm, often to the detriment of both national production and the farm. Treatment of his permanent breeding flock and herd as capital stock would, in our opinion, overcome what we consider to be an injustice and encourage him to sell to a serviceman or younger farmer. The position is more acute at death, when death duties have to be paid in addition to income-tax.

In England a farmer may elect whether to have his flock treated as capital stock or as trading stock, and it has been suggested in evidence before us that this system should be adopted in New Zealand. The Commissioner of Taxes has stated that this system would be cumbersome and unworkable in New Zealand, and we are inclined to agree with his point of view. We are impressed by the views of Mr. R. W. Chaplin, at Gisborne, and of Mr. D. W. Gilbertson, at Hastings, in favour of the recommendations of both of whom we have finally decided.

We recommend, therefore, that the words " and also includes live-stock " should be deleted from section 16 (1) of the Land and Income Tax Amendment Act, 1939. Instead, a farmer's permanent breeding flock and herd should be treated as capital stock. We recommend this as a general principle, realizing that the manifold details involved should be worked out by a committee of experts, including experienced farm accountants.

16. DEATH DUTIES

We consider the principle of death duties to be quite proper, and we realize that sheep-farmers should be on the same footing as other members of the community. However, when in a farming estate two deaths occur in rapid succession the effect may be crippling. This is sometimes reflected in the maintenance and the production of the farm for some years. Where such deaths occur in rapid succession the Commissioner should have power to use his discretion in levying duties, and should use such discretion reasonably so as not to injure the maintenance of the land nor to retard production.

17. GENERAL RATES

We must bring to the notice of the Government the rapidly rising burden of rates on farming land generally, and request a review of the position with a view to stabilizing the total sum charged against the land in hospital rates.

18. WOOL-MARKING

Having carefully considered the practice of the marking of wool for various purposes, we have come to the following conclusions:—

- (a) The marking of wool with any kind of colouring matter is undesirable, and all efforts to find some satisfactory alternative to the wool-branding of sheep for identification purposes should be encouraged.
- (b) It is realized that until some satisfactory alternative is found, wool-branding will continue, but the Department of Agriculture should do all in its power to ensure that farmers use only approved scourable branding-materials and nothing else.
- (c) At the present time the *minimum* size of wool brands is defined, but no maximum is laid down. In view of the fact that many unnecessarily large brands are being used, careful consideration should be given by the Department of Agriculture to the placing of a maximum limit on the size of brands, after consultation with the proposed Sheep Industry Board.
- (d) The colouring of sheep with bloom dips and like substances before sale or show has nothing to recommend it. It spoils much good wool, and it may also deceive the buyer. The Government should prohibit this practice, or any other of a similar nature which does nothing but harm to our national wool-clip.
- (e) Consideration should also be given to the problem of eliminating the use of tar as a dressing for shear cuts.

19. RETURN OF SHEEPOWNERS

Our attention has been drawn to the disadvantages of having sheep industry statistics based as the 30th April of any year. The difficulty is that sheep-farming operations for the year are not completed by 30th April, and in interpreting statistics one has to make constant allowance for the season, as in some years all lambs are away by 30th April and in others they are still on the farm. The main point of time during the year when sheep-farming operations are static is 30th June, and we recommend that this should be the basic date for the collection of statistics. It appears to

us also that the statistics collected must bear a direct relation to the problems for which they will be required. Having regard to the work which we are recommending, including the plan for the steady development of 250,000 acres every year, we consider the following information should be collected and published in the return of sheepowners :—

- (1) Total sheep.
- (2) Breeding ewes.
- (3) Breed of ewes.
- (4) Breed of ram used.
- (5) Total cattle.
- (6) Breeding cows.
- (7) Total area.
- (8) Area under scrub.
- (9) Area of unimproved grasses.
- (10) Area of improved grasses : (a) surface sown ; (b) ploughed pastures.
- (11) Area topdressed.
- (12) Total weight of topdressing applied.

NOTE.—Improved and unimproved grasses should be distinguished as follows.

Improved : Cocksfoot, rye-grass, paspalum, and clover pastures.

Unimproved : Danthonia, brown-top or native grass pastures.

The return of sheepowners is at present published as one large volume at an almost prohibitive price. We consider that it would be more practicable to publish a separate return for each of the eight suggested wards for the Sheep Industry Board. It is most essential that production of this return be kept up to date and in all cases it should be published by 31st December in each year for which it gives the statistics. To effect this it may be preferable to have it cyclostyled in the district offices of the Department of Agriculture if it proves impossible to have it printed by 31st December.

20. AIR STRIPS IN BACK COUNTRY

While not recommending that permanent air strips should be set aside, we would like to draw the attention of the authorities to the desirability of designating emergency air strips in the back country. Care should be exercised by farmers to ensure that paddocks designated as emergency air strips are left without obstructions.

21. KILLING OF COWS DURING DROUGHTS

We view with some concern the practice of sending breeding-cows to the works to be killed during periods of severe drought in any area. These breeding-cows are an essential capital asset of hill country, and the slaughtering of these cows is a minor disaster. We consider that every encouragement should be given to the possibility of transferring them to another district by special transport arrangements organized by the Department of Agriculture rather than to allow them to be slaughtered.

22. TRANSPORT

Transport is a vital factor in the production of the sheep industry. Some years ago the licensing and zoning system was introduced to stop uneconomic competition. At the present time, however, we consider there has arisen a great danger of monopolies being established, with consequent evils.

A new Tribunal has been set up to regulate charges, and it is impossible to see yet what the effect of this Tribunal will be. Transport, however, is a subject that the proposed Sheep Industry Board should study closely and bring down from time to time such proposals as it deems necessary for the improvement of transport and the regulation of charges to the industry. Notice of any application to alter charges or conditions in any area should be served upon the Board by the applicant so that the Board can represent the industry on such occasions. It should also be competent for the Board itself to make application to the Licensing Authority to vary charges or conditions affecting the sheep industry.

23. BALANCE BETWEEN FATTENING AND STORE COUNTRY

Frequent mention has been made before us of the necessity to conserve a balance between fattening and store country. We think this is most necessary. Some areas breed store stock which are used as breeding-stock to produce fat lambs on fattening country. The store country also sends its cattle in store condition to be finished on the fattening country. Consequently, the balance between the two is very important. That balance can be seriously upset if too much fattening country is diverted to dairying, which sometimes occurs during subdivision for closer settlement. This is a matter which should be watched closely by the Director-General of Lands to ensure that a suitable balance is maintained.

24. SHORTAGE OF BLACKSMITHS

The shortage of blacksmiths is becoming acute in country districts, and it must be emphasized that, despite the progressive mechanization of farming, hill-country farmers still need the services of farriers, in particular. We realize that it is difficult to improve the position, but it should be considered by the Director of Employment especially in selecting immigrants. It is also most important that horse-shoes be available.

25. NON-COMMERCIAL FORESTRY

At the present time all of the activities of the State Forest Service are on a commercial basis—that is to say, the commercial value of the timber must offset all costs of plantings. This means that the Service must plant only where planting is economical. There are, however, many areas where it is necessary or desirable to plant trees not for commercial reasons, but to control erosion or to smother weeds. Such planting can be best done by the State Forest Service, which should not be required to put these plantings on a commercial basis.

26. HIDES AND SKINS LEVY

Throughout our report we have stressed the importance of cattle and the urgent need to encourage the stocking of the land with more cattle. It has been represented to us that one means of encouraging cattle would be to pay out more of the selling value of the hides to the farmer. At present part of the value is held back in order to stabilize the cost of leather in the boot and shoe industry. We do not suggest the abandonment of stabilization, but we would point out that at a time when we have found it necessary to recommend assistance for part of the sheep industry, that industry has been helping stabilization of boot and shoe prices out of its production. Careful examination should be made as to whether the pay-out for hides is based on and covers present production costs.

27. PETROL IN DRUM LOTS

Before the introduction of oil-fuel rationing farmers were able to purchase their supplies of lubricating-oil in bulk and of petrol in three-drum lots direct from the oil companies, and thus were able to obtain their supplies at wholesale rates. This was stopped, and now all supplies must be purchased from retailers at higher retail rates. The difference in cost is considerable, and we recommend that farmers be again enabled to purchase in three-drum lots at wholesale rates.

28. LAND VALUES

We regret that there exists a lack of confidence in the country concerning the rigid methods adopted in arriving at land values.

We agree that some control must be exercised over the value of farming land during an inflationary period, as excessive values are detrimental to the sheep industry. We do not agree, however, with the pegging of values at a level which bears little relation to the present position. Values should not be pegged at the 1942 level, but should be based on an average over a period of, say, ten years. This will allow realistic fluctuations of land values over a long period while controlling any tendency for violent short-term fluctuations.

IV. LABOUR AND COMMUNITY

Special clause (4) of our Warrant: "The availability, efficiency, and utilization of labour, both permanent and casual, in the industry, with special reference to the drift of rural population and the possibility and means of attracting labour to the country, including the improvement of rural housing and the provision of community, social, and recreational facilities comparable with those of the towns."

1. FARM LABOUR

(i) DRIFT OF RURAL POPULATION

The drift of rural population is difficult to measure, but we are certain that there has been a drift of population from the country to the towns. The following table shows the numbers of farm-workers engaged in the six seasons:—

1928-29 season	..	140,609 (*)
1929-30	..	140,121 (*)
1935-36	..	155,813 (C)
1944-45	..	122,541 (C)
1946-47	..	126,386 (*)
1947-48	..	123,386 (*), (provisional figure, subject to alteration).

The figures marked (*) are agricultural and pastoral statistics figures compiled by enumerators from occupiers whose farms were situated outside boroughs and cities. To these figures an arbitrary estimate of 2,000 has been added to cover people working on farms, orchards, plantations, and market gardens inside borough boundaries.

The census figures for 1936 and 1945, marked (C), did not include Maoris working on farms, and an arbitrary figure of 5,000 has been added to the 1936 figure and 4,000 to the 1945 total to give the totals shown above.

If we take the total number engaged in farm-work in 1935-36 (the peak year when many unemployed sons, daughters, and other relatives who normally lived in towns and cities returned to the farms and helped the occupier) as 100 and work out the index numbers of those engaged in the other years, we find that for every 100 persons working on farms in 1935-36 there were: 90 in 1928-29, 90 in 1929-30, 100 in 1935-36, 79 in 1944-45, 81 in 1946-47, and 80 in 1947-48.

It is also interesting to note that the number of sheep and breeding-ewes to one unit of labour has increased greatly in the last thirty years.

—			Number of Sheep to One Labour Unit.	Number of Ewes to One Labour Unit.
1916	..	..	666	344
1921	..	..	719	375
1926	..	..	716	401
1936	..	..	875	543
1945	..	..	1,000*	633*

* Estimate only.

The doubling of the number of breeding-ewes to one labour unit may be ascribed to the fact that dry-sheep numbers have fallen in this thirty-year period, being replaced by breeding-ewes on the better pastures.

(ii) CAUSES OF DRIFT

It would be difficult to set out all the causes which have contributed to this drift. The shortage of houses in the country districts when more houses are available in the towns has been an important factor. Still more important, perhaps, has been the position in regard to education. In many of the country districts to get young children to school has been an impossibility, and young married farm hands, when their children reach school age, have been forced to seek employment near a school, even if this meant changing their form of employment. The absence of adequate roading and the inability to get out to a local shopping centre or, more particularly, to a doctor in cases of necessity have also been leading factors. We feel certain that there is no lack of attraction in farm-work, as such, and no lack of persons who are interested in farming as a pursuit, which have contributed to the drift of the rural population to the towns. It appears to us to be principally due to the disparity which exists between conditions in the town and those in the country.

(iii) IMPORTANCE OF FARM LABOUR

We hardly need to stress the importance of having the necessary supply of farm labour. We have said in the introduction that we consider the sheep industry consists of sheep-farmers, farm-workers (and their women folk), the live-stock of the industry, and its lands, and that unless all these component factors are looked after the industry cannot flourish. It must be realized that over recent years there has been a general improvement not only in New Zealand, but throughout the world, in the conditions for working-people. That improvement has been in the main transferred to the sheep industry no less than to other industries, and it is realized by most farmers that if anybody is to compete for a fair share of the labour-supply

available in this country they must provide both the conditions of employment and the wages comparable with those offered in other forms of employment. Good employers among sheep-farmers know that it is desirable to encourage the farm-worker to take an interest in the farm, that he should be taught to understand the basic principles of farming, that he should be able to see that his work is doing something to improve the condition of the land, and that he is thus enhancing a national asset. The farm-worker must also realize that he must consider the farmer's interest and the welfare of the farm by working conscientiously and reliably.

(iv) AVAILABILITY OF LABOUR

If a satisfactory liaison is maintained between the farmer and the farm-worker, and if the Government will give consideration to the points following which we recommend as necessary to get men to work in the country, we think that there will be available a satisfactory share of the labour-supply of New Zealand for the sheep industry. The sheep industry really requires skilled workers with a knowledge of farming conditions and a background of farm life to give them an understanding of farming problems. The number of these skilled workers who could be recruited overseas may be small, but no effort should be spared to recruit them from whatever suitable source they can be obtained, always remembering that immigrants of British stock are the most welcome. The prosecution of a general policy of immigration, by bringing out to New Zealand more men who will be available in the general labour pool will, however, also help the sheep industry, as the men who come out to take other jobs may release New Zealanders who have a better background of farming knowledge.

2. RURAL HOUSING

(i) STATE HOUSES IN RURAL SETTLEMENTS

The State should adopt a policy of building State houses in rural settlements similar to the policy it has adopted in building State houses in town suburbs. A survey has been taken of the exact requirements of country districts, and details of this have been forwarded to the Ministry of Works. We consider that an immediate start should be made with the building of about one thousand State houses in rural settlements of the type at Sanson. These houses will be available for general workers who live in the settlements and undertake casual work, of which plenty is offering throughout the districts everywhere in New Zealand.

(ii) HOUSES ON FARMS

In addition to this, more houses are required to be built on farms for the housing of farm-workers permanently employed on a particular farm. We realize that the State cannot be expected to build these houses, which should be provided by the farmer. The difficulty is, however, that a farm-worker's house may cost £1,600-£2,000 to build under present conditions, but it does not have that value on the farm, and in the event of sale of the property within a year or two the money spent might not be recouped.

It is recognized, therefore, that the inflated value of farm-workers' houses depreciates very rapidly over the first few years, and then at a slower rate for the succeeding years. To meet this position it is necessary that the farmer should be able to depreciate the value of the house as quickly for

taxation purposes as the house actually loses value to him. In order to do this, houses for farm-workers should be allowed special depreciation at an accelerated rate corresponding to the rate of depreciation of actual value. At the present time a special depreciation of 30 per cent. is allowed over the first five years, and, in addition, there is an annual depreciation of $2\frac{1}{2}$ per cent. continuing throughout the life of the house. To meet this rapid depreciation we think that the concession should be extended so that on farm-workers' dwellings' special depreciation of 50 per cent. is allowed over the first five years, 15 per cent. in each of the first and second years, 10 per cent. in the third year, and 5 per cent. in each of the fourth and fifth years. The $2\frac{1}{2}$ per cent. ordinary depreciation would continue as previously. This does not increase the amount of concession granted to the farmer. Under the present system, on a house costing £1,600 the income-tax (at average tax rates) which a farmer does not pay because he has built the house amounts to a total of about £400, which is spread over a period of thirty-three years. Under the recommendation which we have made the tax-concession would still be about £400, but it would be entirely written off in a total period of twenty-five years. The rate of depreciation would also be much greater over the initial few years, when the actual depreciation of the value of the house is greatest. Reference to the values placed on such individual farm-workers' dwellings in valuations for sale by the Valuation of Land Court and its Committees show that the actual depreciation in value of a farm-worker's house is much greater than the rate of special depreciation allowed by the Commissioner of Taxes.

(iii) FINANCING OF RURAL HOUSING

Most farmers should be able to finance the building of houses through their normal sources of finance. Should they not be able to do so, however, it is possible for them to arrange finance through the State Advances Corporation under the Rural Housing Act of 1939. This Act has not been generally put into operation by the counties in New Zealand. Briefly stated, the position under the Act is as follows:—

Local bodies may borrow from the Corporation at 3 per cent. for the purpose of making advances to farmers owning property within the area controlled by the local body, such loan being made on a long-term table basis with interest at $3\frac{1}{2}$ per cent.

The local body takes a first mortgage, but it is necessary to obtain the consent of any existing mortgagee before such a charge can be registered.

Of the 125 counties in New Zealand, 44 applied for and obtained loans under the scheme—the aggregate of such loans being almost £745,000.

Approximately four hundred loans have been approved in favour of the individual farmers—most of these for the period ending 31st March, 1941, when a Government subsidy of 10 per cent. was in effect. At the present time relatively few counties (some half-dozen) are actively operating the Act—these doing so with success.

The procedure is for the farmer to lodge his application with the County Council with plans and specifications of the proposed building—the county referring the matter to the Valuer-General for a report on the property and as to the necessity for the new house. The report, plans, and specifications, and the farmer's application, are referred to the State Advances Corporation, together with a resolution by the Council approving of the loan, for the issue of the Corporation's consent to the loan proceeding. The administration of the loan is entirely in the hands of the County Council, and the supervision of the operation of the Act by the Corporation is on the lines of broad principles.

Every effort is made by the Corporation to encourage the use of the Act to a far greater degree than exists at present, and, even allowing for the present difficulty as to materials and labour, the Corporation holds the view that the Act is capable of producing far better results and regrets that lack of interest on the part of the majority of the County Councils has not permitted of that position being achieved.—(*From the statement in evidence of the State Advances Corporation.*)

If the provisions we have made for special depreciation are granted, and if the State is prepared to build State houses in rural settlements as we have recommended, then we consider that it is right and proper for the counties to operate the Rural Housing Act where there is a request from farmers in their county to do so. Procedure for an individual loan could be expedited if the plans, specifications, and approvals could be finalized by the County Council without reference to Wellington.

Federated Farmers are recommended to undertake a campaign to encourage the building of farm-workers' dwellings, to bring home to their members the realization that for the future they will have to depend increasingly upon married labour, and to publicize widely among farmers, accountants, and local bodies the statutory provisions relating to special depreciation, and familiarize them with the Rural Housing Act.

(NOTE.—Some accountants and many farmers seem to be unaware of the existing provisions and the concessions at present available.)

3. EDUCATION

We have said that education is a very important matter. We do not wish to convey the impression that we are not appreciative of the progress which has been made in recent years by the Education Department, and it must be clearly understood that good progress has been made. In endorsing what has already been done, we would like to urge strongly that this progress should be carried further as there are still many children in the country districts suffering a disadvantage. To that end we would make the following recommendations :—

(i) GRADE "O" SCHOOLS

In the course of his evidence in Dunedin the Rector of the Otago Boys' High School, Mr. E. J. Aim, stated of these schools :—

These very small schools existing in remote areas are conducted in the main by young persons, unqualified and untrained as teachers. This situation is due to insufficient teachers being trained and to high cost per pupil if a fully-trained teacher was employed in every one of these schools. No doubt these untrained persons do their best, and perhaps "any teacher is better than no teacher," but it is obvious that children in such schools suffer a heavy handicap.

To overcome this difficulty we recommend that printed Correspondence School lessons be made available to teachers in Grade "O" Schools, and that, generally, they should be followed as a matter of routine in such schools.

(ii) COUNTRY TEACHERS

In seconding young teachers to work in remote country schools consideration should be given to choosing country girls if this is practicable, as they have a far better understanding of the life of country children, and seem to fit very much better into small rural communities.

(iii) SCHOOL CONVEYANCES

As far as is practicable an even more liberal programme should be adopted in deciding whether or not to run conveyance buses for children. At the present time where school buses are run it appears that the method of finance is quite satisfactory. The difficulty arises where a long journey has to be made up a road for one or two children, and the cost to the parent is often considerable in these cases. It is under circumstances such as these that we think the treatment of country parents should be more liberal.

(iv) PAYMENTS TO MOTHER-TEACHERS

A very great disability is suffered by the woman who must teach her own children with correspondence lessons. It is almost impossible for her to obtain assistance in the actual teaching work; this is a matter which she must supervise herself. In some cases it might be possible for her to obtain some assistance with the housework while she is doing this teaching, but in most cases it will really amount to overtime work, as she will have to do both the housework and the teaching, and this results in very long hours for her. We consider that it is reasonable to take this into consideration, and recommend therefore that a payment be made to mothers in rural districts who have to teach their own children, provided that correspondence lessons are progressively and satisfactorily returned from these children to the Correspondence School. Payment should be made for the teaching of children between five years and twelve years at the rate of 10s. per term week per child, with a maximum limit for any one mother of £2 per week.

(v) CAR REGISTRATIONS

In many remote areas, in place of a bus being used to transport children to school, various parents take it in turn to use their own cars to take the children there. In such cases each of the cars used must be specially registered and insured for the purpose, the cost falling on the community being very much greater than if a school bus were provided. While realizing the difficulties involved, and not wishing any action to be taken which would result in the children being exposed to danger while being conveyed to school, we are of the opinion that consideration could be given to making one registration and insurance cover the position, whichever one of the private cars is used.

(vi) CONSOLIDATION OF COUNTRY SCHOOLS

We support the principle of the consolidation of country schools, and consider that in the interests of the back country in general it should be done as expeditiously as possible. Where a referendum is held on the principle of consolidation, votes should be accorded only to parents of pupils. Consolidation should be proceeded with when there is a favourable majority, and it should not be held up because of one or two dissentients. We have had evidence before the Commission that in one area the consolidation of schools was held up by one man's vote, and that man was a bachelor.

(vii) BOARDING-ALLOWANCES

At the present time these allowances are paid at the rate of 10s. a week. It has been shown to us, however, that this does not nearly cover the costs involved. In the course of her evidence at Christchurch, Mrs. D. McLeod stated :—

From the various prospectuses I have taken the fees for boarding schools, and I present here those of the Timaru Boys' High School, which I think you will agree is fairly representative. I find that a boy cannot be sent to school for less than £70 10s. per year. This is made up as follows :—

	£	s.	d.
Boarding fees : 3 terms at £30	90	0	0
Less boarding allowance : 2s. per school day, say three terms of thirteen weeks at 10s. per week	19	10	0
Total	70	10	0

There are no tuition fees included in that cost, as there were in the case of private boarding schools, and that is why the total of the secondary-school education cost seems to be less than in the case of primary schools, because there are no primary boarding schools available to anybody—country children or town children.

This figure of £70 10s. does not include any extras, pocket-money, or travelling-expenses.

Our investigations revealed that the figures quoted by Mrs. McLeod are fairly representative of the costs of boarding children to-day. We do not suggest that the total cost of boarding them should be provided by way of allowance, for some expense is spared the parents through not having to provide board at home. If we take the saving to the parent as 25s. a week for a total of forty weeks, say, then the parent saves £50 while the child is at school. If this is deducted from the total cost of the boarding fees, £90, it leaves £40 or, based on 40 weeks, £1 per week. We recommend, therefore, that the boarding-allowance should be increased from 10s. to £1 per week, and that it should not be stopped while the child is sick for a day or two, which we were informed is the present practice.

(viii) ADMISSION TO BOARDING SCHOOLS

At the present time most boarding schools are fully booked for a year or so ahead, and country parents are having the very greatest of difficulty in placing their children at schools. Examination of the position reveals that many of the children at present at boarding schools are town children who could live at home and attend the school daily. While we have no objection to this practice if there is sufficient accommodation in the schools, we are very strongly of the opinion that preference should be given to the children who must live away from home if their education is to be continued. Consequently, no school operating a boarding establishment should be allowed to admit a child who could live at home and travel to a nearby school if there are waiting for admission children who are forced to live away from home to complete their education. This would in effect grant a priority for country children, which we recognize is highly justified.

(ix) INTERMEDIATE SCHOOLS

We are of the opinion that consideration should be given to the possibility of boarding country children at intermediate schools. It will be readily admitted that the most difficult years of education through a correspondence course are the last ones, and it is during those years that children who learn by correspondence suffer most in comparison with children who have the opportunity of attending modern schools. It would therefore constitute a considerable advance if many, if not all, of the children who take correspondence lessons could be brought in and boarded at an intermediate school for the final two years of the correspondence course. We realize that there will be difficulties in the way, and that under present circumstances it would not be possible to bring in such a provision immediately throughout New Zealand. We do, however, strongly commend it to the attention of the Director of Education as a step which will do much to improve educational facilities in remote areas, and by that means help to encourage people to stay and work on the land.

(x) AGRICULTURAL SCHOOLS

We have been pleased with the very good work being done at such agricultural schools as Feilding and Napier. Much is known of the value of the Feilding Agricultural High School. Little comparatively has been

heard of the agricultural work being done at Napier, and we were pleased indeed to find such good work being done there. We would like to express our congratulations to the Headmaster of the Napier Boys' High School on the excellent agricultural course his school is providing, and which is a credit to him and to Mr. Midgley. We hope that the Headmaster will take every opportunity of having it extended. Every encouragement should be given, wherever possible, to the establishment of farms attached to high schools in country areas. In addition to this, we consider that much more of an agricultural bias could be given to general education in New Zealand. More could be done to teach the children the prime importance of the land to the welfare of New Zealand. Though their future vocation may lie far removed from farming, this would make them more readily understand and appreciate the difficulties which confront the farmer, and which are therefore most important for the nation and its people to have solved.

(xi) ADULT EDUCATION

We would like to endorse the recommendations of the Consultative Committee on Adult Education, and to express the hope that everything possible will be done to extend adult education in remote country areas.

4. TELEPHONES

Another adjunct of life in a rural community which is most important is the telephone service. In the country where homesteads are often at great distances from each other a telephone is of much more importance than it is in closely-settled areas, where, if necessary, it is possible to reach within a short time a neighbour's house. It is unfortunate that in the last ten years there has been little change in the availability of telephones for the people of the back country. The present policy of the Post and Telegraph Department is towards installing a system of rural automatic exchanges throughout New Zealand. We endorse that policy as being a very good one, both for the Department and for the country people. It is realized that it will take some considerable time to obtain complete national coverage, but it is well worth-while, and will make a great difference when the system is completed. In the meantime, a policy of centralization of the smaller exchanges might give longer operating hours or, if possible, continuous service. Eventually all the small manual exchanges, if not linked directly to a rural automatic exchange, should be switched through as an emergency line connected to the rural automatic when the local exchange is closed. Under present conditions it would make a vast difference if the telephone exchange in remote areas could be open, even if only for an hour in the morning and the evening, on Saturdays and Sundays, in addition to during the week. In many of these areas the switching is done in the local store, and it may possibly be necessary for the Post and Telegraph Department to give to the telephonist an allowance for remaining on duty during these periods. We consider, however, that it is a matter of considerable importance and well worth-while, as it would make it possible for contact to be made with doctors or district nurses in cases of emergency during the week-end. Where there is at present no telephone service, the Marginal Lands Board should give consideration to reasonable financial assistance towards the installation of such, as it is very expensive under present conditions.

5. ELECTRICITY

(i) RURAL RETICULATION FUND

A great deal of evidence has been presented to us on the subject of the reticulation of rural areas for the supply of electricity. We hope it will be appreciated in official quarters that the whole outlook of a settlement can be altered through making electricity available in the home. This was realized in the Rural Reticulation Act, under which there was established a fund to assist with the provision of electricity in country areas. The provisions of the Rural Reticulation Act are in our opinion very good, and the Fund appears to be sufficient to cover the demands likely to be made upon it at the present time. We welcome the statement by the General Manager of the State Hydro-electric Department, quoted later, that if more money is required in the future it will be made available. The position of the fund at 31st October, 1948, was as follows :—

Cash balance in the Rural Electrical Reticulation	
Fund as at thirty-first October, one thousand	
nine hundred and forty-eight	£73,032 Os. 6d.

The annual subsidies provisionally approved to that date amounted to £20,135, or $4\frac{1}{2}$ per cent of the estimated capital cost of £448,876 required to construct 950 miles of line to supply 1,596 prospective consumers.

In regard to the state of the Fund, the General Manager of the State Hydro-electric Department made this statement in reply to a question from us :—

On account of the increase in line construction costs since the Rural Electrical Reticulation Council formulated its policy in September, 1946, it is intended to revise all the applications received to date on the basis of present-day average costs. The necessary information is being obtained from the Power Boards concerned, and it is possible that the total amount of the provisional subsidies may be increased to about £26,000.

Power Boards usually require a revenue of 15 per cent. of the capital costs of lines to cover their annual outgoings. The subsidies so far approved will therefore, in the case of subsidized rural lines, reduce the consumers' annual costs for power by about one-third.

In the first instance the subsidies granted are provisional as they are based upon estimates of capital cost and revenue. No subsidy is paid until the actual capital cost of a line is known, and it has been operated for one year to ascertain the actual revenue.

The construction of approved lines has been delayed largely because of shortages of line material and labour. From the replies received last August to a questionnaire asking the Power Boards for details of the progress which had been made in building lines, only 231 miles had been built and a further 183 miles would be built by the middle of 1949, out of a total of 909 miles approved at that date. Unless the rate of construction is speeded up it would appear as though subsidies may be paid at the following rates for the next three years :—

	£
By 31st March, 1949	1,800
By 31st March, 1950	7,800
By 31st March, 1951	9,000

The building of rural lines under the subsidy scheme is not, therefore, being held up on account of funds being inadequate, as has been alleged in some quarters.

Evidence rather contrary to the opinion we have expressed, that the present amount of the Fund and the conditions under which it is expended are satisfactory, was presented to us by the Wairarapa Electric-power Board. As there seems to be some misunderstanding held in the Wairarapa of the position in regard to subsidies from the Fund, we consider it advisable to quote the reply of the General Manager of the State Hydro-electric Department to the evidence of the Wairarapa Board :—

These particular points were discussed with the Board at some length when the Rural Electrical Reticulation Council visited the Board's district last January.

There is no question of this Board, or any other Board, "taking a chance" of the subsidy being extended from ten years to fifteen years. An undertaking has already been given to the Board that, if at the end of ten years the revenue received from the consumers on the line is insufficient to meet the 15 per cent. required by the Board, the period of subsidy would be extended to the full fifteen years.

It is the experience of the Council and most Boards that in time many lines become financially self-supporting due to closer settlement and increased load and revenue. Some Boards are therefore satisfied with guarantee periods of five or eight years. In the first instance, therefore, the period of a subsidy is limited to a maximum of ten years, but, as mentioned, this would be extended if necessary.

On account of the very wide variation in the costs of lines in the various Power Board areas, the Council adopted standard costs per route-mile of line for the purposes of computing subsidies. Any estimated costs in excess of the standards are disregarded by the Council. The standards were approved by the Electric-power Boards and Supply Authorities' Association. The standard for a three-phase line was £450 a route-mile, increased in special cases to £500. The Wairarapa Power Board's subsidy was based on £500 a mile.

New and higher standards have recently been adopted by the Council on the recommendation of the Association.

As recommended in the statement, page 4, the Wairarapa Board desires the Council to accept its actual costs, regardless of what these costs may be. The Board's costs are usually above the standards recommended by the Association. In this connection I would quote from the report dated 13th September, 1948, supplied by the Power Boards' Association in reply to the Council's request for recommended standard costs of power lines in the sparsely settled areas:—

It is therefore apparent that if authority A and authority B were located in the same town, and had areas similar in every respect the one to the other, as to locality, distance, terrain, and the like, but who operated independently in every way; and both were required to erect one mile of 11,000 volt three-phase line and supply three consumers at the end of it, there would be a variation in the cost of the extension. The striking of an average of all costs submitted would seem to permit of some raising of the standard of the authorities who have cut costs to the bone, and the paring of the standard of those whose practice is high.

The report fully substantiates the policy of the Council in declining to pay subsidies on capital costs which are considered to be unduly high.

The Electrical Supply Regulations 1935 require a Supply Authority to supply free the first 60 ft. of a service line and meters. It is not obligatory for any length of service-line in excess of this amount to be supplied free. Usually any excess amount becomes the property of and is charged to the consumer.

The Council allows the cost of meters and the first 60 feet of service-line, plus time-switches, as part of the total cost of an extension for subsidy purposes.

The Wairarapa Board recommends that Government assistance be sought to supplement the funds available for rural reticulation. At present, and as mentioned before, the funds are adequate. If additional financial assistance becomes necessary in the future the Supply Authorities have indicated in their discussions with the Council their willingness to double the present rate of levy.

The position with the reticulation of the very rural areas under the subsidy scheme may be summed up quite shortly. In approved cases and subject to its conditions and the provisions of the Electricity Act, 1945, the Council will subsidize where necessary up to one-half of the annual costs incurred on a line extension and for a maximum period of fifteen years. The subsidies so granted are considered adequate by the majority of the Power Boards. No work is held up on account of insufficient funds being available for distribution as subsidies. There are delays, however, in meeting the demands of all prospective consumers due to shortages of line materials and labour. The average pre-war rate of line-construction by all Power Boards was 600 miles a year, and it should not be overlooked that even if normal conditions applied to-day the amount of new work which could be undertaken each year is limited by practical considerations.

(ii) SINGLE-WIRE RETICULATION

During the course of our tour we were impressed by seeing several instances of the reticulation of rural districts with a single high-tension wire conveying electricity. As it appeared that this was a great saving

in expense and likely to benefit other country districts, we asked the General Manager of the State Hydro-electric Department for his comments on the provision of single-wire reticulation, and he replied as follows :—

High-tension single-wire earth-return distribution lines have limited application, and licences to build and operate such lines are issued subject to certain conditions being observed. The more important of these concern interference with Post and Telegraph lines and the protection of live-stock.

Single-wire power-distribution lines must be separated from Post and Telegraph telephone-lines by not less than 4 chains, and the induced voltage in Post and Telegraph telegraph-lines shall not exceed 2 volts. If the power-line does create interference in the Post and Telegraph line, then it shall be converted to normal two-wire construction. The normal maximum earth return current shall not exceed 8 amps., and the value of the earth resistance on the high-tension side of the transformer shall not be more than 5 ohms.

In country where there is any extensive development of Post and Telegraph lines there would be difficulty in the routing of single-wire power-lines to comply with the foregoing requirements. The low value of earth-resistance demanded would not be readily secured unless special and relatively expensive means were adopted in some classes of country. The limitation of 8 amps. placed upon the value of the earth return current automatically limits the total load which can be carried by the line to about 50 kVA. or 90 kVA. with 11,000 volts to ground. An increase in load above that figure would call for the line being converted to normal construction, with the probable result that the line would ultimately cost more than would be the case had normal construction been employed in the first instance.

It is therefore difficult to answer in a general statement your question whether the single-wire system is satisfactory. Each case of a proposed line-extension would need to be considered on its merits, having regard to technical and economic considerations, and to the probability or otherwise of the district to be served by the line being developed and settled closer. Per route-mile of line the single-wire system is somewhat cheaper in its first cost than normal two-wire construction, but this is only one consideration. The suitability of one system compared with another should best be decided by the local engineer having regard to all known local conditions. For a more detailed opinion I would suggest you might consult the Electric Power Boards and Supply Authorities' Association.

We do consider, however, that much more should be known by country people about this form of reticulation, and that it could be adopted inside the conditions stated by the General Manager in many more districts throughout New Zealand. We have felt it desirable, however, to acquaint farmers generally with the position, so that every investigation may be made into the possibilities of single wire reticulation if it is feasible.

We were surprised at the remoteness of some of the localities which are being served by this system—*e.g.*, in Northland and the King-country—as compared with some of the more closely-settled East Coast districts where no power is available. We commend the scheme whereby the Wairere Power Board in the King-country co-operated with farmers and supervised the erection by them of an 11,000-volt single-wire transmission-line to serve the needs of an isolated locality.

(iii) AMALGAMATION OF POWER BOARD DISTRICTS

A judicious amalgamation of districts might make some contribution towards the solution of the problem of serving the back-country areas. This was recommended to us by the Power Boards and Supply Authorities' Association, and we commend it to the attention of the Local Government Commission for favourable consideration.

(iv) DIESEL PLANT IN ISOLATED AREAS

Where there is no probability of rural reticulation being carried out within a reasonable time consideration should be given to the establishment of central Diesel units in such remote districts as will have enough settlement

to warrant them. We have seen some examples throughout New Zealand where these Diesel units are rendering a very valuable service. On the other hand, we have been informed in some quarters that the costs of operation do not make them worth-while. We have the feeling, however, that if the costs in such cases were as high as have been quoted to us, then the successful examples which we saw would not be carrying on. If there is no probability of getting electricity by other means than the State Hydro-electric Department should give consideration to generating in those areas by Diesel plant.

6. COMMUNITY FACILITIES

General community facilities, such as halls and areas for recreation, are also important in encouraging people to live and work in rural areas. We would like to commend to the Minister of Internal Affairs the special case of rural communities for assistance from the Physical Welfare Fund which is under his direction. Town areas receive a subsidy of £1 for every £1 they raise themselves. Considering the difficulties which beset people in remote districts, through the scattered nature of the distribution of the population, and in the national interest generally, these areas should receive a subsidy of £3 for every £1 they collect themselves, provided the local county is prepared to accept the ownership of the facilities and guarantee the adequate maintenance of them. We have noticed how much easier it has been to obtain labour, particularly of young people, in districts which are well served with community facilities.

We would also like to commend to the farmers themselves the urgent necessity of co-operating and to provide these facilities in order that the young people may be encouraged to come to their districts and to remain in them. Valuable assistance is available for these farmers in the services of the Physical Welfare Officers of the Department of Internal Affairs. We think that these officers should be specially instructed on the national need for keeping people in the rural communities, and of the necessity for developing in these districts recreations and interests which will make living-conditions congenial. There is much that the Physical Welfare Officers can do in this direction. We have heard many tributes to the work they have done, and we hope that it will be extended.

We would also like to stress to the County Councils of New Zealand the fact that they have a great responsibility to the people in country districts, and they must be prepared to assume that responsibility. Some Councils have assumed the responsibility for establishing and maintaining recreational facilities in their counties, and as a result, with the assistance of the Department of Internal Affairs, these areas have made great progress. We are also impressed by the fact that many counties will not accept such a responsibility, and as a result no progress is being made. We would ask the Counties' Association to stress to County Councils the necessity for Councils to accept their responsibility for community facilities in their counties, and for making some progress in co-operation with the Department of Internal Affairs towards providing these essential facilities.

7. LABOUR FOR SCRUB-CUTTING

We have dealt with the labour problems of the sheep industry in general, but it is necessary to refer to labour for one aspect more particularly. That aspect is scrub-cutting. It must not be thought that the demands for scrub-cutting labour will be similar to such demands in past times. We

have experienced almost ten years of war conditions, with the resulting shortage of labour. The result is that the magnitude of the problem to-day far exceeds anything which had to be faced in the past. We are concerned how the labour can be provided for this work.

It has been suggested to us in many places that mobile camps provided by the Ministry of Works should be available to farmers at a reasonable rental. This would assist greatly in providing accommodation for workers for such work as scrub-cutting and drainage. It is realized that there may be difficulties, but we commend the suggestion to the Ministry of Works for sympathetic investigation and implementation if found practicable.

V. MISCELLANEOUS (MAINLY LOCAL)

MISCELLANEOUS RECOMMENDATIONS, MAINLY OF A LOCAL CHARACTER RESTRICTED TO PARTICULAR DISTRICTS OR CERTAIN SECTIONS OF THE INDUSTRY

1. THE DANGER OF NASSELLA TUSSOCK

We consider that more research is necessary into methods of controlling *nassella tussock*. The Department of Agriculture has taken over a small area for experimental purposes, and this may yield valuable information as more knowledge is needed if the weed is to be controlled. It appears to us that the existing two *Nassella Tussock* Boards have adequate power to handle this problem, and we would recommend support for the Boards in their work by the various Departments, particularly the State Forest Service.

Apparently one of the best methods of handling *nassella* is to smother it by planting the thickly-infested areas in trees. Another method is to arrest wind-borne seeds by planting spaced belts of trees. It may be that such plantations will not be a commercial proposition. On the other hand, they may be of national value in controlling *nassella*. We recommend therefore, that the Boards should have the fullest assistance of the State Forest Service in planting *nassella* areas in trees.

We would uphold the action of the Department of Agriculture in taking steps to control seeds exported from the area, with a view to stopping *nassella* being transferred to other districts. A close watch should be kept on hay exported from the district as well as seeds.

2. AWATERE BRIDGES

While we were in the Blenheim district evidence was presented to us about the two bridges in the Awatere River Valley. In both cases loans were raised backed by special rates, to obtain the money to build these bridges, and the residents now complain that the resultant rates are unduly heavy. We have said in our general recommendations that all settlers should be provided with reasonable all-weather access roads. Where, however, residents of an area have banded together, rated themselves with the special rate and had a loan raised by the county, we are of the opinion that a contract has been entered into and it would be most undesirable to raise any expectations in such circumstances that loans so raised might later be remitted if pressure were brought to bear. We consider, therefore, and have informed both the residents and the county concerned accordingly, that the matter is entirely one for the County Council, or, since it is a matter of local-government rating, one for the Local Government Commission if any appeal is to be made from the decisions of the County Council.

3. CLARENCE RIVER ROAD, KAIKOURA

Evidence was presented to us in Kaikoura about the necessity for some form of access road to the middle reaches of the Clarence River Valley, where there are several stations. At the present time wool from the Bluff Station has to be packed out over a narrow pack track, and it was suggested that this track could at small cost be opened up as a road. The matter had been investigated by the Ministry of Works, and a high figure set as the cost of the project. The local settlers were of the opinion that this represented the cost of building a first-class road to the area, whereas all that was wanted was an access road for summer cartage, which could be built at a lower cost. Realizing the importance of access, we would recommend the Works Department to make a further survey of the area. All requirements have at present to be packed in to these stations at a cost of over £100 a ton.

4. ROCK PHOSPHATE

In various parts of New Zealand requests have been made to us that we should recommend that ground rock phosphate be made available in place of superphosphate, where required. Where there are areas with an acid soil, and where lime cannot be economically used to correct the acidity, rock phosphate is a far more effective form of top-dressing than superphosphate. At the present time, however, it is very difficult to obtain supplies of ground-rock phosphate, as most of the rock is being converted into superphosphate. We consider that it is essential that North African ground-rock phosphate should be made available to farmers in areas where it is required and where the Department of Agriculture considers it to be the more effective top-dressing.

5. CROIXELLES WHARF

According to evidence presented to us in the Marlborough Sounds, a road had been constructed to the Croixelles Harbour (Okiwi Bay), but no wharf had been constructed at the end of the road to enable goods to be landed from launches and barges. We were unable to inspect the actual area, but if a road has been constructed and is not completely effective by the lack of a wharf, we would recommend attention to this matter.

6. COUNTY COUNCIL FOR SOUNDS

We spent some time in the Marlborough Sounds area, and were impressed with the wide prevalence of weeds and scrub which are infesting the pastures and leading to rapid deterioration. We appreciate that difficulties of transport about the Sounds are one aspect of the problem, but it seemed to us that by far the greatest cause of difficulty was the absence of any satisfactory form of local authority which could administer weed-control and other matters. There is no doubt that noxious weeds are out of hand in the Sounds area, and under the new proposed scheme noxious weeds will be the responsibility of County Councils. There is, at the present time, no county organization for the Sounds area, and we think the sooner some organization is set up the better. We would recommend that the Local Government Commission give early consideration to the necessity for some form of local authority for the Sounds area, as a means of arresting the deterioration which is becoming evident there.

7. WATER-SUPPLY, TAKAKA

Evidence was presented to us in Takaka that the farmers were having great difficulty with supply of water in the Takaka Valley. The area is a limestone one, and for a part of the valley the river disappears underground to reappear farther down the valley. In this area it is very difficult for the farmers to obtain water, and it seems to be uneconomic for them individually to obtain water for stock. It appeared to us that the Works Department might profitably establish a small water-supply scheme in this area, and we recommend investigation accordingly.

8. LEES VALLEY

This is one unfortunate example of faulty subdivision in the South Island high country. The valley is an almost entirely enclosed one just west of Oxford, in Canterbury. The only entrance is by a narrow gorge, through which the road must climb by a winding route around steep faces to give reach to the valley. In our opinion, there is no question that the valley was badly subdivided, both in respect to the size of holdings and to the balance of country. It was originally subdivided into fourteen holdings. Many of these have failed, and already there has been some amalgamation and regrouping. We consider that before stability is reached further regrouping will be necessary. Evidence presented to us in the valley contained requests for attention to the road, but there was a lack of unanimity among the settlers. Some wanted a new road constructed over the saddle at the north end of the valley; others wanted the existing road improved. In view of the lack of unanimity, we make no recommendation. Before any great sums are spent on giving better access to the area, we are of the opinion that further consideration should be given by the Lands Department to the question of regrouping. Attention should also be given to the economic possibility of the drainage of the swamp area.

In the meantime however, access to the valley in the event of emergency is provided for by a reasonable airstrip. Unfortunately, access to this airstrip is across a small creek where a bridge requires repairs which could be effected by the local settlers.

9. MOLESWORTH STATION

Much has been written in official pamphlets and in articles in newspapers and journals, and much has been said in farmers' discussions all over New Zealand, on the subject of Molesworth Station and the steps taken by the Lands Department to reclaim it from its deteriorated condition. We spent some time at Molesworth, and by courtesy of the Director-General of Lands stayed at the station for a few days and were escorted across much of the station by the Manager. We would like to express our thanks to the Director-General of Lands for his invitation to view Molesworth at first hand.

We would like to state, in the first place that we have found no evidence to justify the statements continually circulating in the district that Molesworth has been a "sink" for public funds.

It would be well if we pointed out briefly the position of Molesworth as we have viewed it. There can be no doubt that the station was allowed to get into a very poor state. We do not propose to outline the causes of the deterioration; suffice it to say that it did get into a poor state, with pastures depleted and rabbits rampant across its countryside. The licensee

having sold the stock and surrendered the licence, the station was resumed by the Lands Department, which decided to stock it entirely with cattle. It should be appreciated, and it is appreciated by the Director-General of Lands, that comparatively few high-country properties are in the same favourable position for cattle stocking as is Molesworth. Although high, it contains very large flat areas, and the valleys and gullies, instead of being steep-sided, as is usual in high country, are more gentle in slope with seepage at the base where good cattle feed grows. Molesworth is therefore suitable for cattle in a way which is not typical of high-country stations; in fact, we doubt whether in all the high country there would be more than half a dozen stations of a similar nature. The Lands Department does not regard Molesworth as an outstanding example of how to tackle high country. It regards Molesworth as an experiment designed to retrieve a particular property in the particular conditions pertaining to it. Viewed in that perspective we consider that the work of the Lands Department at Molesworth has been on the right lines and has been well directed.

However, we cannot shut our eyes to the flood of propaganda on the subject of Molesworth which has been issued by the Soil Conservation Council. This has painted Molesworth in a false light. We are satisfied that it was not so painted with the approval of the Director-General of Lands. In fact, we were impressed by the fact that senior officers of the Lands Department did not share the views so widely and repeatedly expressed by the Soil Conservation Council and the Catchment Boards. We have said elsewhere in our report that we consider it dangerous that propaganda based on half-truths should be issued, and in which conditions particular to certain localities are alarmingly exaggerated and painted as national threats. Much of what has been written of Molesworth can be unquestionably placed in the category of misleading propaganda. We want to make it plain that no blame for this state of affairs is attributable to the Lands Department, whose work at Molesworth we fully appreciate.

There was comparatively little tussock deterioration in the Molesworth area except in the Awatere, and the great lesson to be learned from Molesworth is not so much control of erosion or methods of stocking, but rather the urgent and absolute necessity of reducing rabbits. It is an inescapable fact, and the Lands Department recognizes it, that the destruction of rabbits has not been achieved as a total success at Molesworth. The reduction has been hampered by the heavy infestation on some neighbouring country. Until such destruction is achieved, then little else can be accomplished.

On general principle we are strongly opposed to the adoption of any policy which would lead to the selling of stock from high country, particularly Merino stock. Should the Lands Department be successful in re-establishing Molesworth, they would find it almost impossible to stock the station with Merinos. We think it is most necessary that high-country sheep should be retained on their own country, because if they are dispersed replacement will prove almost impossible.

Summing up our opinions of Molesworth, therefore, we repeat that Molesworth has not been a sink for public money. On the other hand, its administration by the Lands Department has been prudent and conservative. It has been an experiment from which up to the present little of general importance has been learned. That does not mean that the experiment may not produce worth-while long-term results. The Department has done probably the only thing which could have been done. The over-riding factor is that Molesworth was overrun with rabbits. Despite a

strenuous campaign by the Lands Department, rabbits have not been eliminated—nor have they yet been reduced to the stage at which it could be said that control was gained. Until control of rabbits is gained in any high country we are of the opinion that no worth-while progress is possible.

10. SOUTH WESTLAND

We were impressed by the very large area of land which lies awaiting development in South Westland. The availability of land for the sheep industry was one of the principal matters referred to us, and the beef-cattle industry is a portion of the sheep industry. There is room for tremendous development of cattle in South Westland, and no doubt for a large number of sheep in association with the cattle-stocking policy. We are of the opinion that the Lands Department should make a thorough investigation of the position in South Westland, with a view to adopting a progressive long-term land-development plan for the area. It is recognized that at the moment materials and labour are in short supply, and the Department is not in a position to undertake any immediate land-development there. Nevertheless, we think that the whole area should be thoroughly investigated and plans drawn up in order that a major land-development scheme can be pursued as soon as conditions are suitable.

11. TRAINING MEN FOR HIGH COUNTRY

Evidence was presented to us in the South Island on the subject of training men for high country. It is admitted that men to work high country must have a specialized knowledge, and there is great difficulty in getting men with this degree of skill and experience. The ideas suggested to us were that a suitable property should be taken over and run as a training farm to train men as musters and shepherds for the high country. We have given the matter full consideration, but our considered opinion is that experience is much better gained under good practical station management.

12. MOUNT COOK RESERVE

While in the Mackenzie country our attention was drawn to grazing-rights on the Mount Cook Reserve. Naturally the area of land at Mount Cook, which is the principal habitat of mountain flora, such as the famous *ranunculi* and *celmisic*, should be reserved and must not be grazed, as that would result in the destruction of the flora. A curious anomaly has arisen, however, in that one ridge of Mount Wakefield, which is quite densely clothed with mountain flora, not being in the reserve, is let on a grazing lease. A large area of flat country in front of the Hermitage, and extending down to the Tasman River, which has little mountain flora and which is continuous brown-top, grassland where grazing is most essential to control fire-risk, is shut up as a reserve and not open to grazing. Obviously an anomaly exists, and, in our opinion, the two areas should be transposed—that is to say, the area with the flora reserved and the area of brown-top grassland made available to grazing by the neighbouring stations.

13. LAKE WAKATIPU TRANSPORT

Evidence was presented to us at the head of Lake Wakatipu of the difficulties which beset settlers in the area in regard to transport on the lake which is by State-owned steamer service. It was pointed out to us that a tourist travelling the whole distance from Queenstown to the head of the lake and back to Queenstown, a total distance of nearly 60 miles, paid less

than a Lake County settler or his employee living and working in the area who wanted to travel a distance of a few miles to visit a neighbouring station. It will be readily appreciated that the continuation of such a position must inevitably lead to bitterness on the part of these local residents. We are inclined to agree with them that the position in the past has been unjust. We were informed by the officer in charge of the service at Queenstown that the matter was in hand at the time of our inquiry, but we would place on record our opinion that the fares charged to these residents should be not more than the fares charged to tourists.

One settler on the lake petitioned the Commission on the subject of wharves, but we are satisfied that the present agreement between the Railways Department and the settlers is acceptable to all the other station-owners round the lake. We consider, therefore, that the settler concerned should co-operate with the Railways Department and enter into an agreement similar to those which are working so satisfactorily with the other settlers.

Considerable attention is required to roading on the lakeside, particularly at the head of the lake. This is made necessary by the fact that during the busy tourist season it is not possible for the lake steamer to call at every station. One of the stations most affected is Greenstone Station, which has a very unfortunate service in the summer compared with other stations. We are of the opinion that this could be easily overcome by building a bridge across the Greenstone River and the construction of a short road of a few miles length to give access to the wharf at Elfin Bay. This would be in the interests of the steamer service, as it would cut out one call on the lakeside and would mean that Greenstone Station would have regular communication with Queenstown. We consider that this road should be put in by the Works Department, having due regard to the present position of the finances of the Lake County Council, and, furthermore, consider that it should be made an immediate project. As a second step we consider that a road should be constructed from Greenstone to the head of the lake with a bridge across the Dart River. This will give all of the stations in the area access to their settlement township of Glenorchy. According to the present plans, Glenorchy is to be linked by road with Queenstown, but the building of such a road would leave the settlers on the western side in no better position than they are now, as they would still have no access to Glenorchy. The execution of these recommendations we have made in regard to (a) bridge over the Greenstone and road from Greenstone Station to Elfin Bay to be done immediately, and (b) road from Greenstone to Kinloch and a bridge over the Dart some miles above Kinloch as a later project, will give suitable access to the settlers in this area.

14. MAKAKAHO ROAD

Evidence was presented to us at Wanganui on behalf of a group of settlers in the Upper Waitotara Valley. Their petition was that the Makakaho Road should be extended to give a through connection at Pipiriki with the Raetihi district. On paper the scheme looked a very commendable one, but before making our recommendations we decided to inspect the area from the air in the course of our aerial survey of the difficult hill country in the Wanganui hinterland. After having an aerial view of the country which the projected road would traverse, and realizing that it is steep, razor-back, forested country, we have no recommendations to make.

15. MANGATITI VALLEY

Evidence was presented to us in Wanganui by a young returned serviceman who was desirous of taking up one of the abandoned sections in the Mangatiti Valley. We are of the opinion that matters concerning an individual application for land are not matters we should handle, but rather that we should indicate the general principles on which such applications should be considered. We have indicated that we think abandoned lands should be resettled where there is an opportunity of placing on the land a young man who can carry out the necessary improvements, and thus make his own labour the capital he invests in the property. This principle should be applied in the case quoted, and it appeared to us from our own conclusions and from the comments of local farmers that this is a case which should receive sympathetic consideration. We have therefore passed the request on to the Director-General of Lands, with whom we have discussed it, for his consideration.

16. CABLE FERRIES, WANGANUI RIVER AREA

Evidence was presented to us in the Wanganui area about the difficulty of gaining access to properties because of the deep gorges in which the rivers and their tributaries run. At the present time access is gained by cable ferries or light suspension bridges. These were constructed many years ago, and are now at the end of their useful life and in need of replacement. This replacement-cost under present conditions is quite beyond the means of the settlers. Failure to renew the cable ferries must result in loss of production from the areas. We consider, therefore, that the Ministry of Works should give attention to this question with a view to either making grants towards the replacement of these ferries or bridges or devising alternative means of access.

17. CHATHAM ISLANDS

In the course of our sittings at Christchurch evidence was presented on behalf of the sheep-farmers of the Chatham Islands. Their requests covered such matters as roads, education, and health services, to all of which attention has been given by the authorities during the past years. One particular request was for a 50-per-cent. subsidy on the cost of transport to and from the Islands. We are not in a position to recommend such a large subsidy, however, although we do appreciate the importance of production in the Chatham Islands, particularly as the ewes and wethers sent to Canterbury are a factor in production there. We recommend that a survey be made into the cost of transport to and from the Islands.

18. SAND-DUNE COUNTRY

Reference was made in evidence at Palmerston North, in the Dargaville district, and at Bulls to the importance of continuing a policy of reclaiming consolidated sand country. It appeared to us that continuous planting of trees up the coastal area from Foxton to Wanganui is necessary to control drifting sand. This is necessary also in other areas. Some work of this nature has been done by the Works Department, and we would recommend its continuance as soon as possible. There are considerable possibilities of increased production in these areas. The fully-developed consolidated sand country which we have seen was carrying good pastures, and its production was at a high level.

PART FOUR—SUMMARY OF RECOMMENDATIONS

The following is a summary of the recommendations that we have made :—

Matters Within the Portfolio of the Hon. the Minister of Agriculture :

1. Reconstruction of the Wool Board to become a Sheep Industry Board representing the sheep industry and parallel to the Dairy Board (pages) 48.
2. Introduction of a standard price for fertilizer, 91.
3. Department of Agriculture to be central authority for all matters concerning farming methods. Department to correlate all agricultural research and to organize a Sheep Division parallel to the Dairy Division, 60.
4. The Director-General of Agriculture to have the responsibility for organizing the distribution of fertilizers, 94.
5. Appointment of a committee to inquire into the usage and demand for fertilizers, 94.
6. Local authorities to be encouraged to compost organic wastes, 97.
7. The Director-General of Agriculture to include in his Annual report a statement of the weed position in each county, and to appoint Weed Control Officers, 111.
8. Experiments in aerial top-dressing should come under the control of the Director-General of Agriculture, 116.
9. The Director-General of Agriculture to arrange for the importation of iron intermediates and standards for fencing, 118.
10. The Department of Agriculture, in co-operation with the Ministry of Works, to proceed with irrigation works, 119.
11. The Department of Agriculture to proceed with research into certain matters listed, 121.
12. The Department of Agriculture to proceed with the establishment of two experimental stations, 124.
13. The Department of Agriculture to take precautions against the importation of weed-seeds, 125.
14. The Department of Agriculture to co-operate with the Sheep Industry Board in undertaking a general survey of the sheep industry, 125.
15. The Department of Agriculture to prohibit the use of certain materials for branding and wool marking, 129.
16. The Return of Sheep Owners to be compiled as at 30th June and to include much additional information, 129.
17. The Department of Agriculture to assume the responsibility for arranging transport of live-stock in periods of drought, 130.
18. The Department of Agriculture to arrange for the availability of ground rock phosphate where required, 145.

Matters Within the Portfolio of the Hon. the Minister of Defence (Air Force) :

1. The Royal New Zealand Air Force to experiment with helicopters for aerial top-dressing, 116.
2. The Air Department to designate as emergency airstrips suitable areas in the back country, 130.

Matters Within the Portfolio of the Attorney-General :

1. Amendment of the Trustee Act, 1908, to permit trustees to modify the terms of mortgages over marginal lands, 57.
2. Amendment to the existing law in regard to trespass (farms), 120.

Matters Within the Portfolio of the Hon. the Commissioner of State Forests :

1. The State Forest Service to plant suitable trees to ensure that there will be an adequate supply of fencing-post timbers in the future, 118.
2. The State Forest Service to undertake research into the most effective manner of preserving timber required on farms, 122.
3. The State Forest Service to be permitted to undertake afforestation work of a non-commercial nature on land liable to erosion or susceptible to weeds, 131.
4. The State Forest Service to render all possible assistance to the Nassella Tussock Boards by afforestation work wherever required, 144.

Matters Within the Portfolio of the Hon. the Minister of Education :

1. Correspondence School lessons to be available to teachers of Grade "O" schools, 136.
2. That wherever possible country girls be appointed to schools in country districts, 136.
3. That an allowance be made to mothers who teach their own children, 137.
4. Boarding-allowance to be increased to £1 per week and that arrangements be made for country children to have priority of admission to boarding schools, 137, 138.
5. The establishment of agricultural high schools is supported. All children to be taught more of the importance of farming to this country, 138.

Matters Within the Portfolio of the Hon. the Minister of Finance :

1. That provision be made for farmers on country liable to snow losses to set aside reserves, 114.
2. That the land-tax on farming lands be abolished, 126.
3. Amendment of taxation law to correct anomalies, 126-128.
4. That the provisions relating to special depreciation be amended to encourage the construction of houses for farm-workers, 134.

Matters Within the Portfolio of the Hon. the Minister of Housing :

1. That arrangements be made whereby elderly farmers wishing to retire may obtain priority for State houses in towns so that land will be released for the settlement of discharged servicemen, 86.
2. That State houses be erected in rural settlements, 134.

Matters Within the Portfolio of the Hon. the Minister of Internal Affairs :

1. Matters concerning pest-destruction by Wildlife Division, 106.
2. That the Local Government Commission readjust county boundaries to facilitate better roading in back-country areas, 113.
3. That a review be made of the incidence of rates on farming land, 129.
4. That, in the interests of better rural electrical reticulation, small Electric-power Boards, serving back-country districts, should be encouraged to amalgamate, 142.

5. That more assistance be given to rural communities from the Physical Welfare Fund and that Physical Welfare Officers be encouraged to promote recreation in rural areas, 143.

6. That, if possible, the area known as Sounds County be granted some form of local government, 145.

Matter Within the Portfolio of the Hon. the Minister of Industries and Commerce :

1. That the Director of Price Control undertake an investigation into the prices charged for fencing-materials, particularly the relationship between the prices for concrete and wooden fencing-posts, 118.

Matters Within the Portfolio of the Hon. the Minister of Labour and Employment :

1. That the Department of Labour and Employment ensure that the award relating to shearers is strictly enforced to encourage the training of shearers, and that such training be continued, 121.

2. That the Immigration Division of the Department of Labour and Employment encourage the immigration of blacksmiths, particularly farriers, 131.

Matters Within the Portfolio of the Hon. the Minister of Lands :

1. That there be established a Marginal Lands Board. A scheme to develop marginal lands under such board is submitted, 53, 55, 57.

2. That within the Department of Lands and Survey there be set up a Marginal Lands Division and a Land Conservation Division, 59.

3. That the Department of Lands and Survey assume the responsibility for the conservation of land (soil) now accepted by the Soil Conservation Council, 68.

4. That pastoral licensees may be able to convert their licences into pastoral leases, 74.

5. A scheme is submitted for the regrouping of uneconomic units, 74.

6. That good husbandry should be encouraged and the good husbandry clause redrafted, 76.

7. That Crown tenants be represented on the Land Settlement Board and the Land Settlement Committees, 77.

8. That endowment lands should be resumed as Crown lands and be controlled by the Department of Lands and Survey in the national interest, 77.

9. That the Land Settlement Board should institute a training scheme for prospective young farmers, 78.

10. That compensation for land taken should be paid without delay, and preferably before the land is taken, 79.

11. That the Department of Lands and Survey should have power to take land which is being badly farmed, 85.

12. That the landowners and lessees of the high country should have a copy of recommendations on burning, 105.

13. That the Director-General of Lands ensure that the balance between fattening and store country be maintained, 131.

14. That the basis of pegging land values be reviewed, 132.

15. That the Department of Lands and Survey undertake a special survey of the South Westland area, 148.

16. That steps be taken to correct the anomalies of the Mount Cook Reserve, 148.

Matter Within the Portfolio of the Hon. the Minister of Maori Affairs :

1. That there be established an authority to review the development of Maori lands, 84.

Matter Within the Portfolio of the Hon. the Minister of Marketing :

1. That a review be made of the effect of the levy on hides and skins, 131.

Matter Within the Portfolio of the Hon. the Minister of Mines :

1. That the Mining Act be reviewed, 120.

Matter Within the Portfolio of the Hon. the Postmaster-General :

1. That there be an extension in the hours during which the rural telephone exchanges are open, 139.

Matters Within the Portfolio of the Hon. the Minister of Railways :

1. That the attention of the Railways Department be drawn to the danger of spreading weeds in ballast, 112.

2. That the charges to local residents on Lake Wakatipu steamers be reviewed, 149.

Matter Within the Portfolio of the Hon. the Minister of Rehabilitation :

1. That the policy of the Rehabilitation Board be altered to allow returned servicemen to take up partly-developed land, 86.

Matter Within the Portfolio of the Hon. the Minister in Charge of the State Hydro-electric Department :

1. That the State Hydro-electric Department give consideration to the installation of Diesel electric generating-plants in back-country areas, 142.

Matters Within the Portfolio of the Hon. the Minister of Transport :

1. That the attention of the Commissioner of Transport be drawn to the dangers of permitting higher axle-loads, 114.

2. That the farming community be allowed to purchase petrol and oil in drum lots, 132.

3. That the registration of private cars used to carry children to schools be reviewed to decrease costs, 137.

4. That an inquiry be made into the charges for transport to the Chatham Islands, 150.

Matters Within the Portfolio of the Hon. the Minister of Works :

1. That the Soil Conservation and Rivers Control Act be amended to make the Soil Conservation and Rivers Control Council a Rivers Control Council, and that Catchment Boards be abolished, 67.

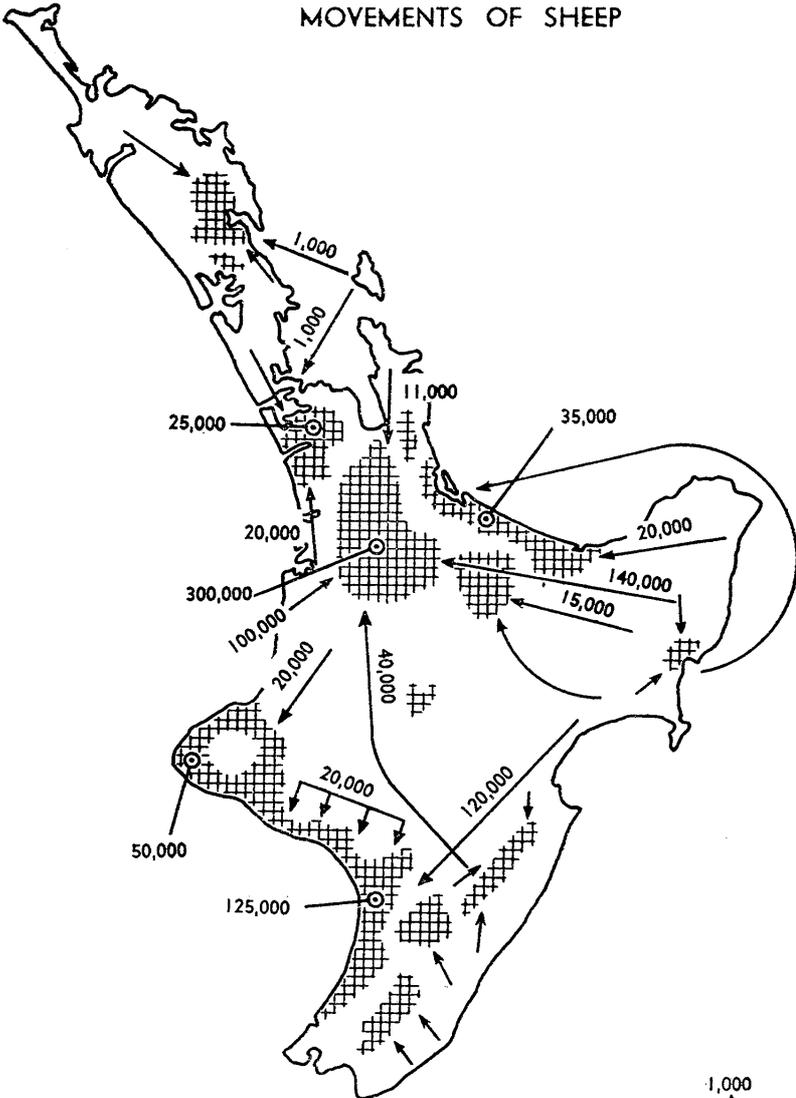
2. That the responsibility for land-conservation be relinquished by the Soil Conservation Council and be vested in the Department of Lands and Survey, 68.

3. That the Ministry of Works establish farm machinery pools, 85.
 4. That the Ministry of Works undertake immediately a survey of back-country roads and proceed as soon as possible with the metalling of clay roads, 113.
 5. That the Ministry of Works, in co-operation with the Department of Agriculture, proceed with irrigation schemes in Otago and Canterbury, 119.
 6. That an investigation be made by the Ministry of Works into the prices charged for water in certain irrigation schemes, 119.
 7. That the Ministry of Works institute mobile camps for workers engaged in scrub-cutting and drainage-works, 143.
 8. That the Ministry of Works review the need for certain roads in the Clarence River and Lake Wakatipu areas, 145.
 9. That the Ministry of Works investigate the needs of farmers in the Wanganui area where cable ferries are a necessity, 150.
 10. That the Ministry of Works pursue sand-country planting-work as rapidly as possible, 150.
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PART FIVE—ATLAS OF MAPS

All maps in this Part were prepared by the Department of Agriculture unless otherwise stated.

MOVEMENTS OF SHEEP



Fat lamb areas requiring replacements

Romney areas breeding replacement ewes

Movements shown



FIG. 1.—MOVEMENTS OF SHEEP.

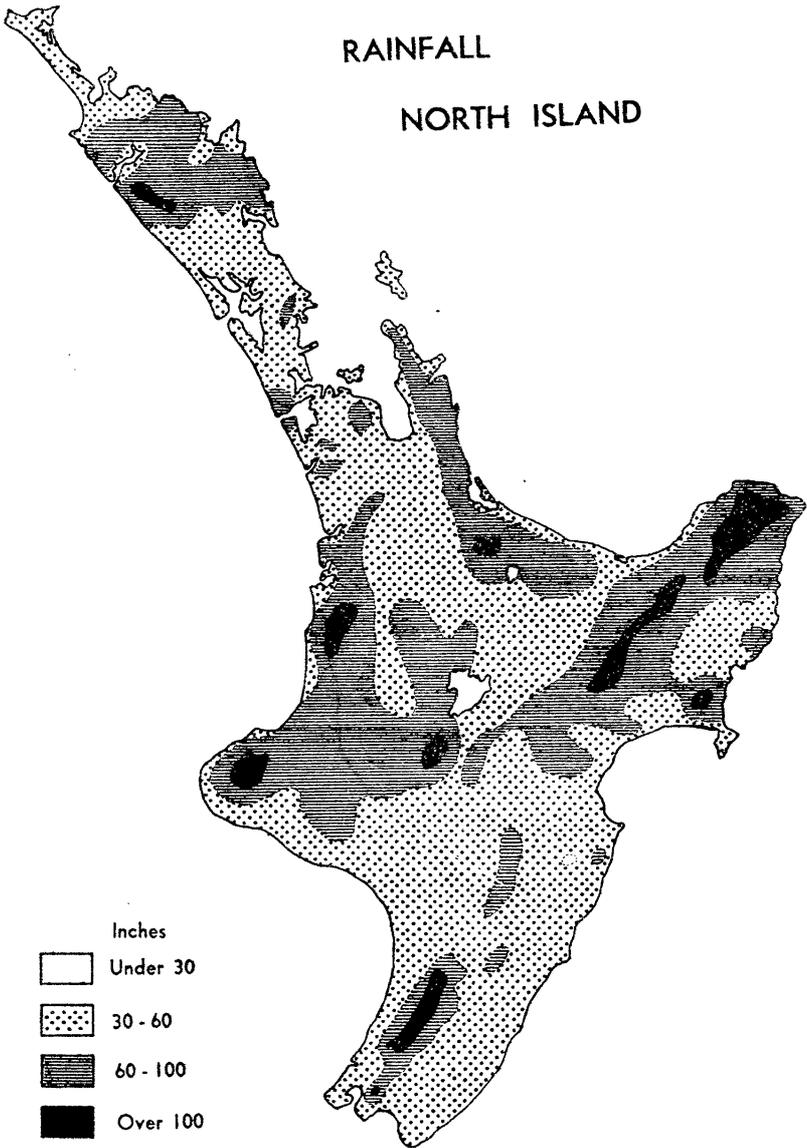


FIG. 2 (i).—RAINFALL NORTH ISLAND.

RAINFALL
SOUTH ISLAND

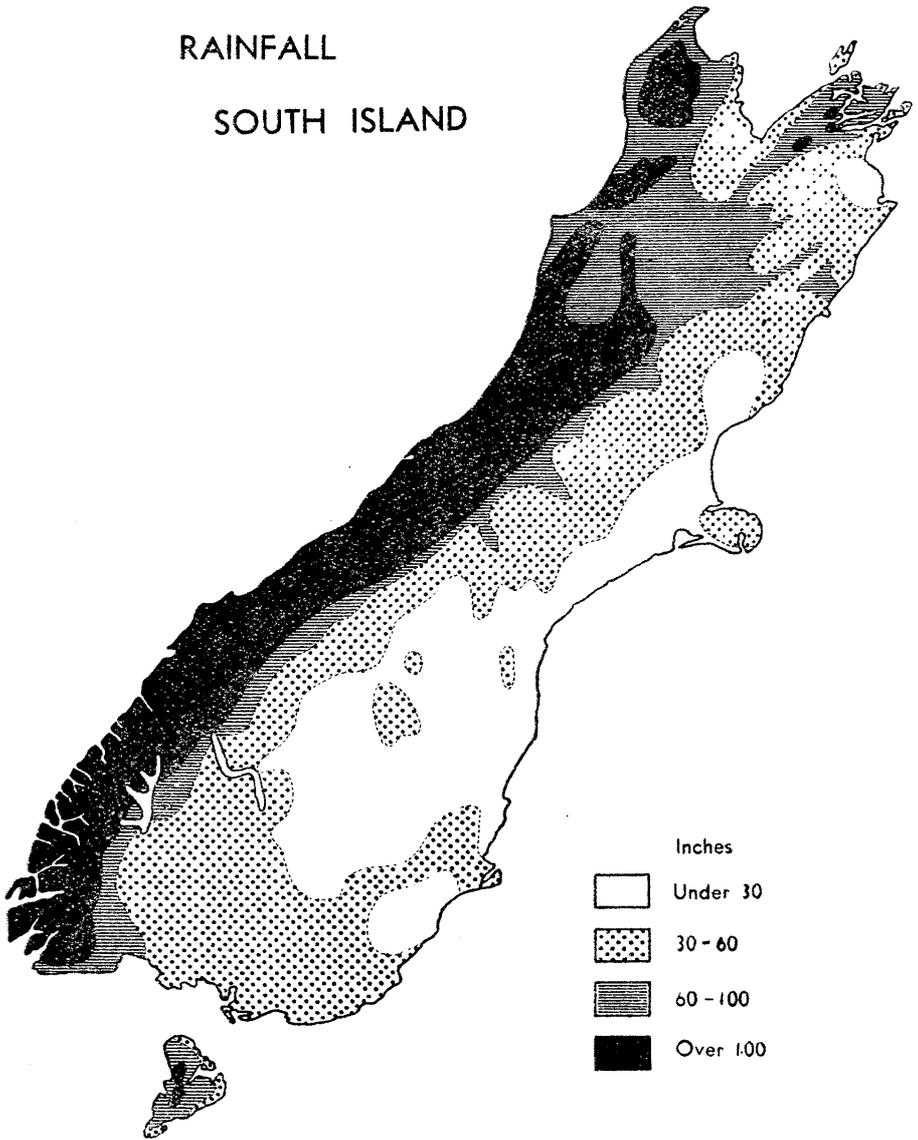
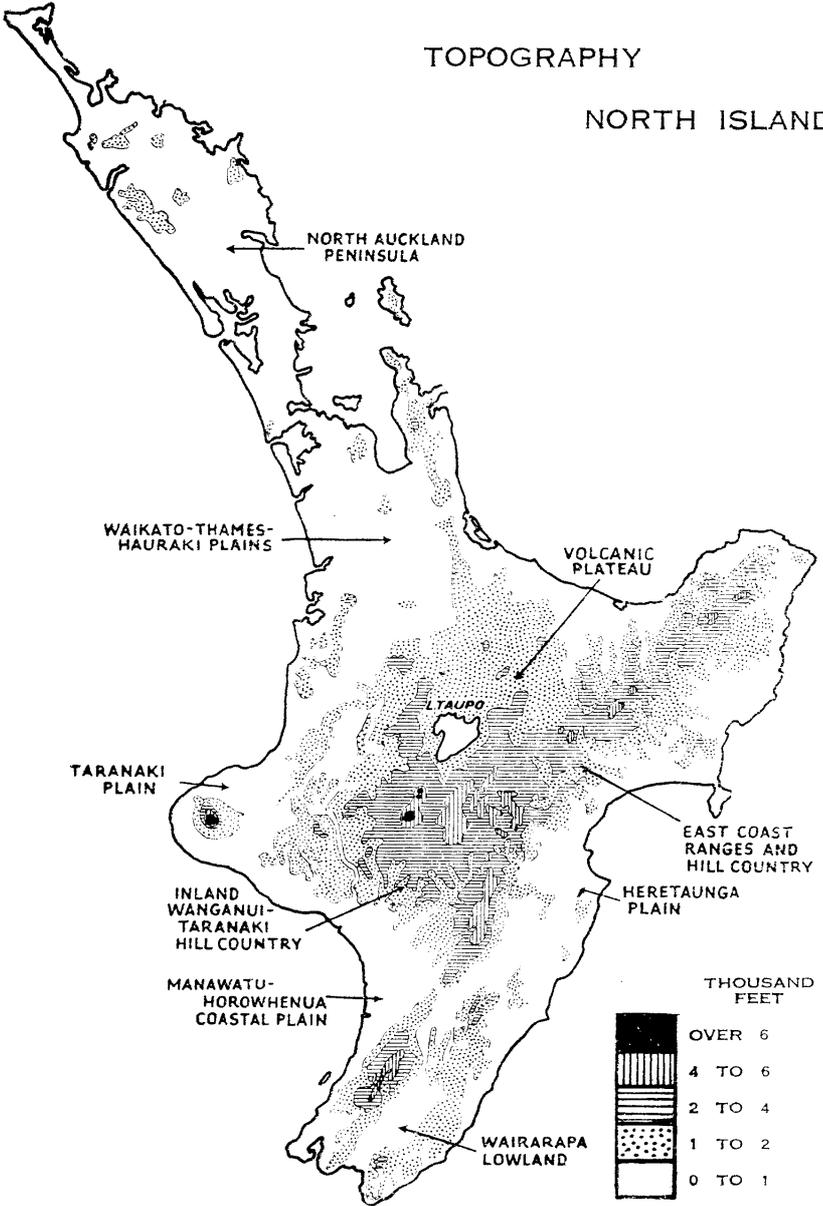


FIG. 2 (ii).—RAINFALL SOUTH ISLAND.

TOPOGRAPHY

NORTH ISLAND

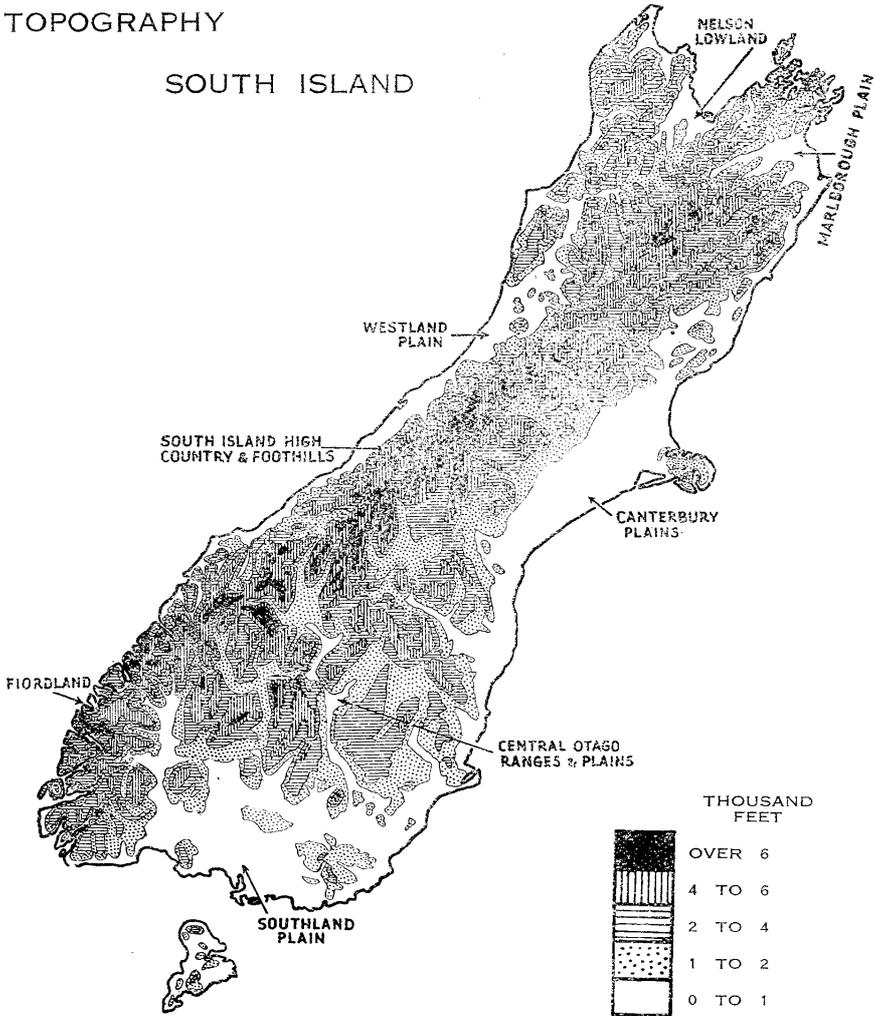


Drawn by the Head Office, Lands and Survey Department, Wellington.

FIG. 3 (i).—CONTOURS : NORTH ISLAND.

TOPOGRAPHY

SOUTH ISLAND



Drawn by the Head Office, Lands and Survey Department, Wellington.

FIG. 3 (ii). CONTOURS: SOUTH ISLAND.

MAP OF NORTH ISLAND FARMING

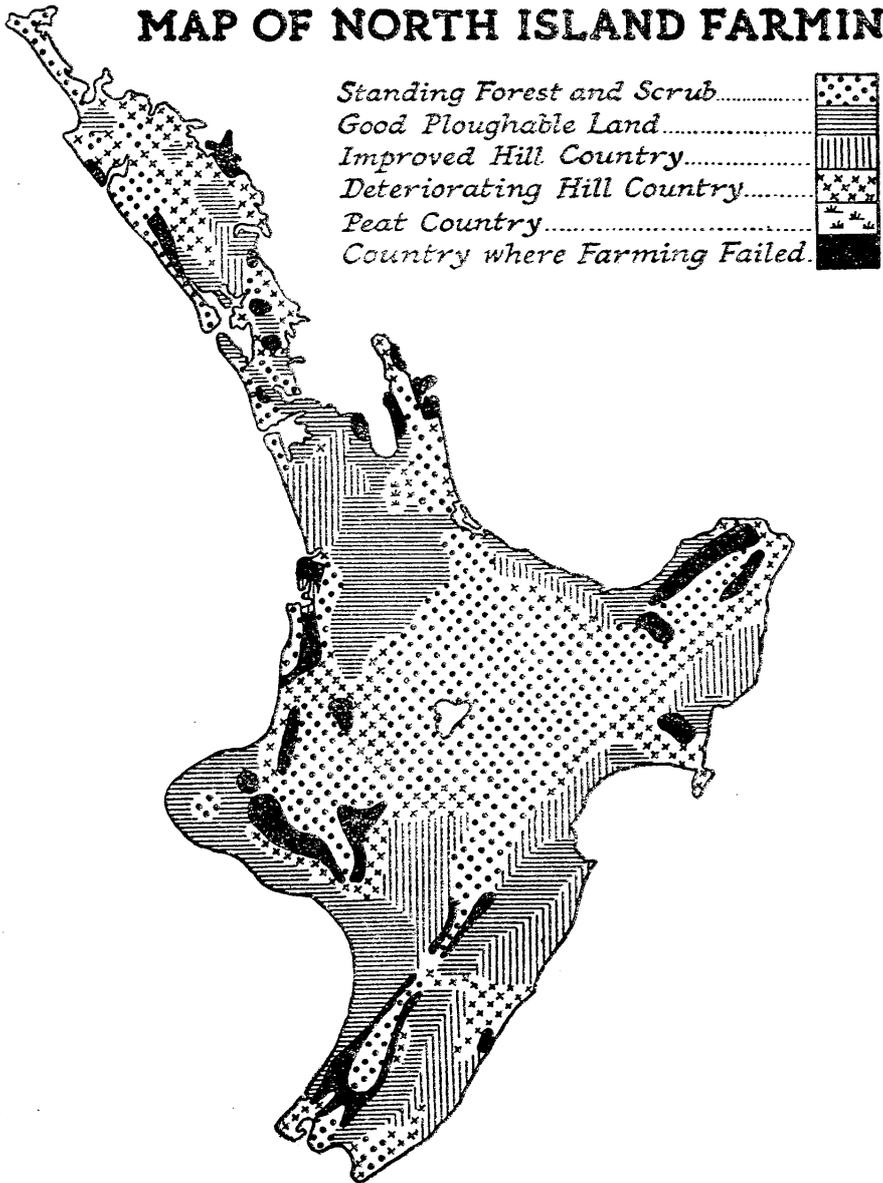


FIG. 4 (i).—SHEEP-FARMING CHARACTERISTICS: NORTH ISLAND.

MAP OF SOUTH ISLAND FARMING

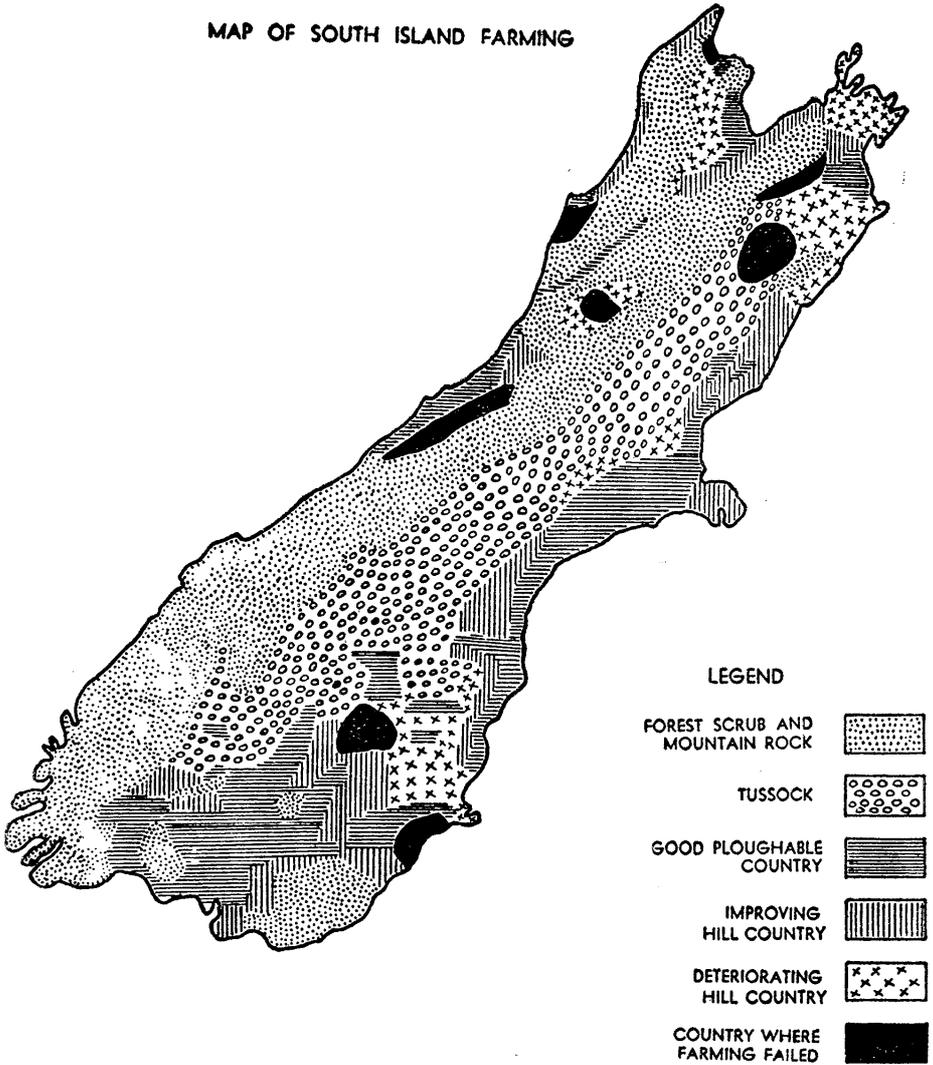
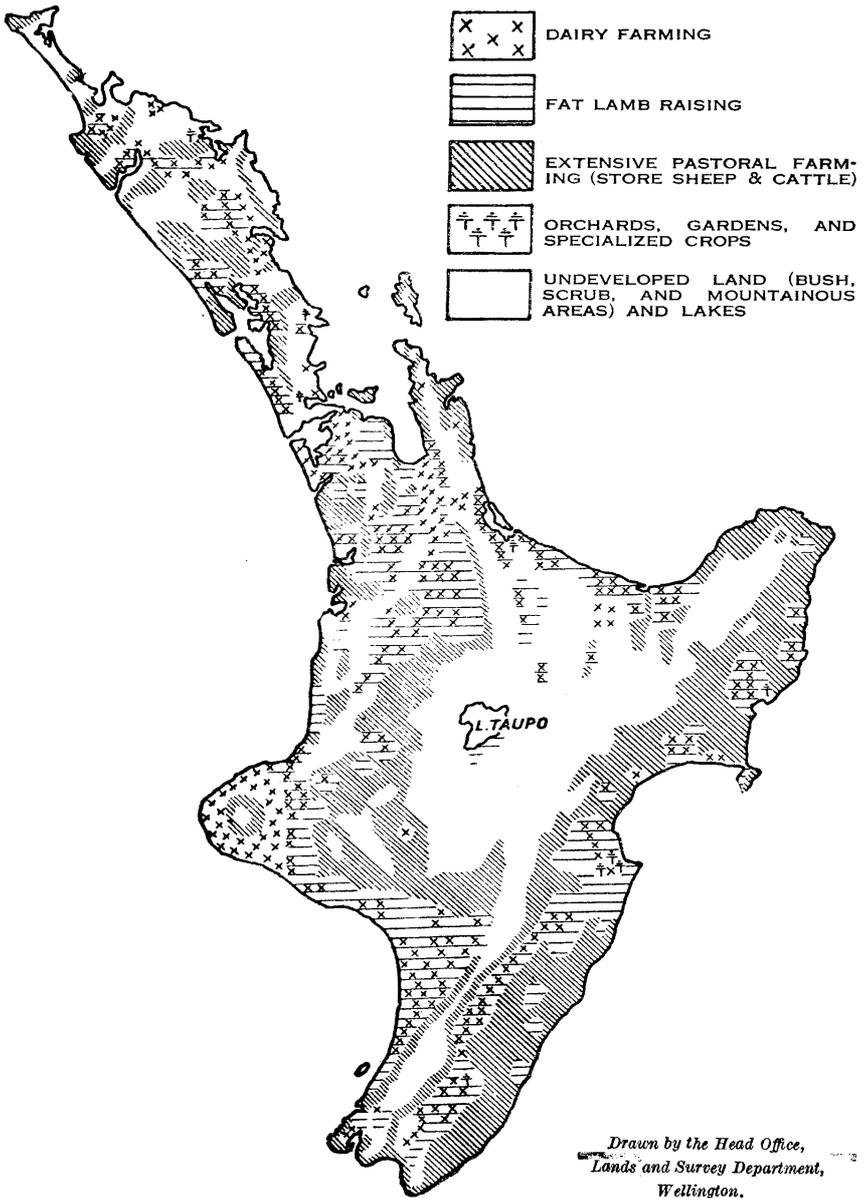


FIG. 4 (ii).—SHEEP-FARMING CHARACTERISTICS : SOUTH ISLAND.

DISTRIBUTION OF SYSTEMS OF FARMING NORTH ISLAND



F-g. 5 (i).—DISTRIBUTION OF SYSTEMS OF FARMING: NORTH ISLAND.



FIG. 6 (i).—SHEEP-FARMING REGIONS: MAP OF NORTH ISLAND SHOWING REGIONAL BOUNDARIES.

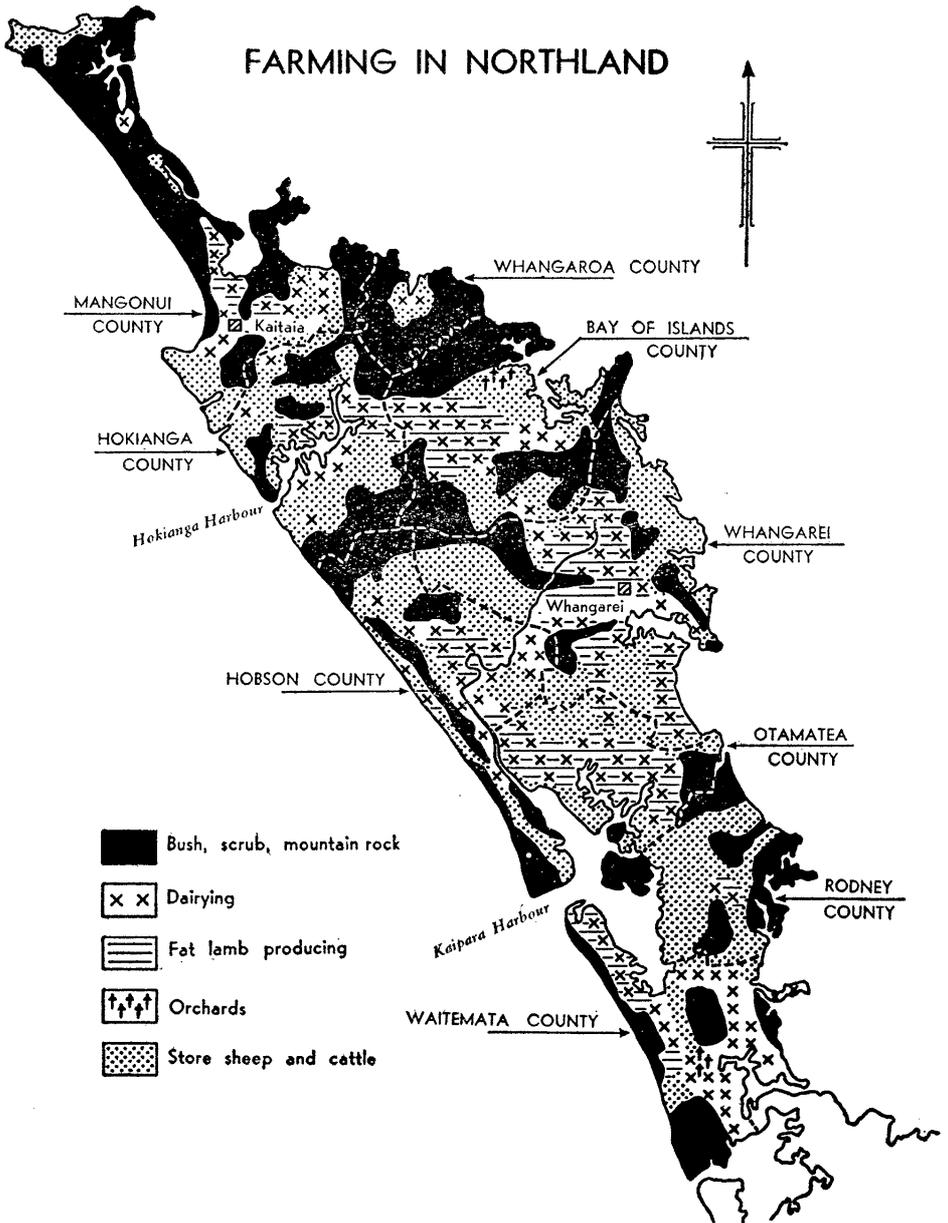


FIG. 6 (ii).—SHEEP-FARMING REGIONS: NORTHLAND.

FARMING IN SOUTH AUCKLAND

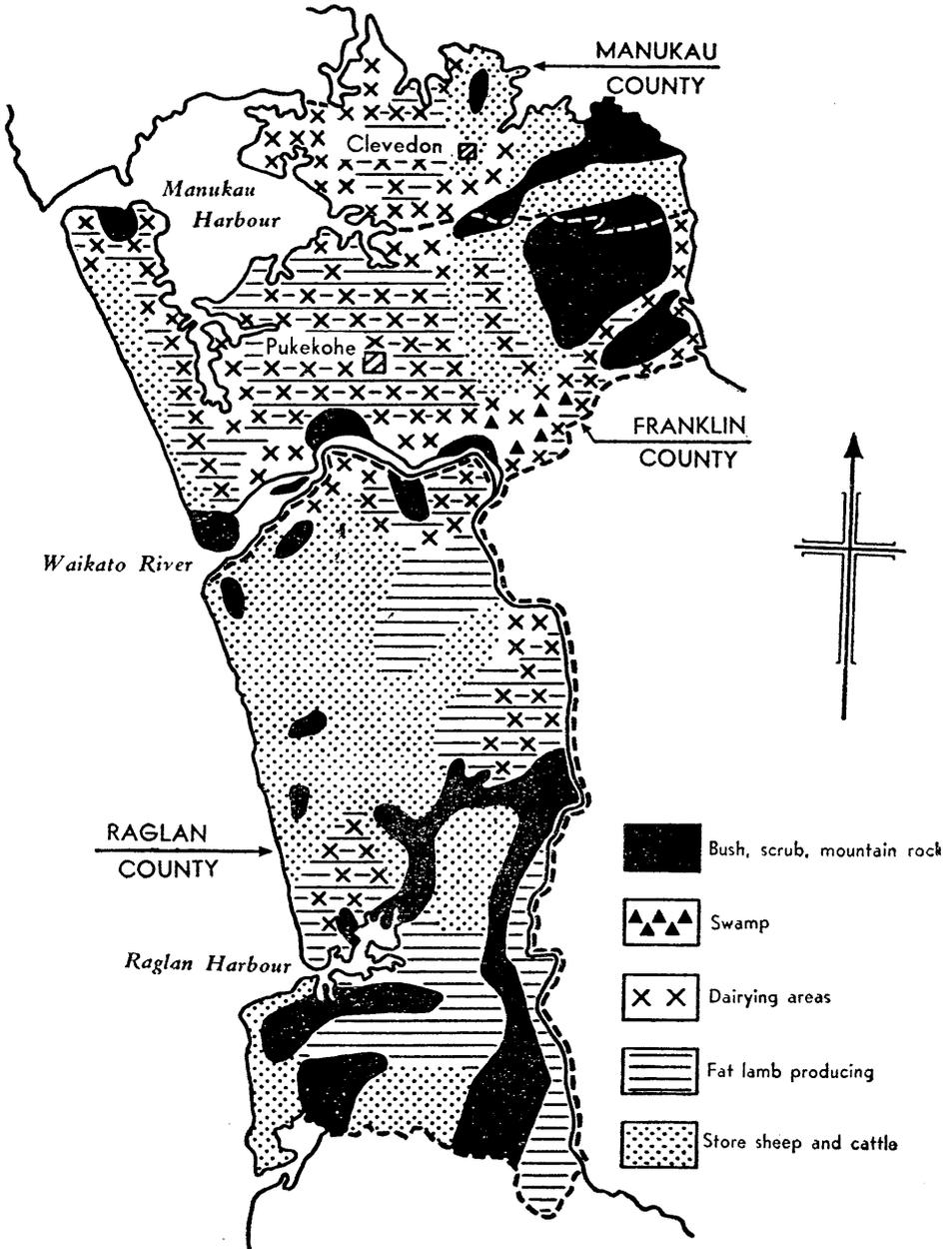


FIG. 6 (iii).—SHEEP-FARMING REGIONS: SOUTH AUCKLAND.

FARMING IN WAIKATO

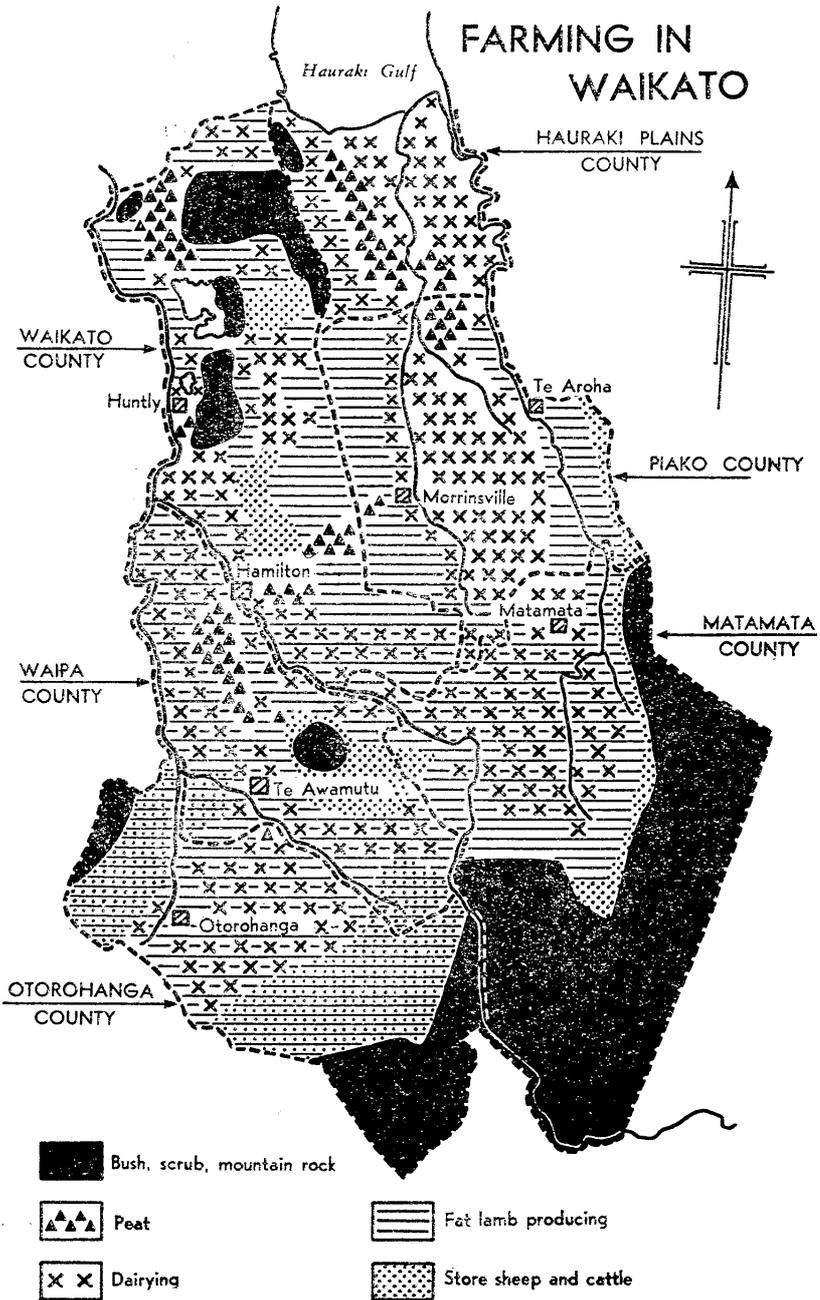


FIG. 6 (iv).—SHEEP-FARMING REGIONS: WAIKATO.

FARMING IN CAPE COLVILLE

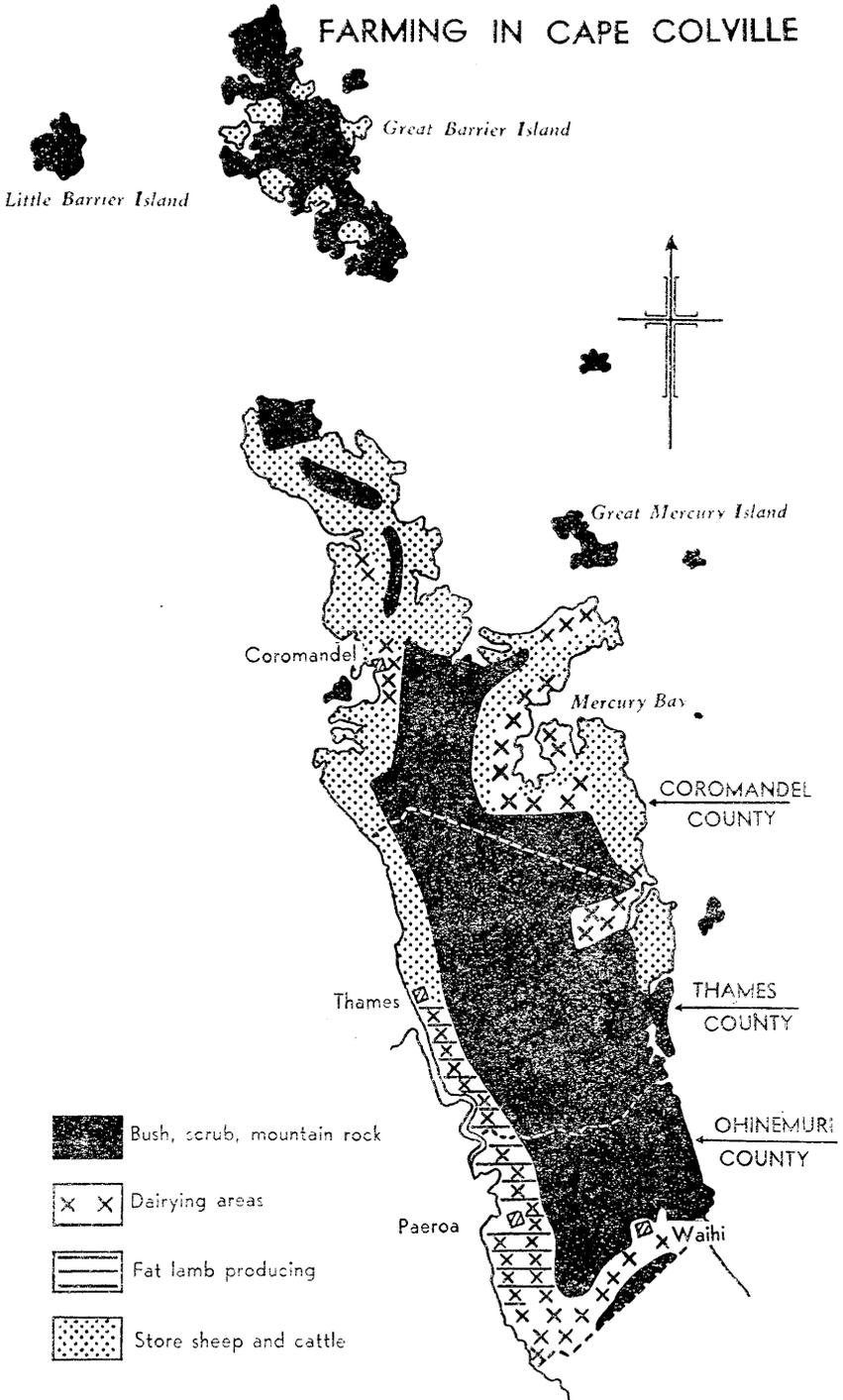


FIG. 6 (v).—SHEEP-FARMING REGIONS: CAPE COLVILLE.

FARMING IN CENTRAL PLATEAU

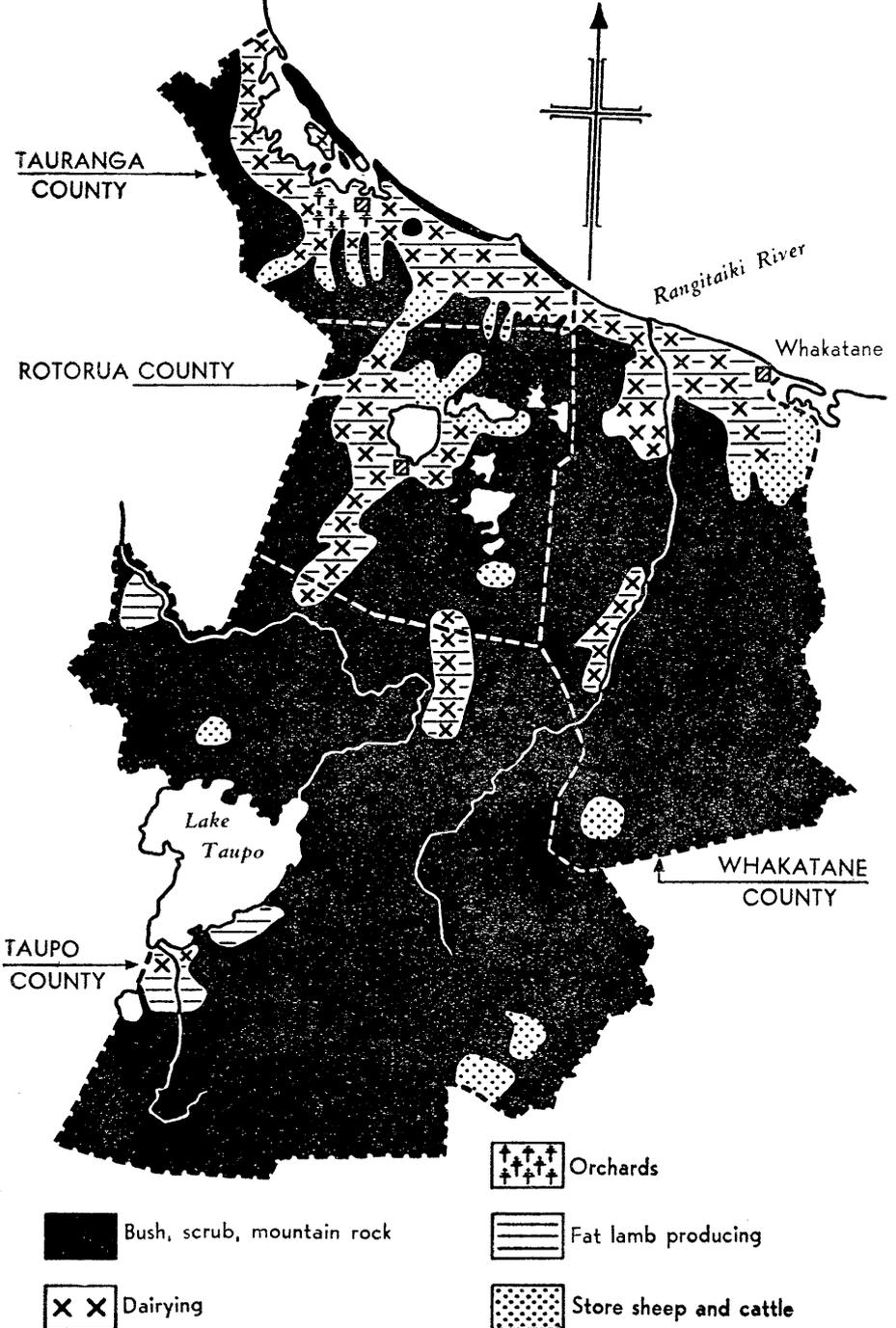


FIG. 6 (vi).—SHEEP-FARMING REGIONS: CENTRAL PLATEAU.

FARMING IN EAST CAPE

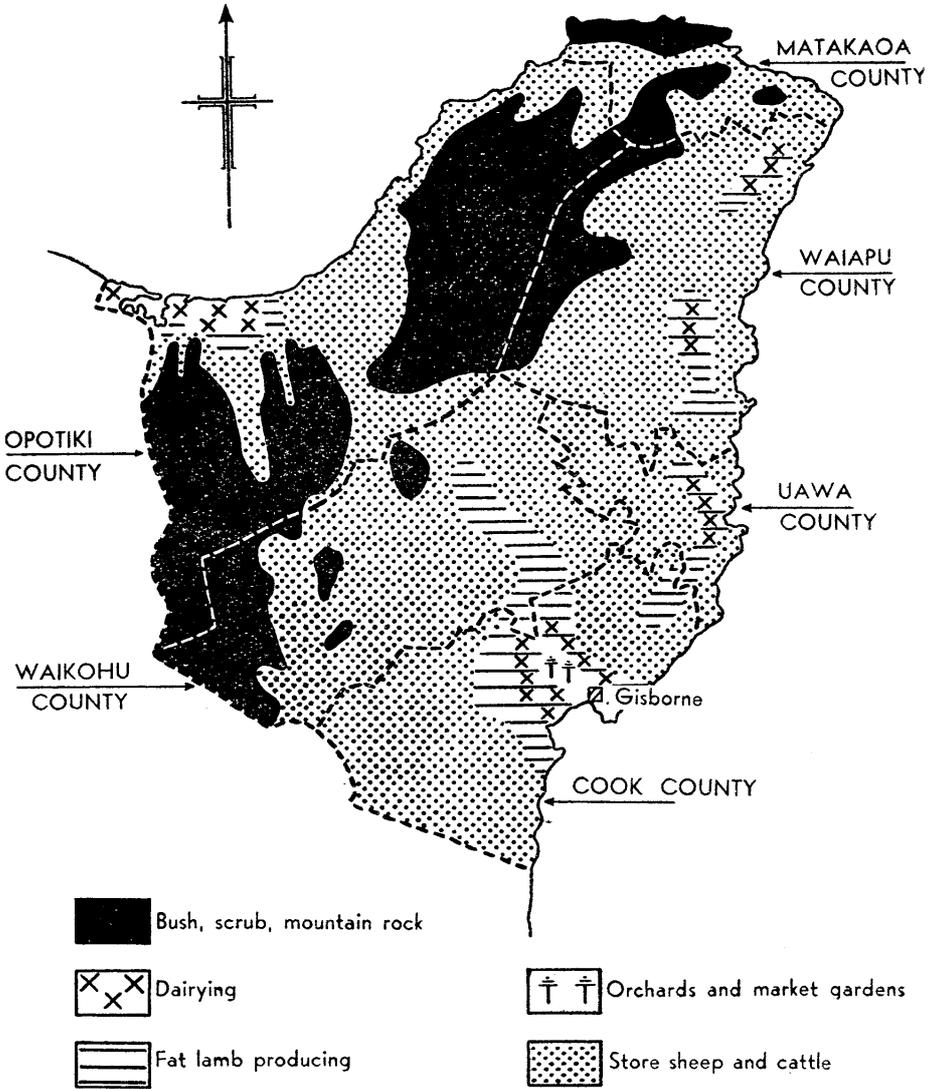


FIG. 6 (vii).—SHEEP-FARMING REGIONS: EAST CAPE.

FARMING IN WESTERN UPLANDS

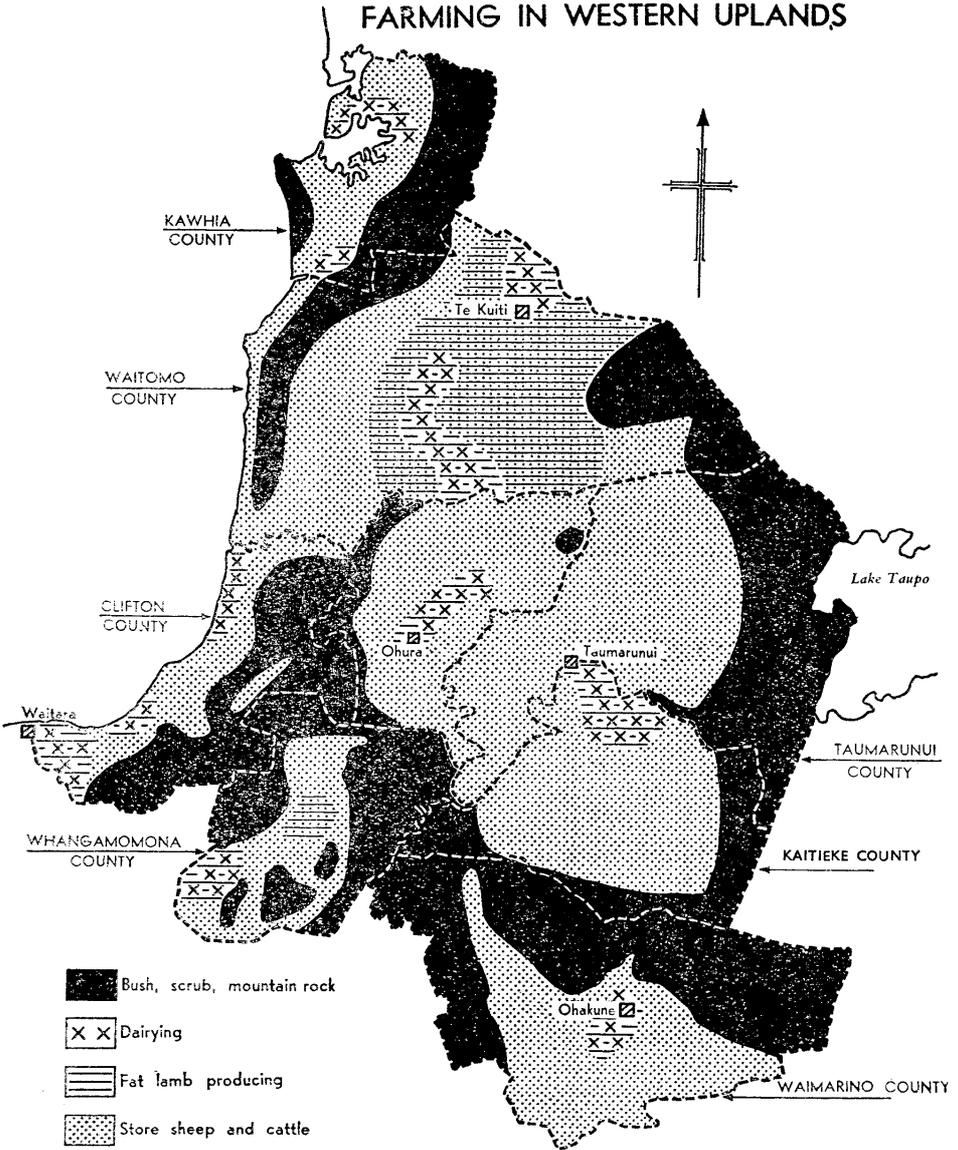
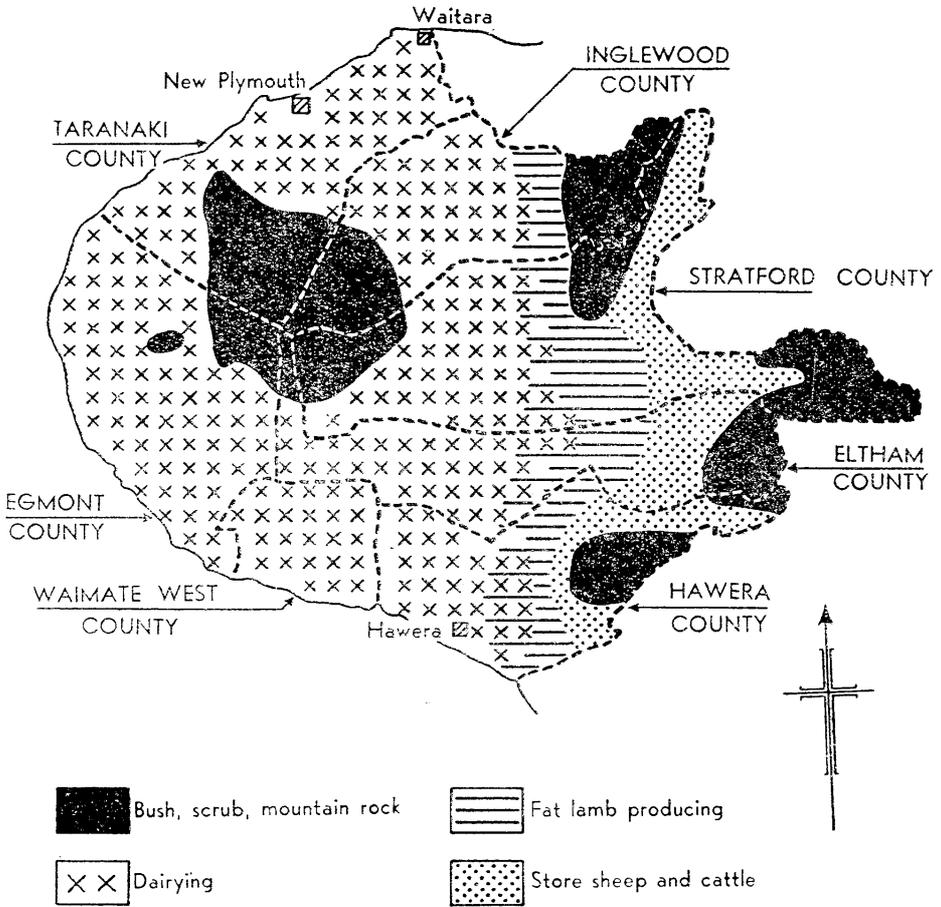


FIG. 6 (viii). SHEEP-FARMING REGIONS: WESTERN UPLANDS.

FARMING IN TARANAKI



Note: There is some lamb fattening but not to the same extent as in the Waikato.

FIG. 6 (ix).—SHEEP-FARMING REGIONS: TARANAKI.

FARMING IN HAWKE'S BAY

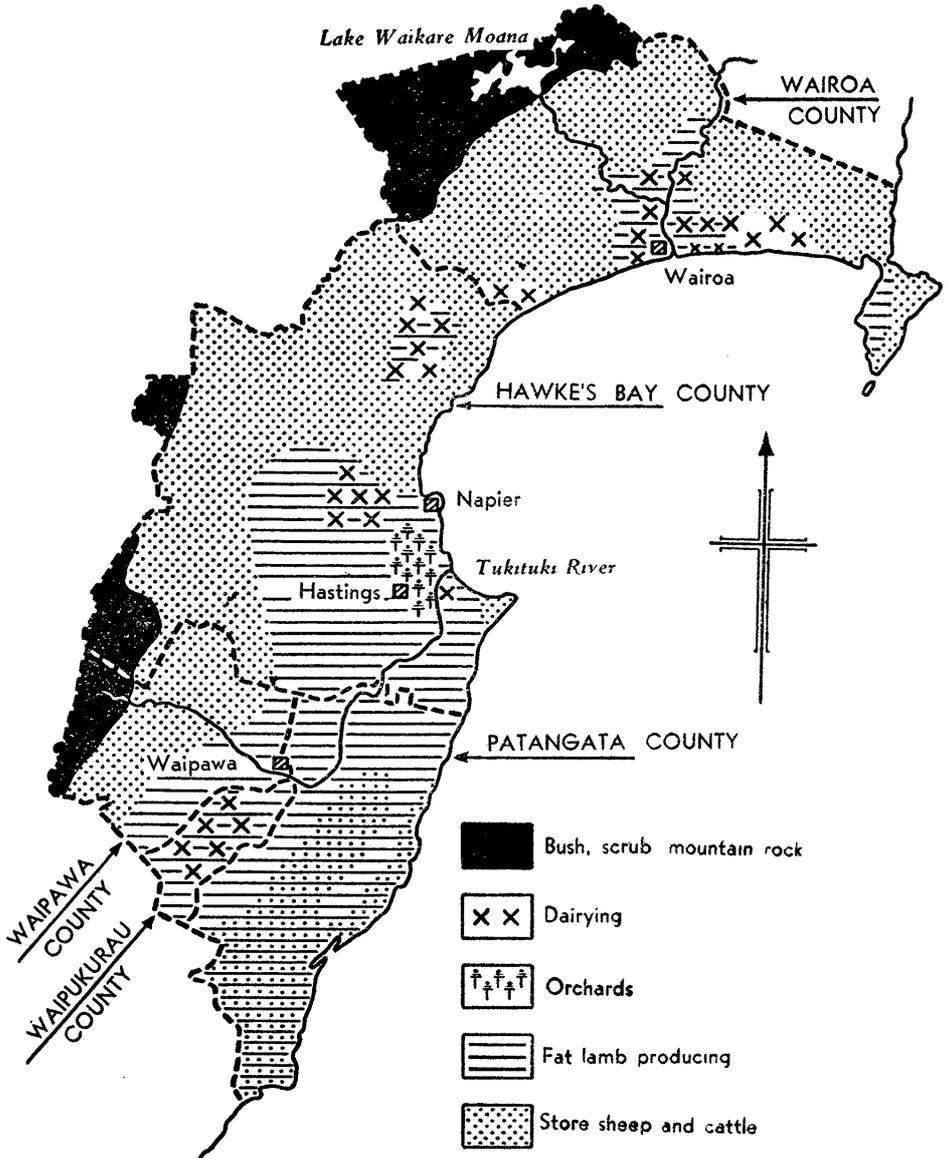


FIG. 6 (x).—SHEEP-FARMING REGIONS: HAWKES BAY.

FARMING IN RANGITIKEI

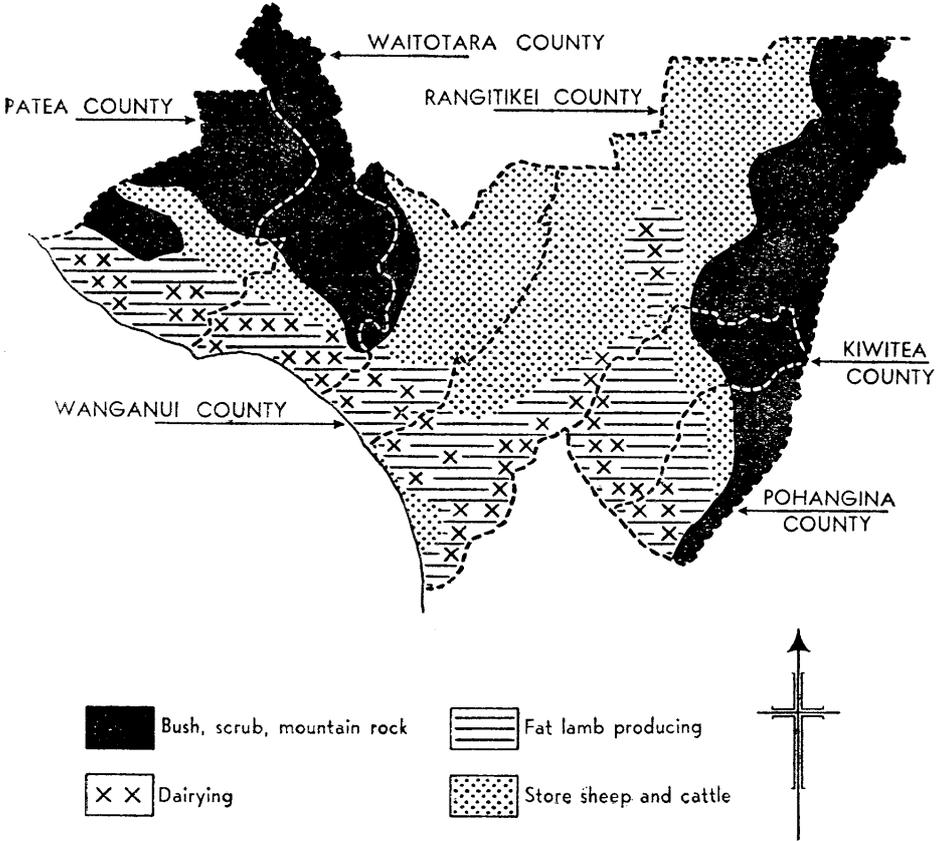


FIG. 6 (xi).—SHEEP-FARMING REGIONS: RANGITIKEI.

FARMING IN MANAWATU

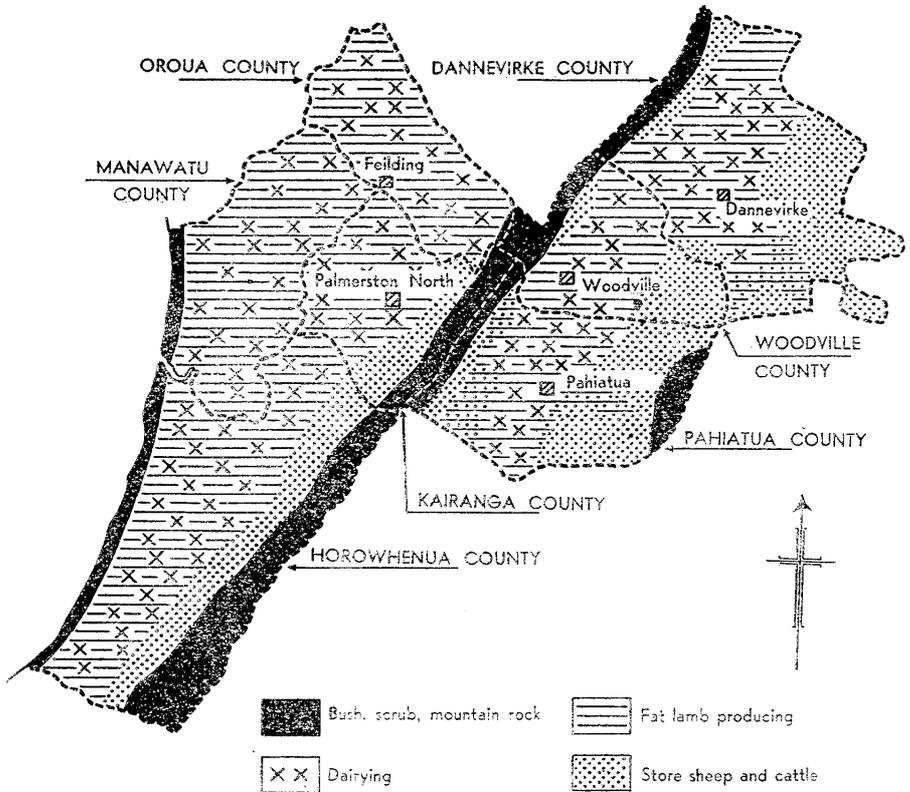
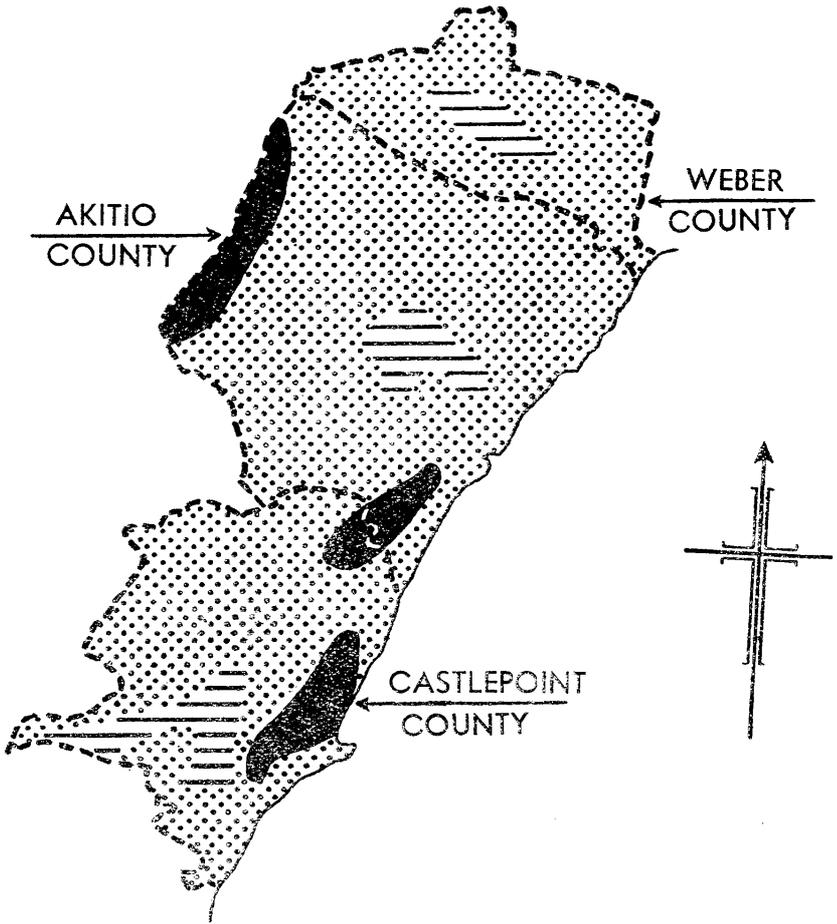


FIG. 6 (xii).—SHEEP-FARMING REGIONS: MANAWATU.

FARMING IN CASTLEPOINT



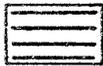
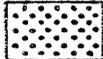
-  Bush, scrub, mountain rock
-  Fat lamb producing
-  Store sheep and cattle

FIG. 6 (xiii).—SHEEP-FARMING REGIONS: CASTLEPOINT.

FARMING IN WAIRARAPA

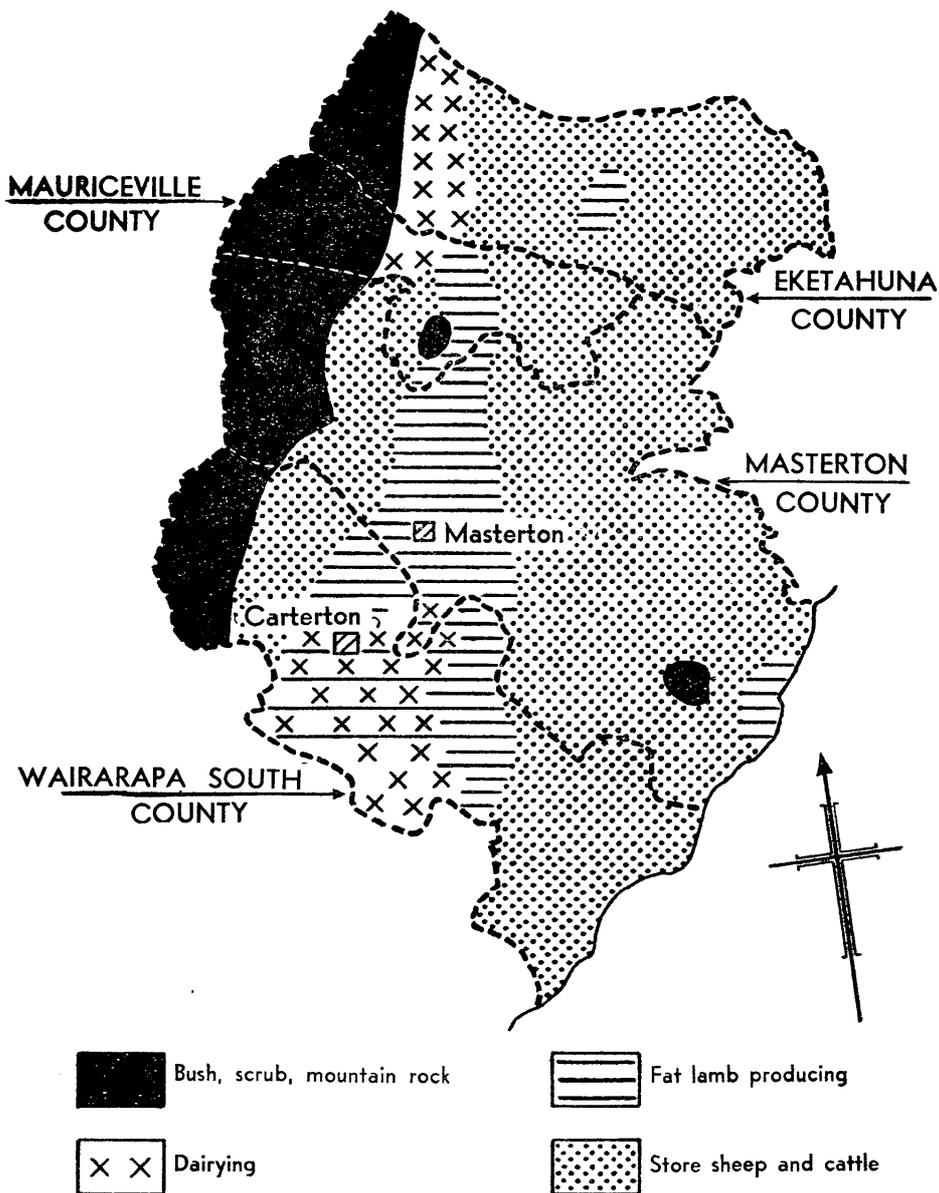


FIG. 6 (xiv).—SHEEP-FARMING REGIONS: WAIRARAPA.

FARMING IN FEATHERSTON

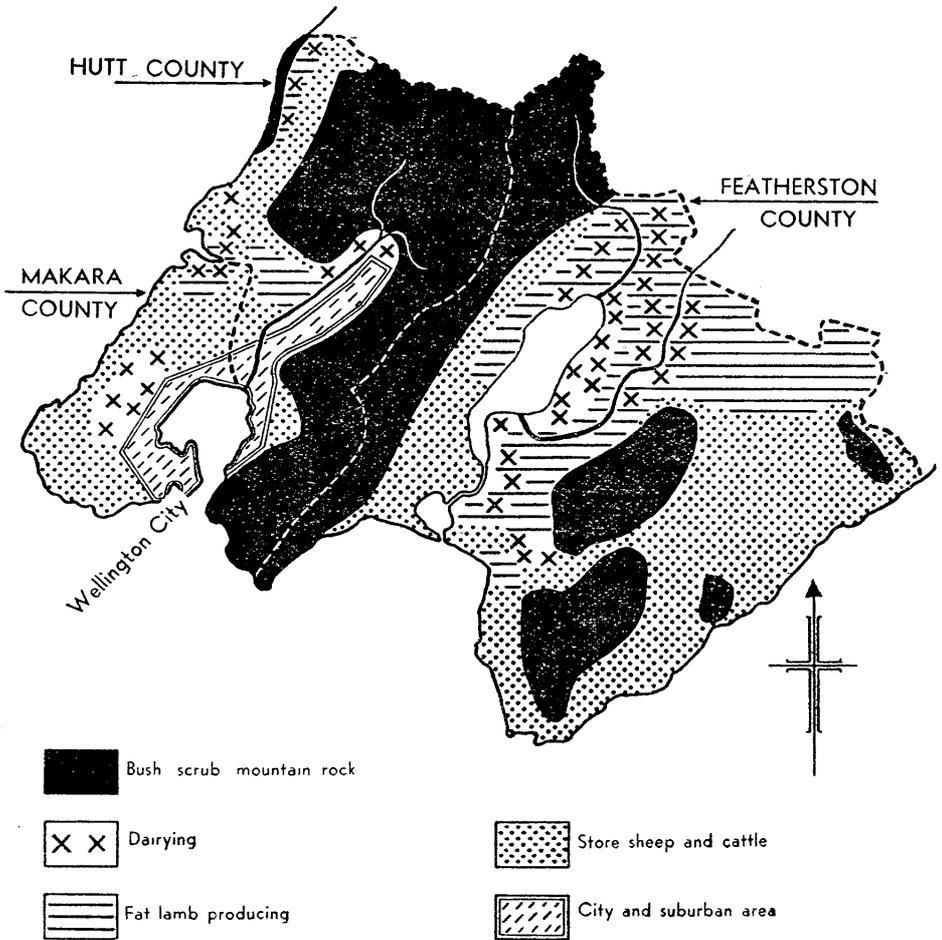


FIG. 6 (xv).—SHEEP-FARMING REGIONS: FEATHERSTON.

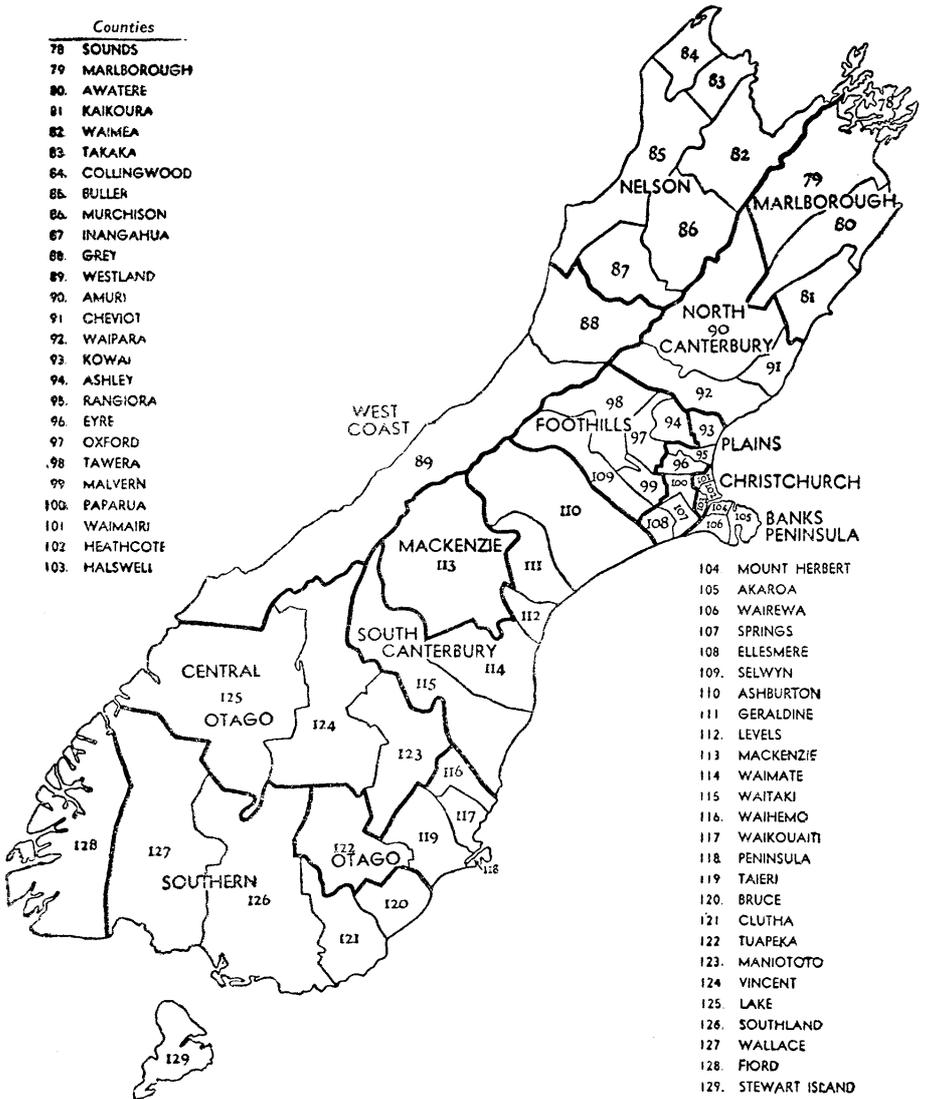


FIG. 6 (xvi).—SHEEP-FARMING REGIONS: MAP OF SOUTH ISLAND SHOWING REGIONAL BOUNDARIES.

FARMING IN MARLBOROUGH

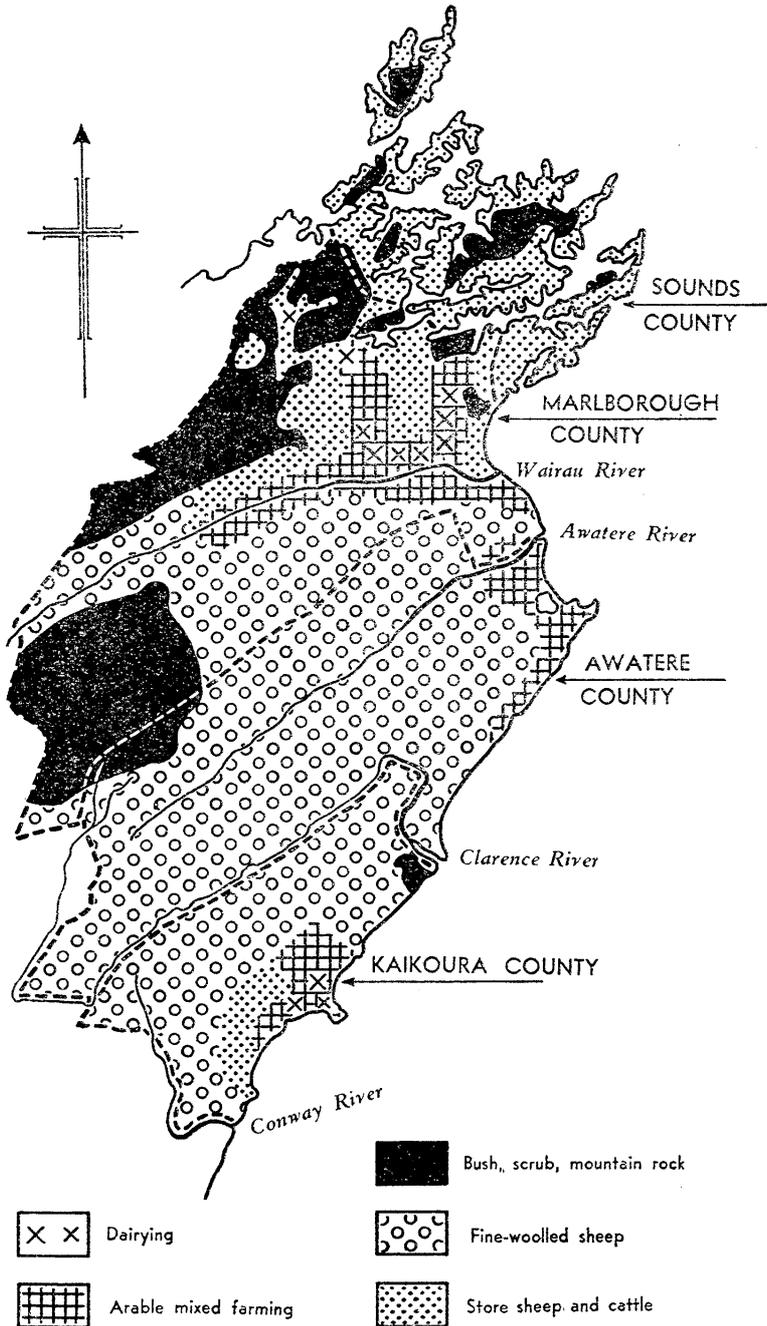


FIG. 6 (xvii).—SHEEP-FARMING REGIONS: MARLBOROUGH.

FARMING IN NELSON

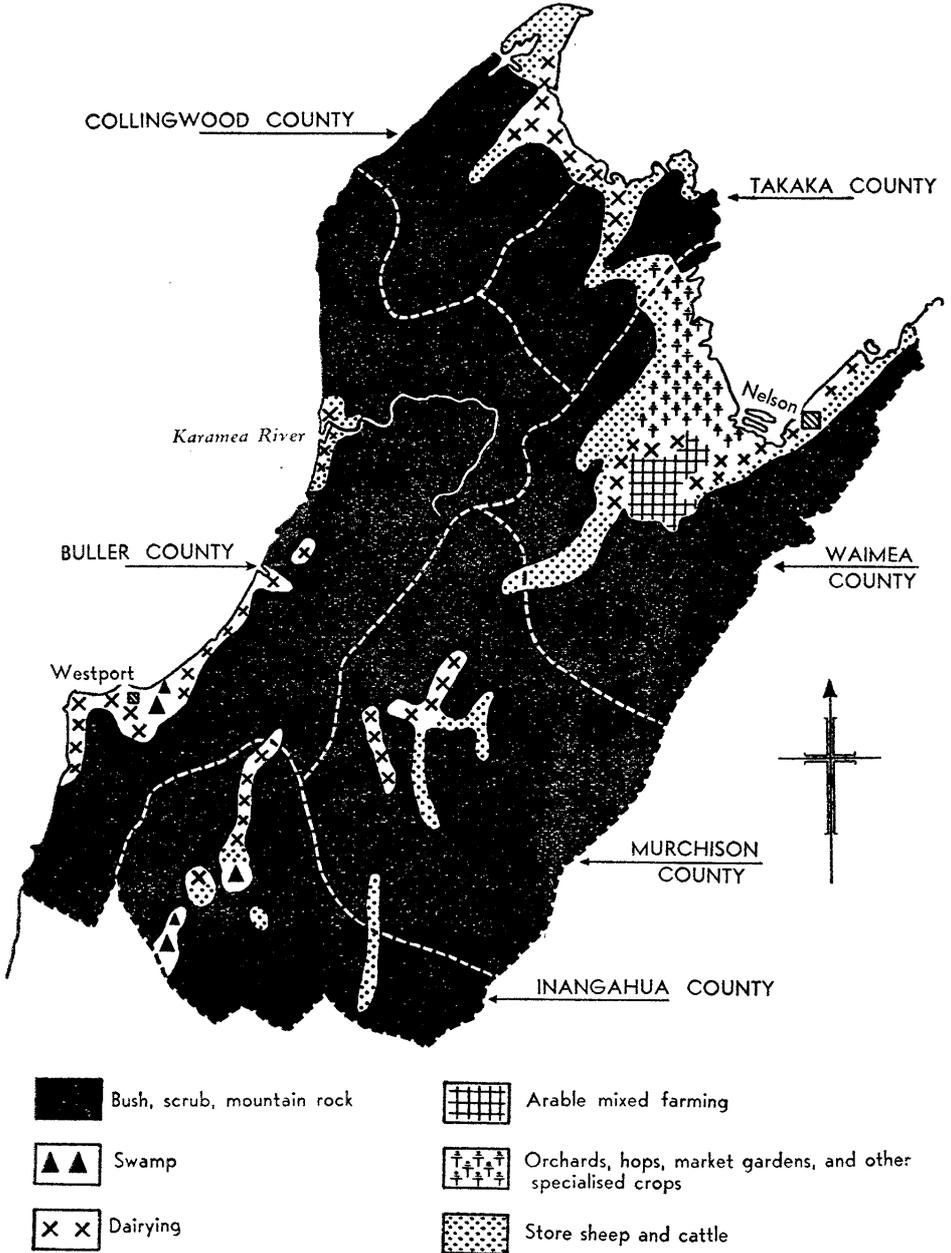


FIG. 6 (xviii).—SHEEP-FARMING REGIONS: NELSON.

FARMING IN WEST COAST

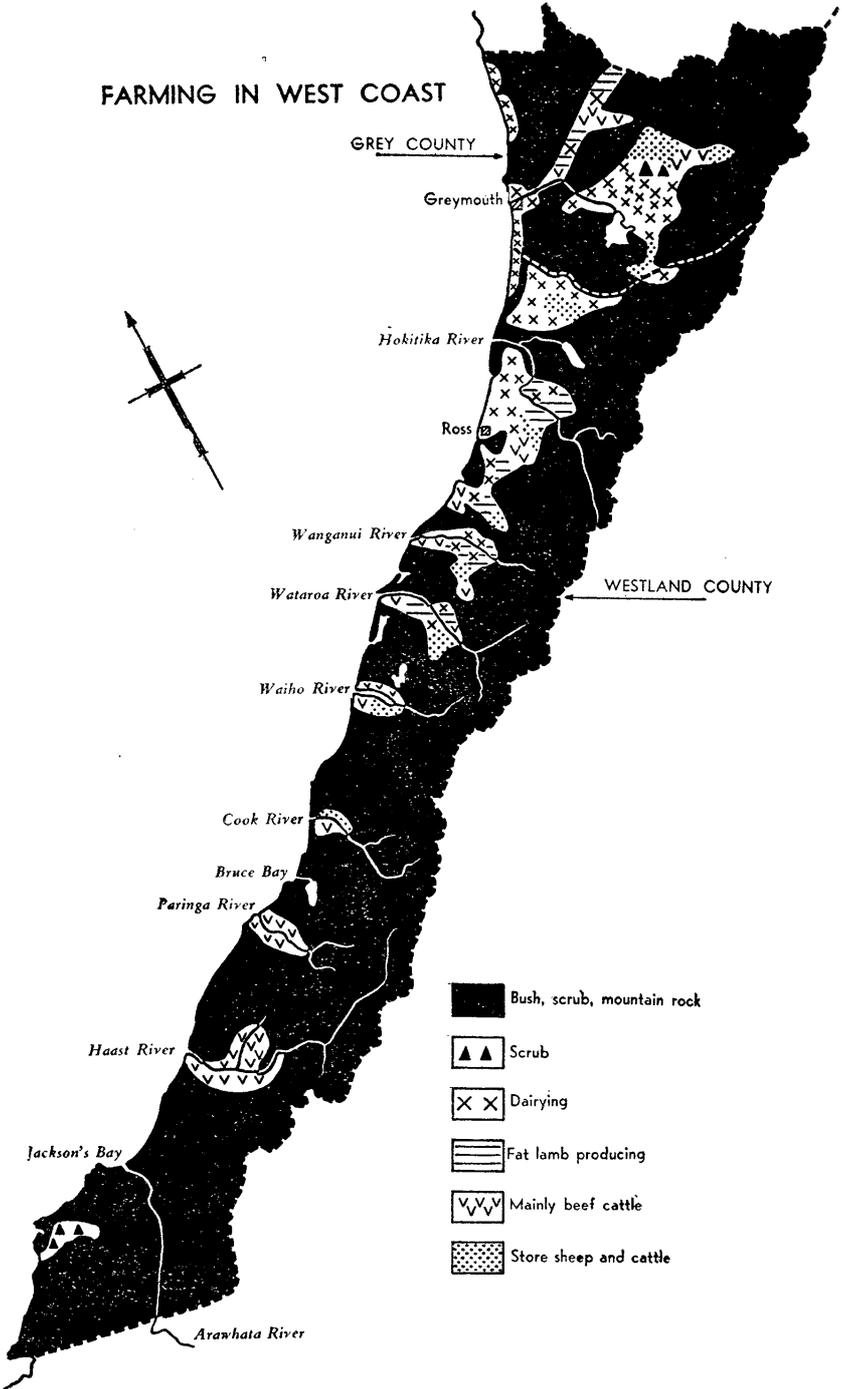


FIG. 6 (xix).—SHEEP-FARMING REGIONS: WEST COAST.

FARMING IN NORTH CANTERBURY

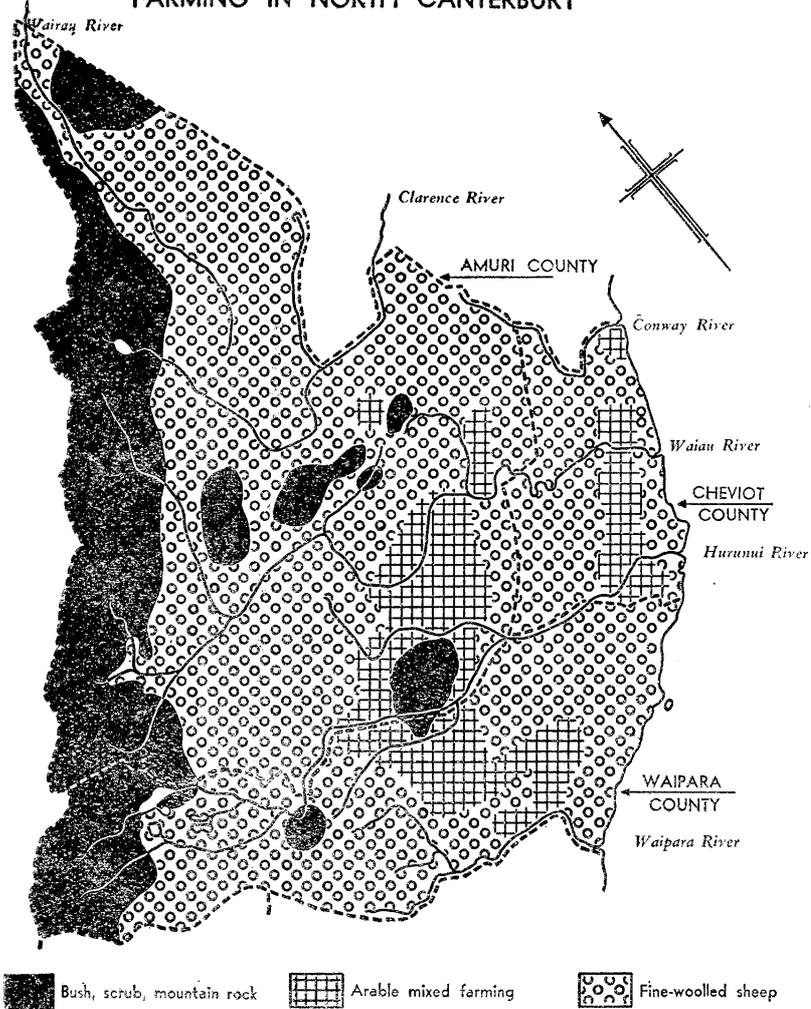


FIG. 6 (XX).—SHEEP-FARMING REGIONS: NORTH CANTERBURY.

FARMING IN FOOTHILLS AREA

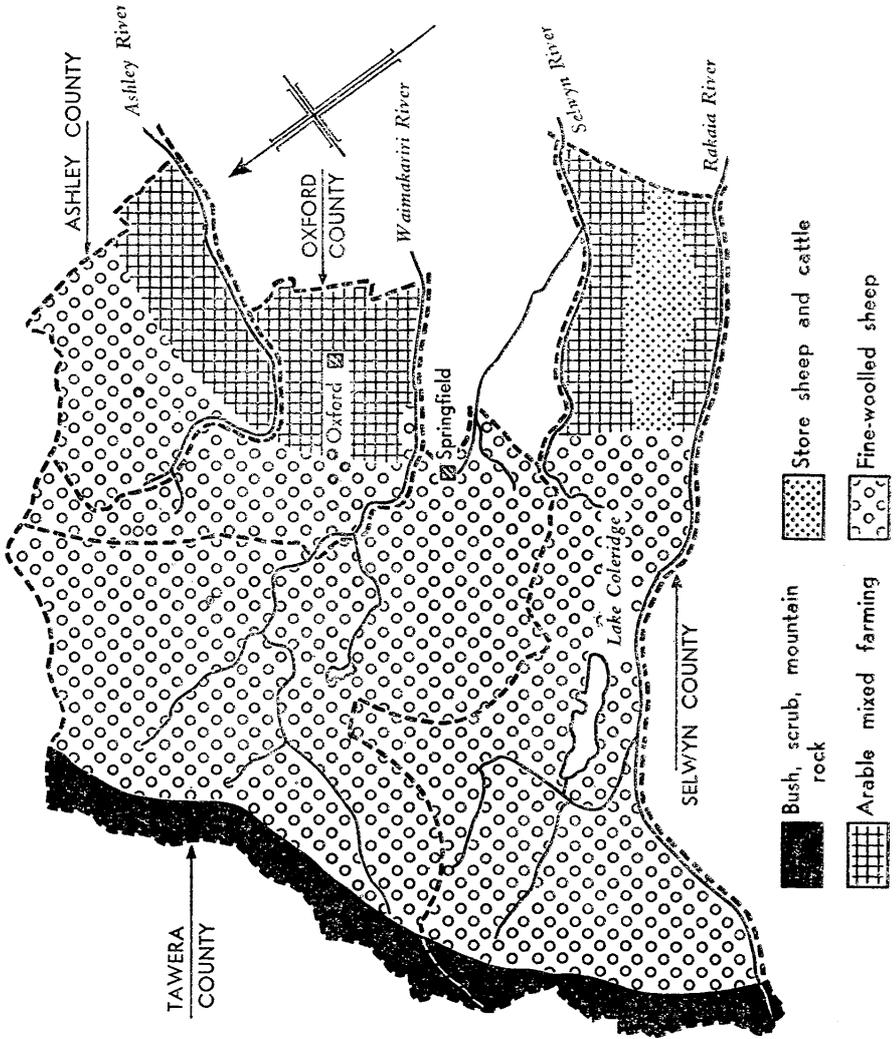


FIG. 6 (xxi).—SHEEP-FARMING REGIONS: FOOTHILLS.

FARMING IN PLAINS AREA

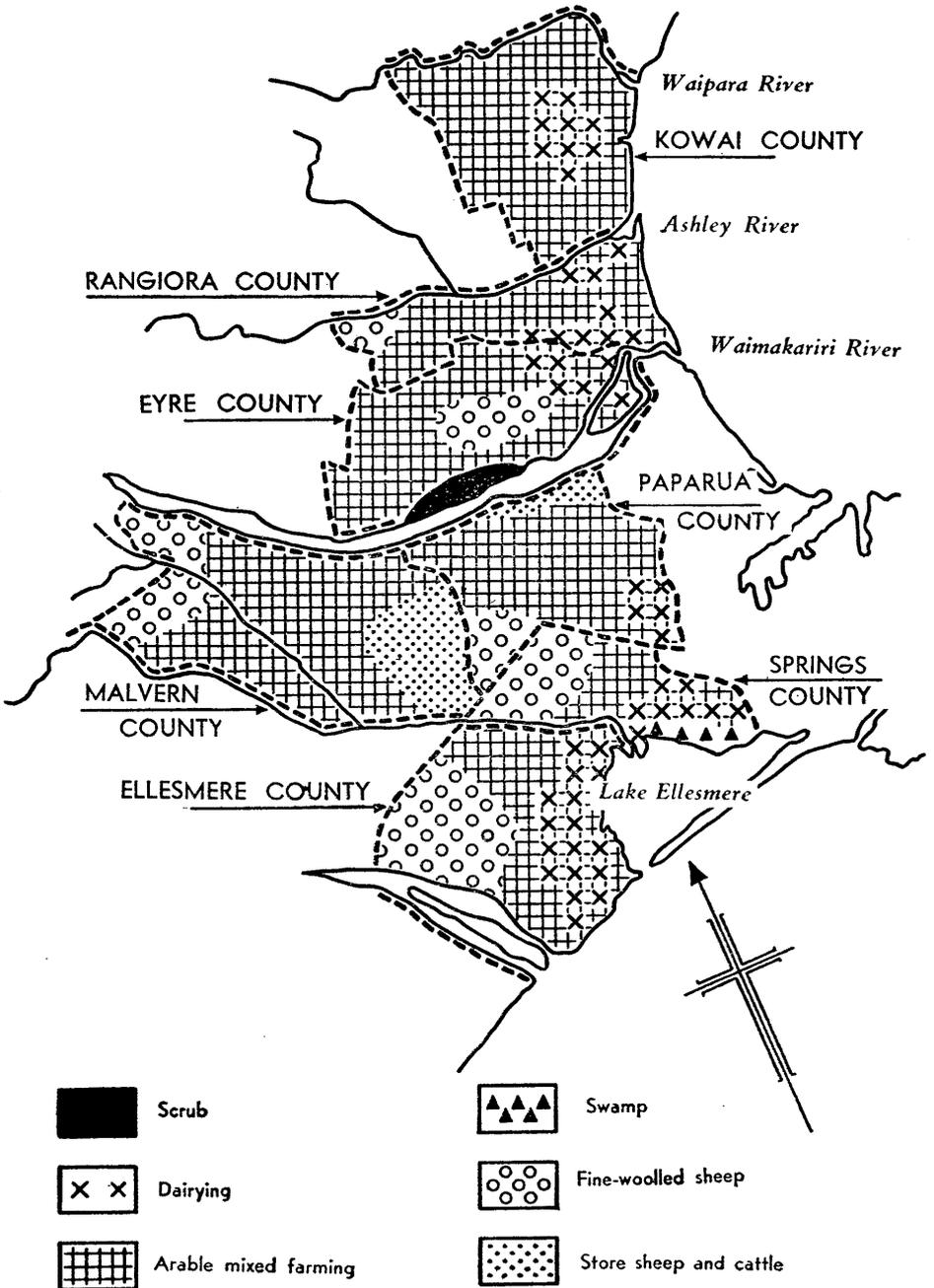


FIG. 6 (xxii).—SHEEP-FARMING REGIONS: PLAINS.

FARMING IN CHRISTCHURCH AREA

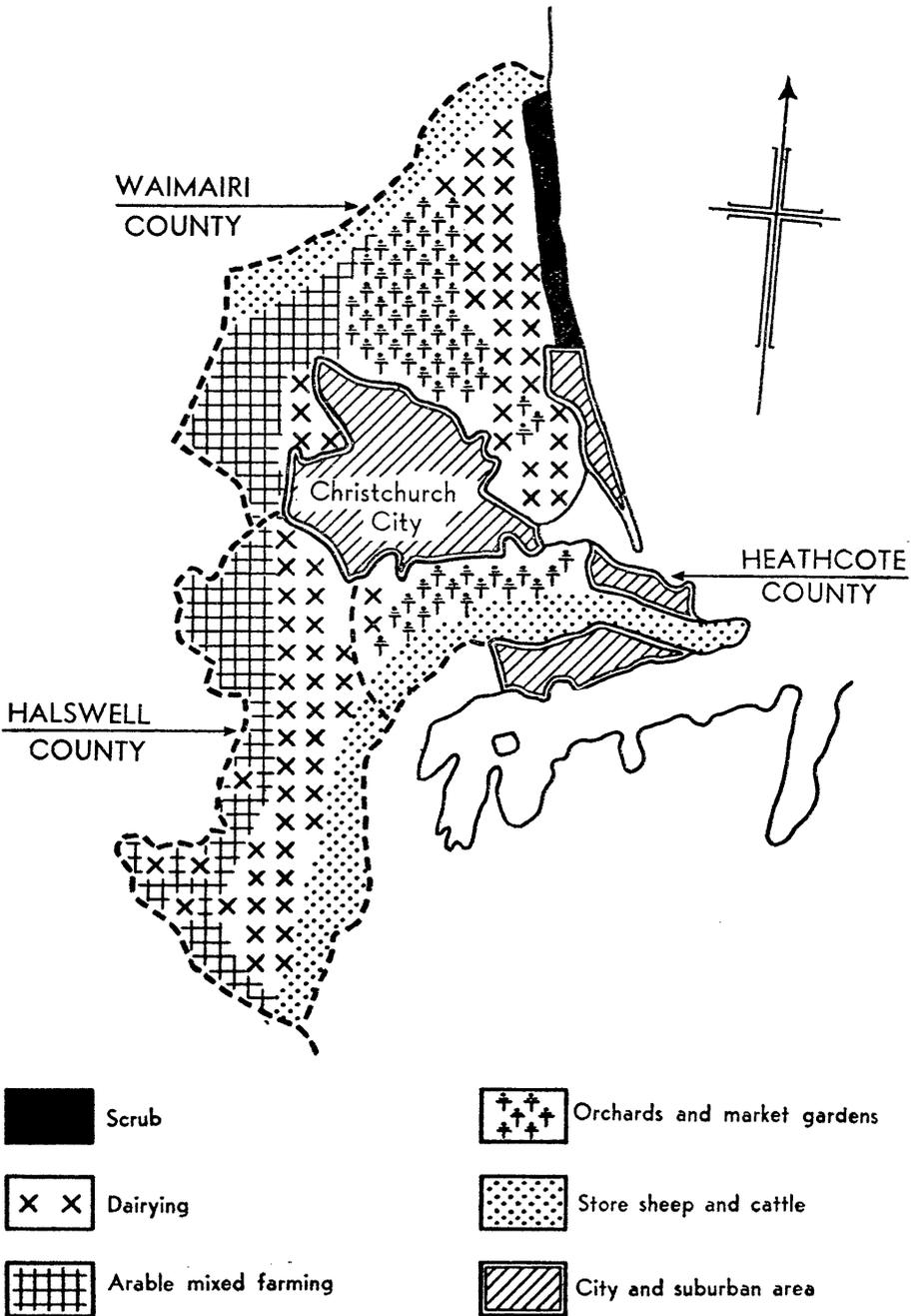


FIG. 6 (xxiii).—SHEEP-FARMING REGIONS: CHRISTCHURCH.

FARMING IN BANKS PENINSULA

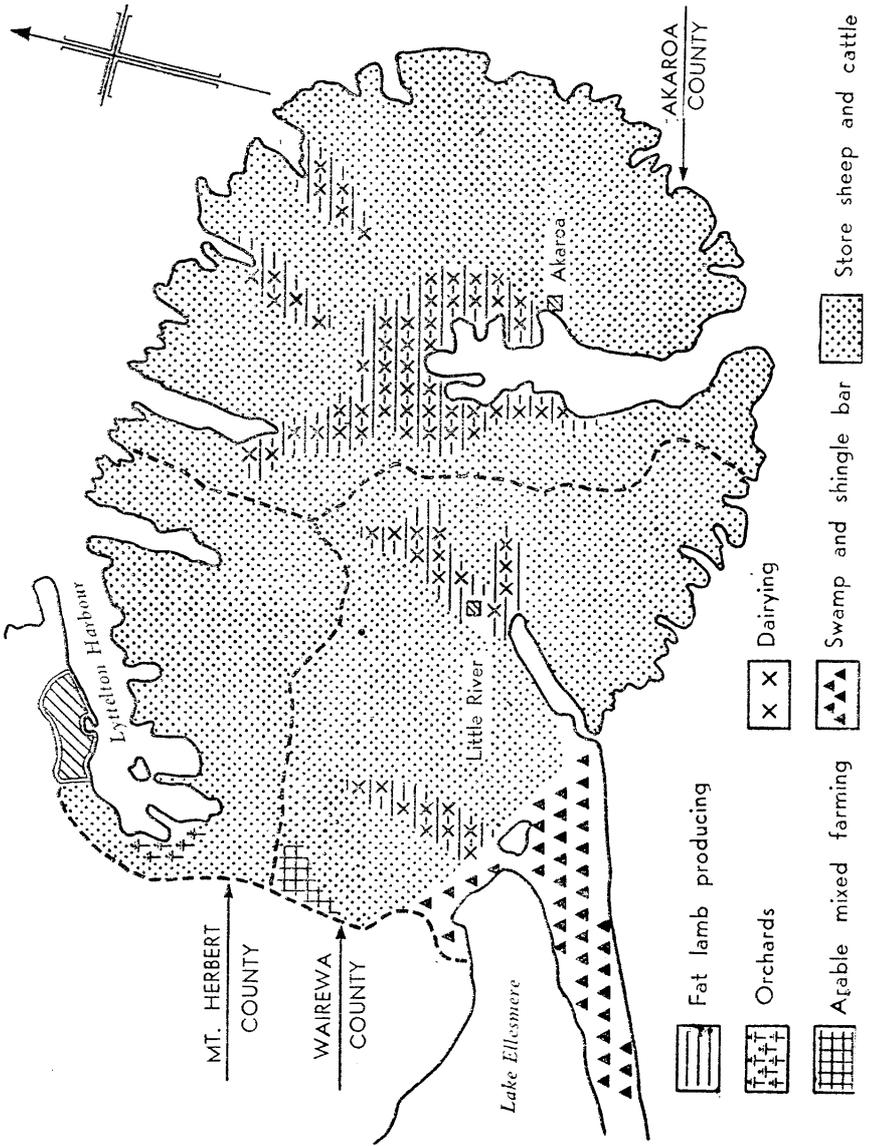


FIG. 6 (xxiv).—SHEEP-FARMING REGIONS: BANKS PENINSULA.

FARMING IN SOUTH CANTERBURY

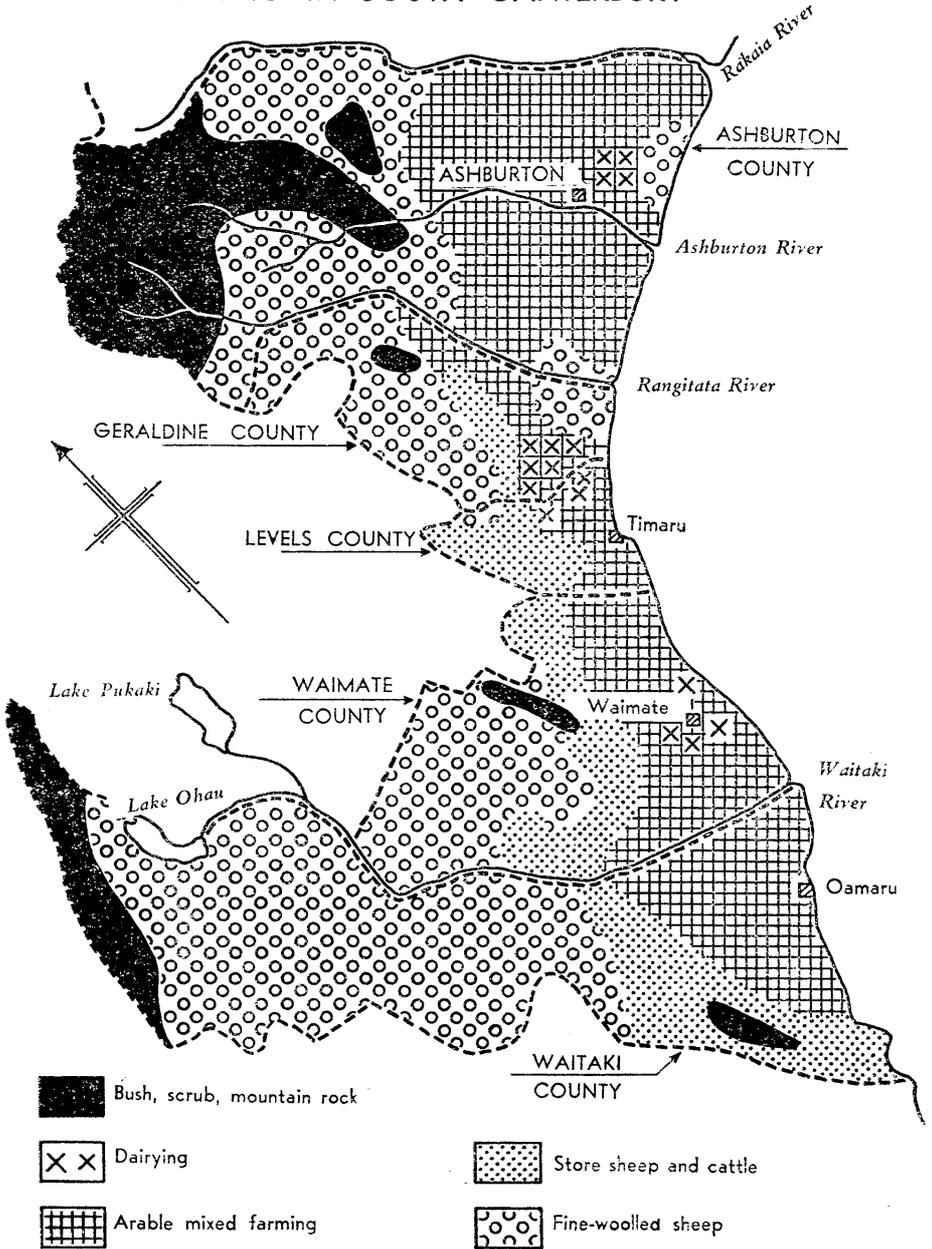


FIG. 6 (xxv).—SHEEP-FARMING REGIONS: SOUTH CANTERBURY.

FARMING IN MACKENZIE

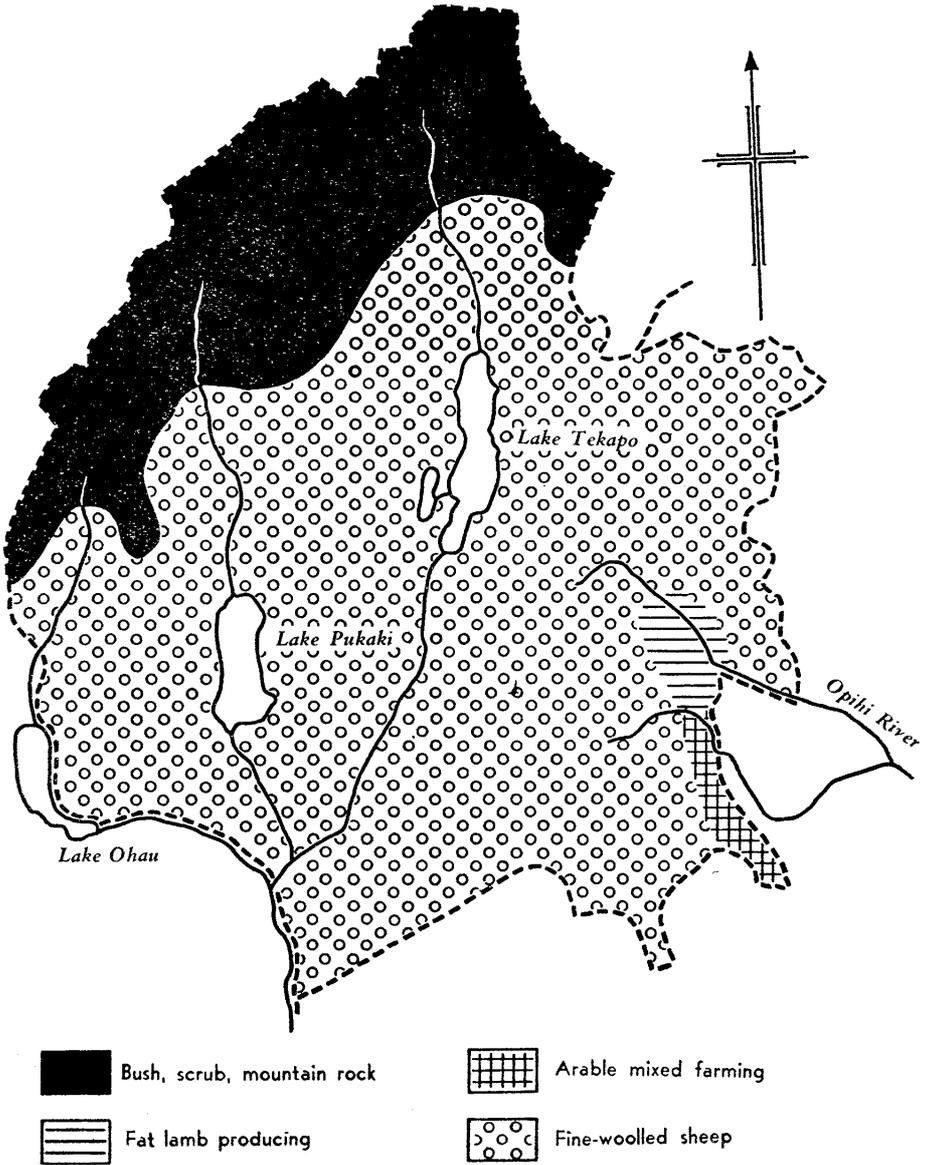


FIG. 6 (xvii).—SHEEP-FARMING REGIONS: MACKENZIE.

FARMING IN OTAGO

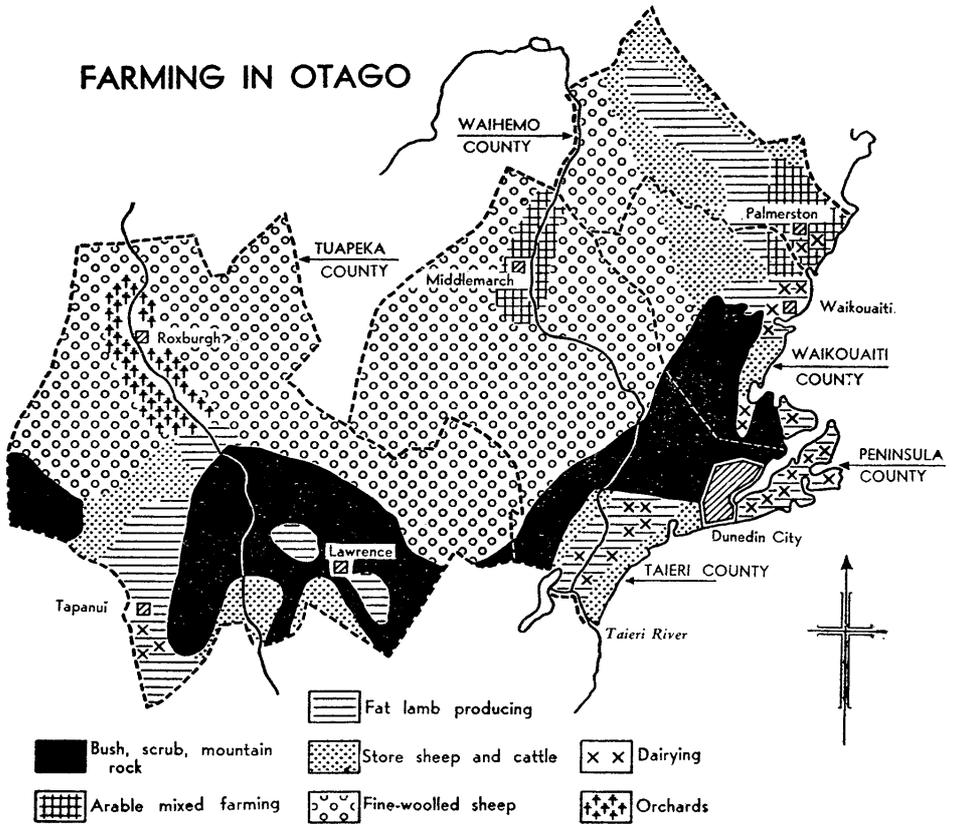


FIG. 6 (xxvii).—SHEEP-FARMING REGIONS: OTAGO.

FARMING IN CENTRAL OTAGO

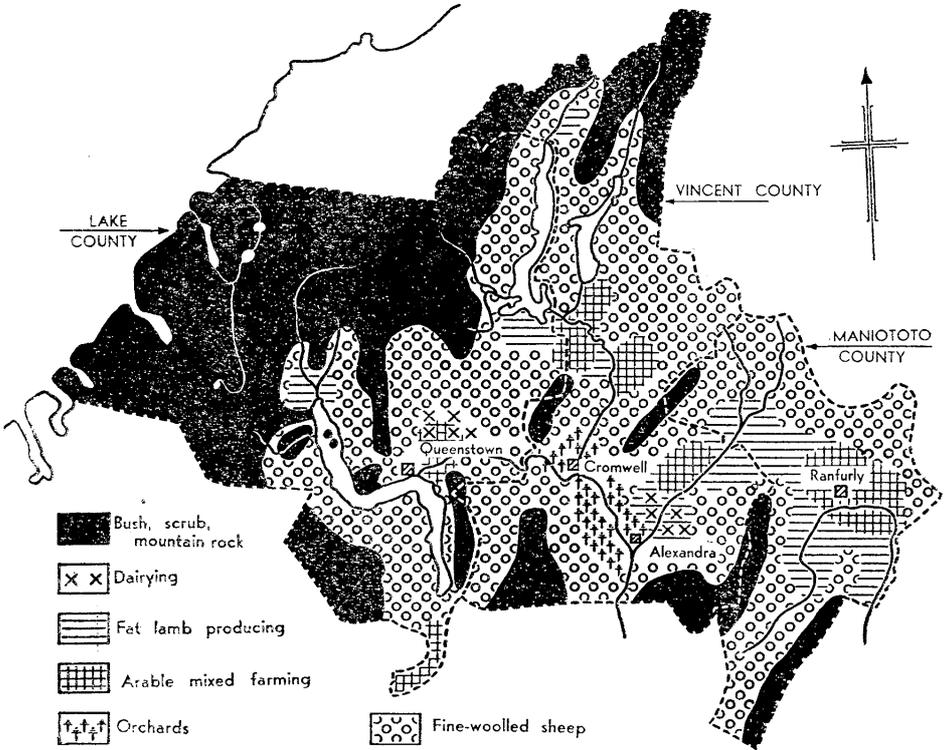


FIG. 6 (xxviii).—SHEEP-FARMING REGIONS: CENTRAL OTAGO.

FARMING IN SOUTHERN AREA

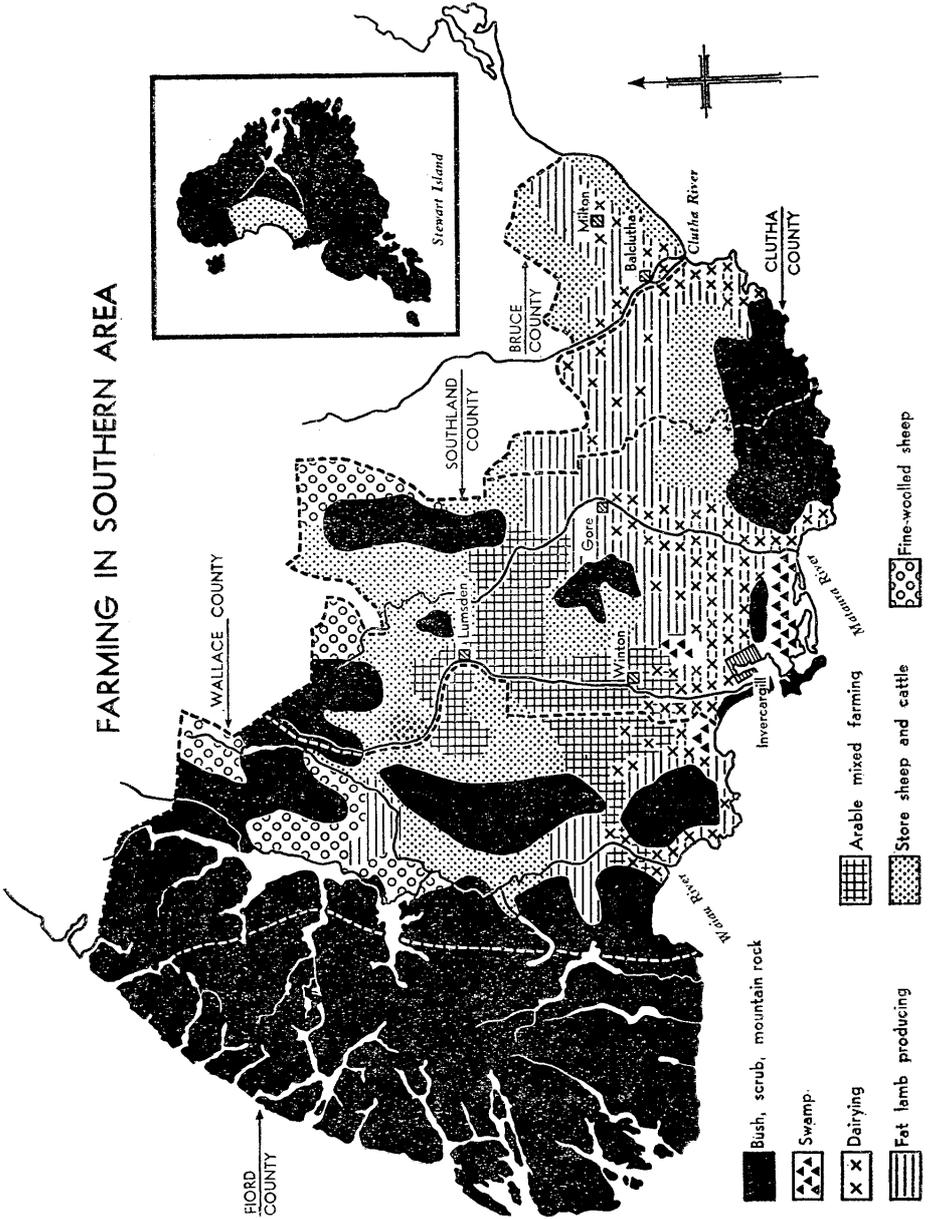
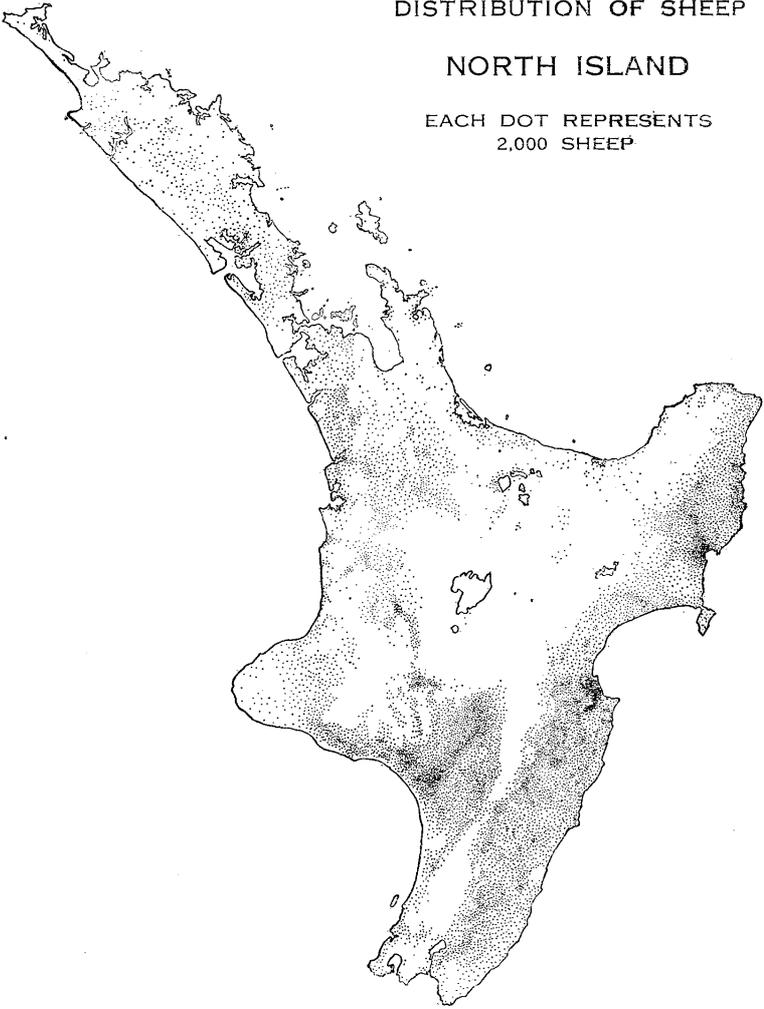


FIG. 6 (XXIX).—SHEEP-FARMING REGIONS: SOUTHERN.

DISTRIBUTION OF SHEEP

NORTH ISLAND

EACH DOT REPRESENTS
2,000 SHEEP



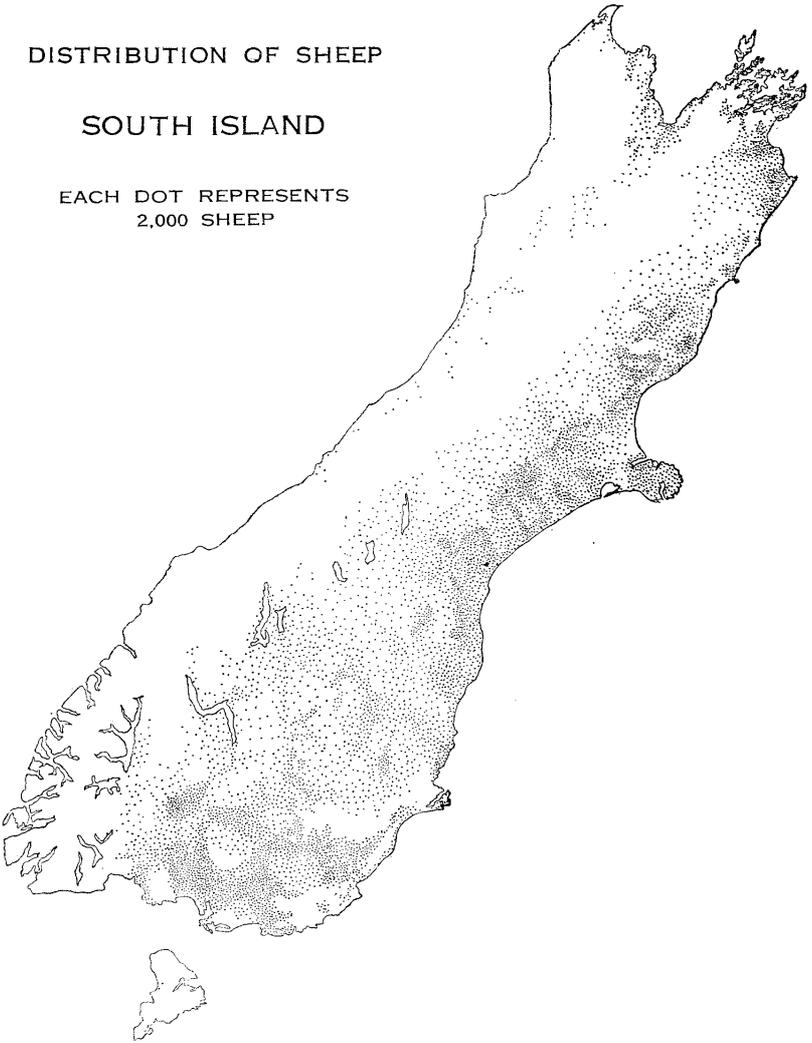
*Map prepared by Dr. W. M. Hamilton,
Department of Scientific and Industrial
Research.*

FIG. 7 (i).—DISTRIBUTION OF SHEEP: NORTH ISLAND.

DISTRIBUTION OF SHEEP

SOUTH ISLAND

EACH DOT REPRESENTS
2,000 SHEEP

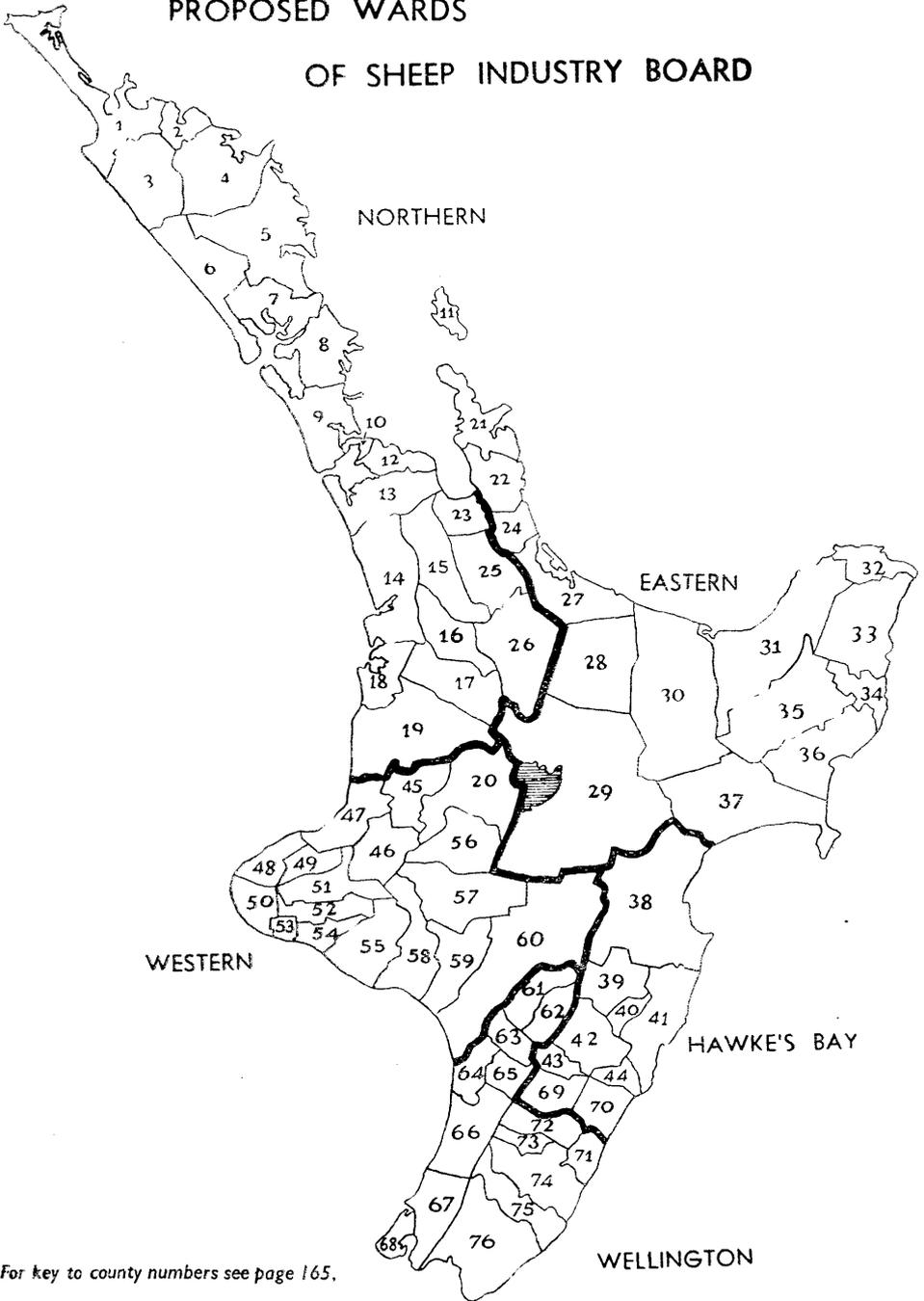


*Map prepared by Dr. W. M. Hamilton,
Department of Scientific and Industrial
Research.*

FIG. 7 (ii).—DISTRIBUTION OF SHEEP: SOUTH ISLAND.

PROPOSED WARDS

OF SHEEP INDUSTRY BOARD

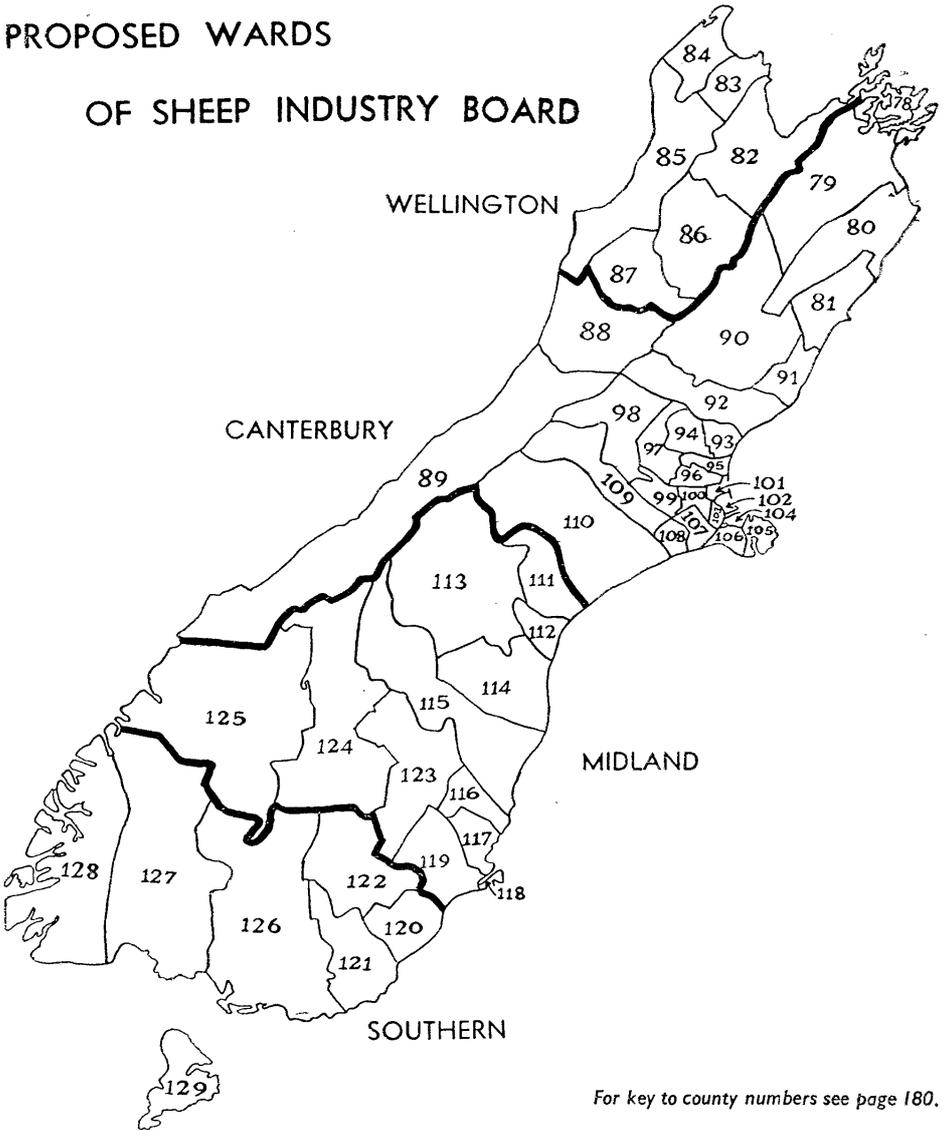


For key to county numbers see page 165.

FIG. 8 (i).—PROPOSED WARDS OF SHEEP INDUSTRY BOARD: NORTH ISLAND.

PROPOSED WARDS

OF SHEEP INDUSTRY BOARD



For key to county numbers see page 180.

FIG. 8 (ii).—PROPOSED WARDS OF SHEEP INDUSTRY BOARD: SOUTH ISLAND.

ORIGINAL LAND COVER
NORTH ISLAND

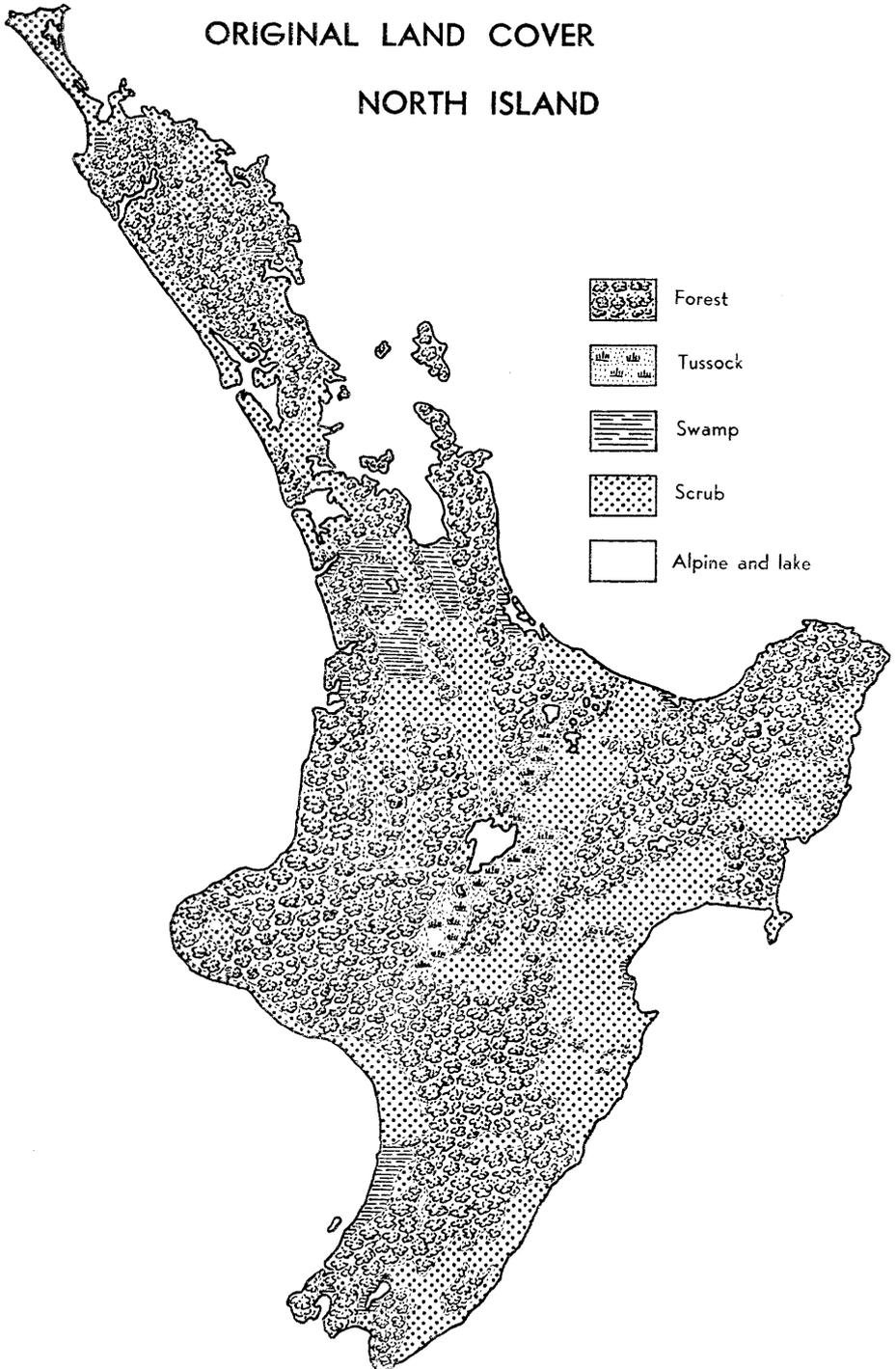


FIG. 9 (i).—ORIGINAL LAND COVER: NORTH ISLAND.

ORIGINAL LAND COVER
SOUTH ISLAND

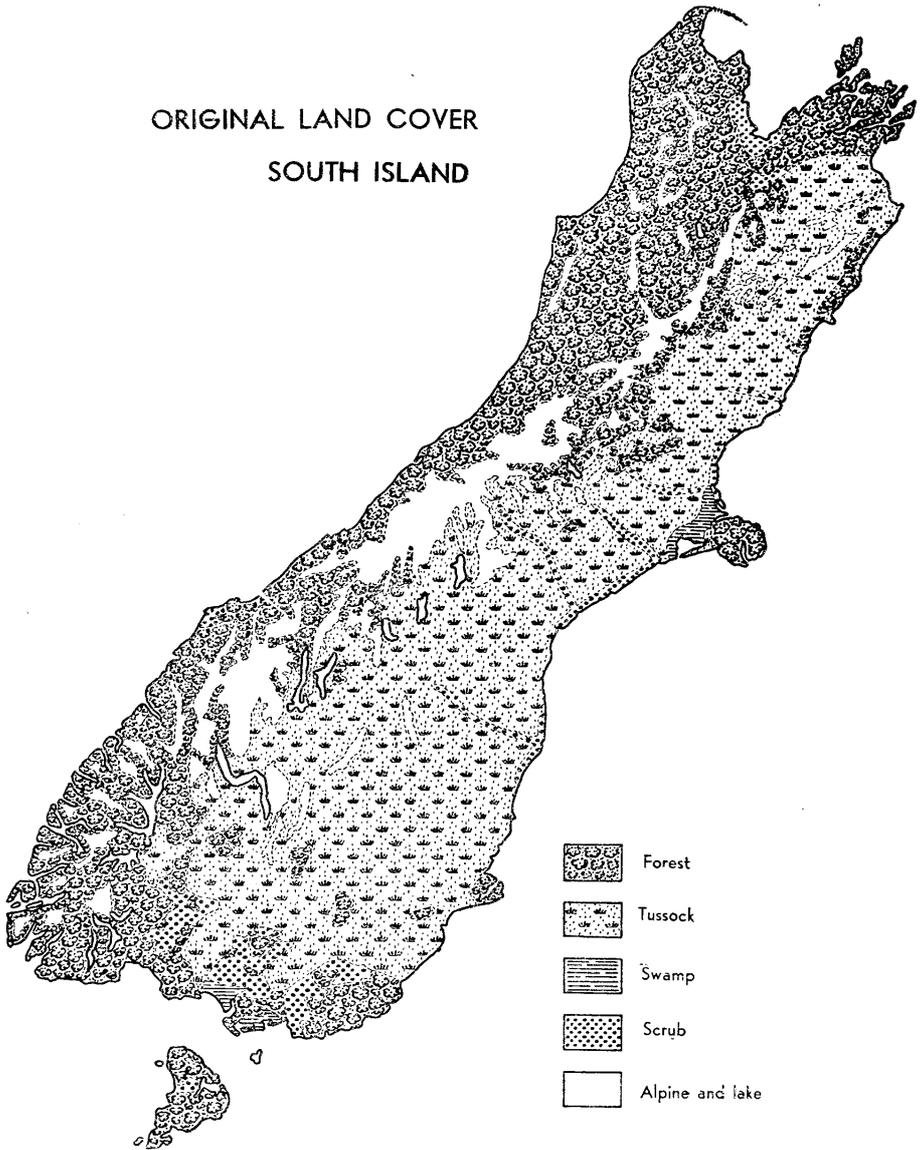


FIG. 9 (ii).—ORIGINAL LAND COVER: SOUTH ISLAND.

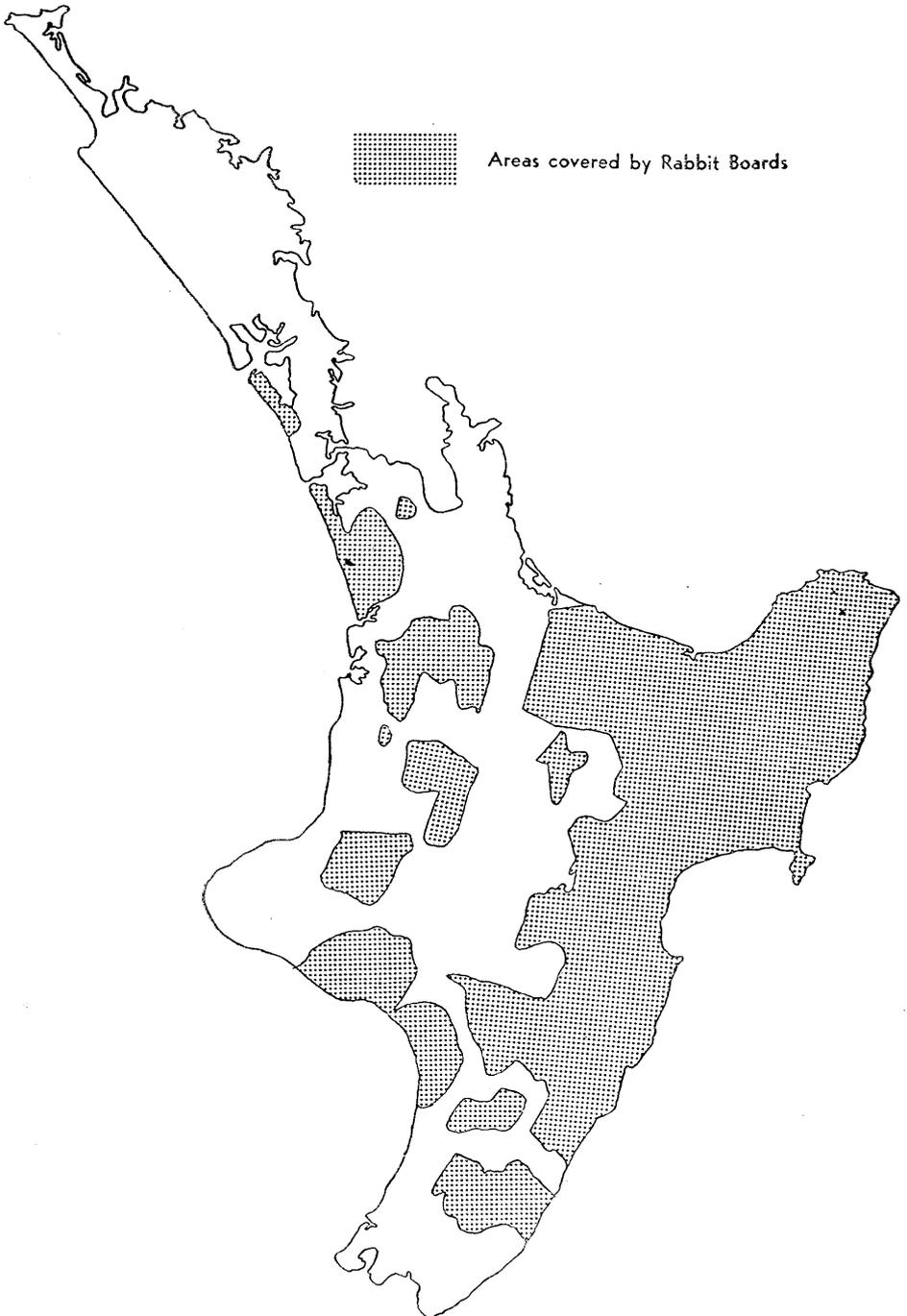


FIG. 10 (i).—RABBIT BOARD DISTRICTS : NORTH ISLAND.

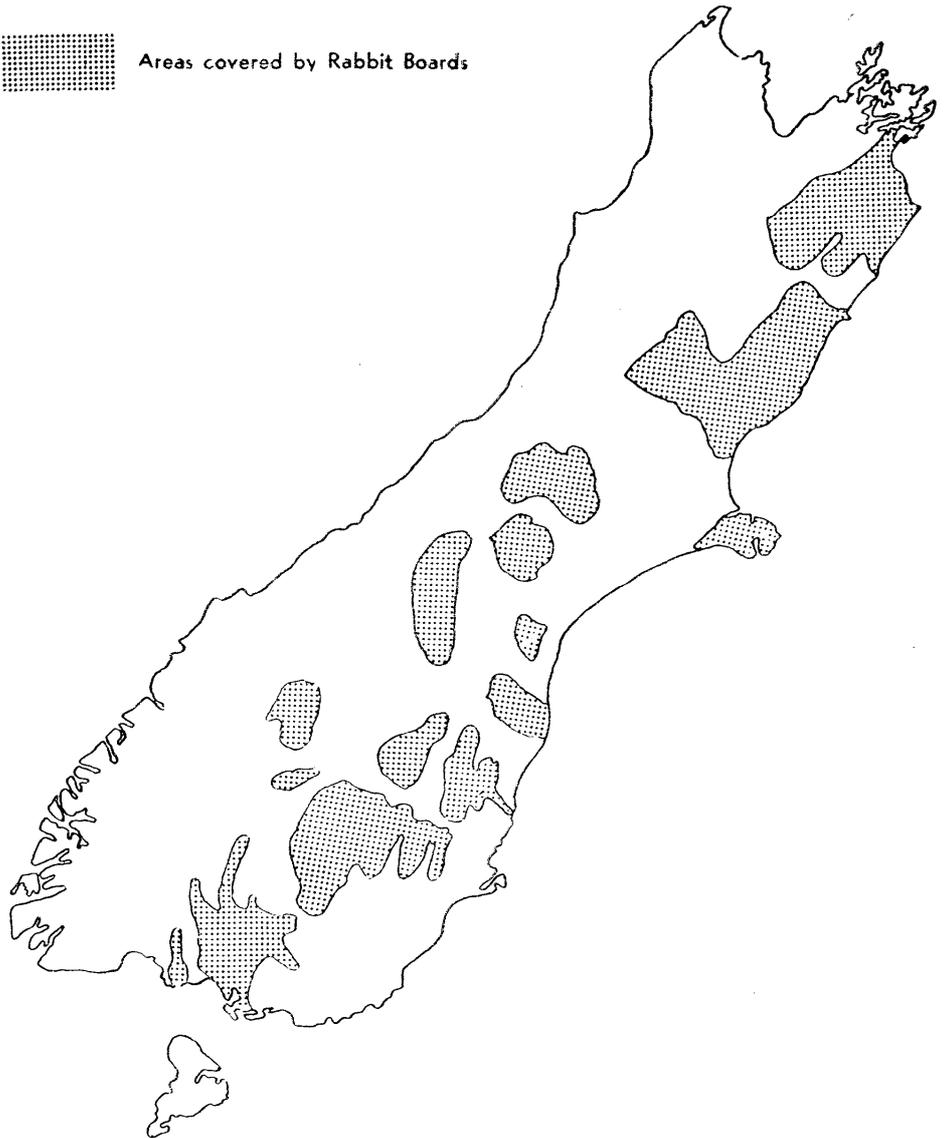


FIG. 10 (ii).—RABBIT BOARD DISTRICTS: SOUTH ISLAND.

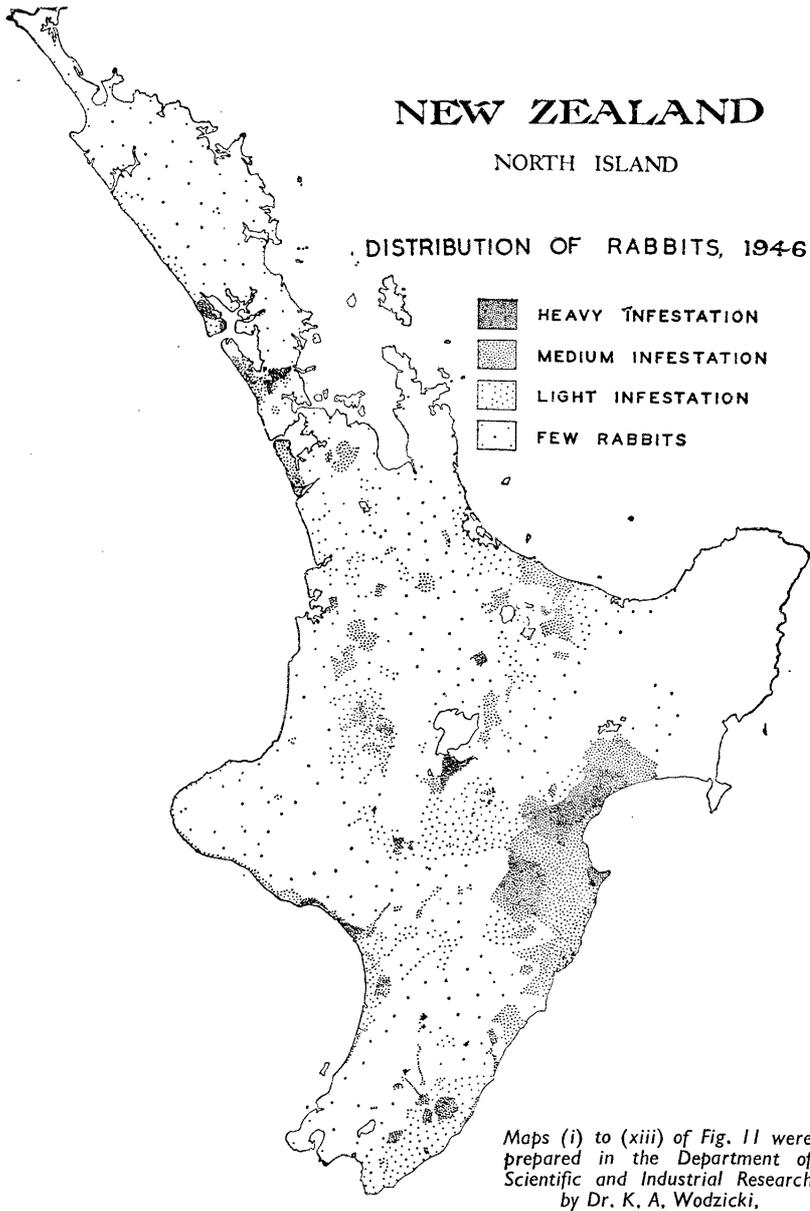


FIG. 11 (i).—DISTRIBUTION OF PESTS : RABBITS, NORTH ISLAND.

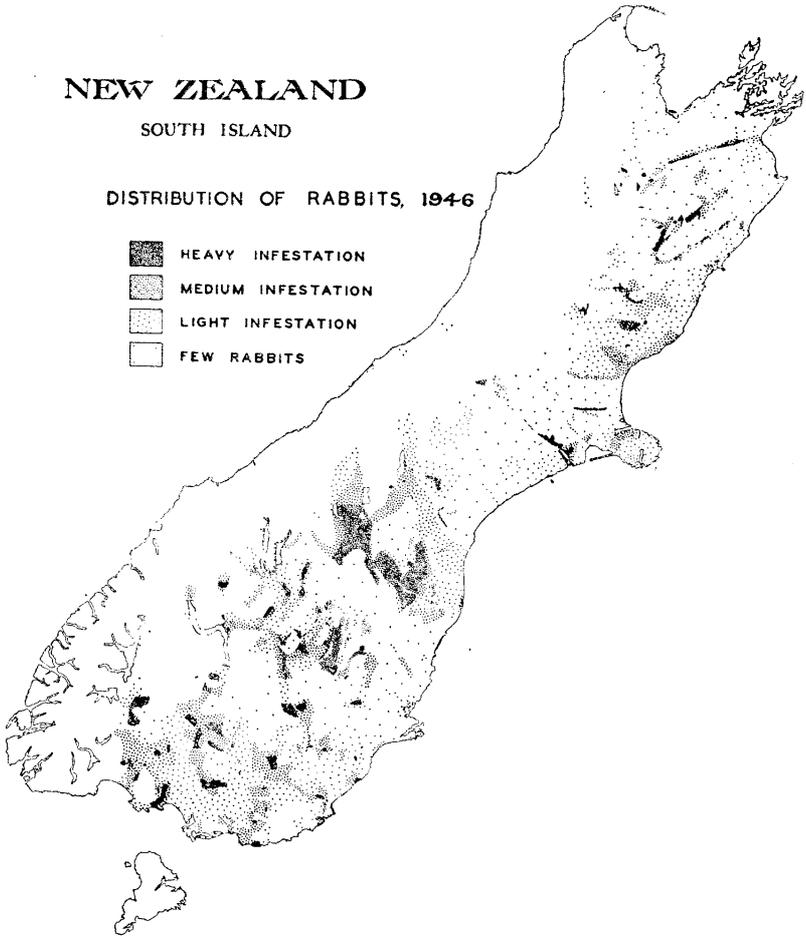


FIG. 11 (ii).—DISTRIBUTION OF PESTS : RABBITS, SOUTH ISLAND.

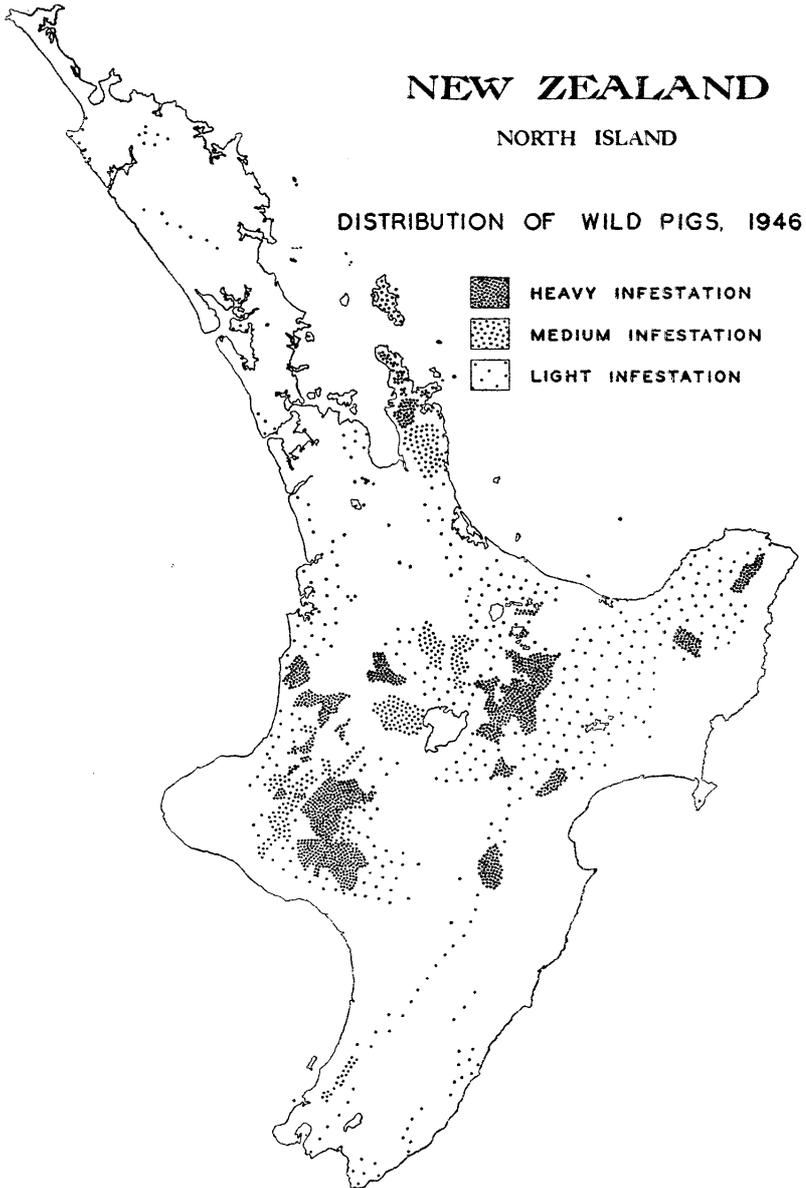


FIG. 11 (iii).—DISTRIBUTION OF PESTS : PIGS, NORTH ISLAND.

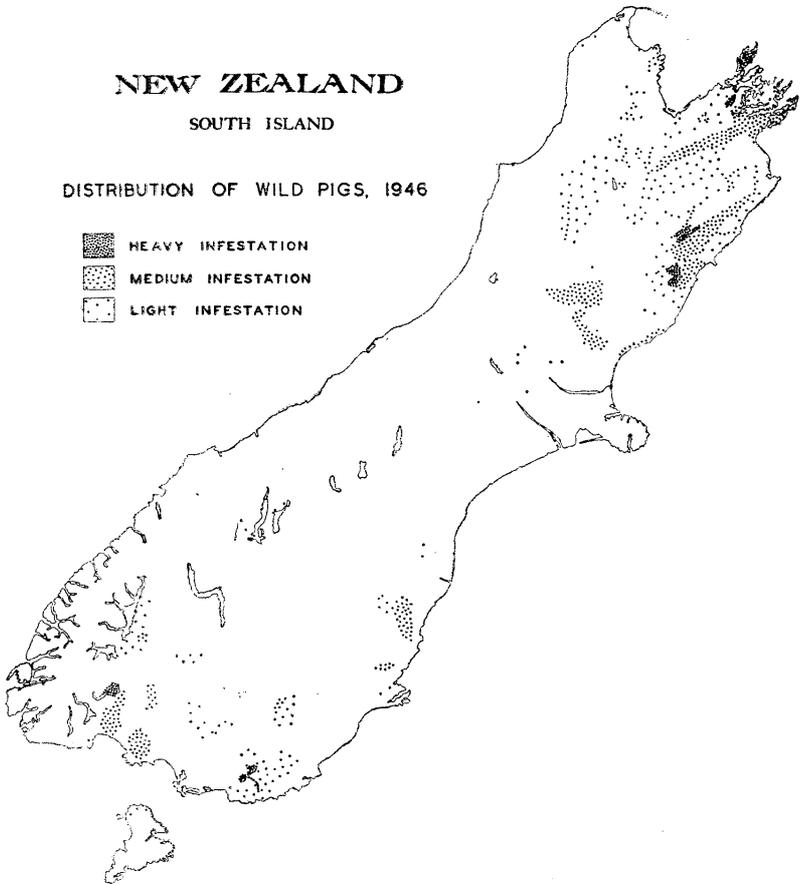


FIG. 11 (iv).—DISTRIBUTION OF PESTS: PIGS, SOUTH ISLAND.

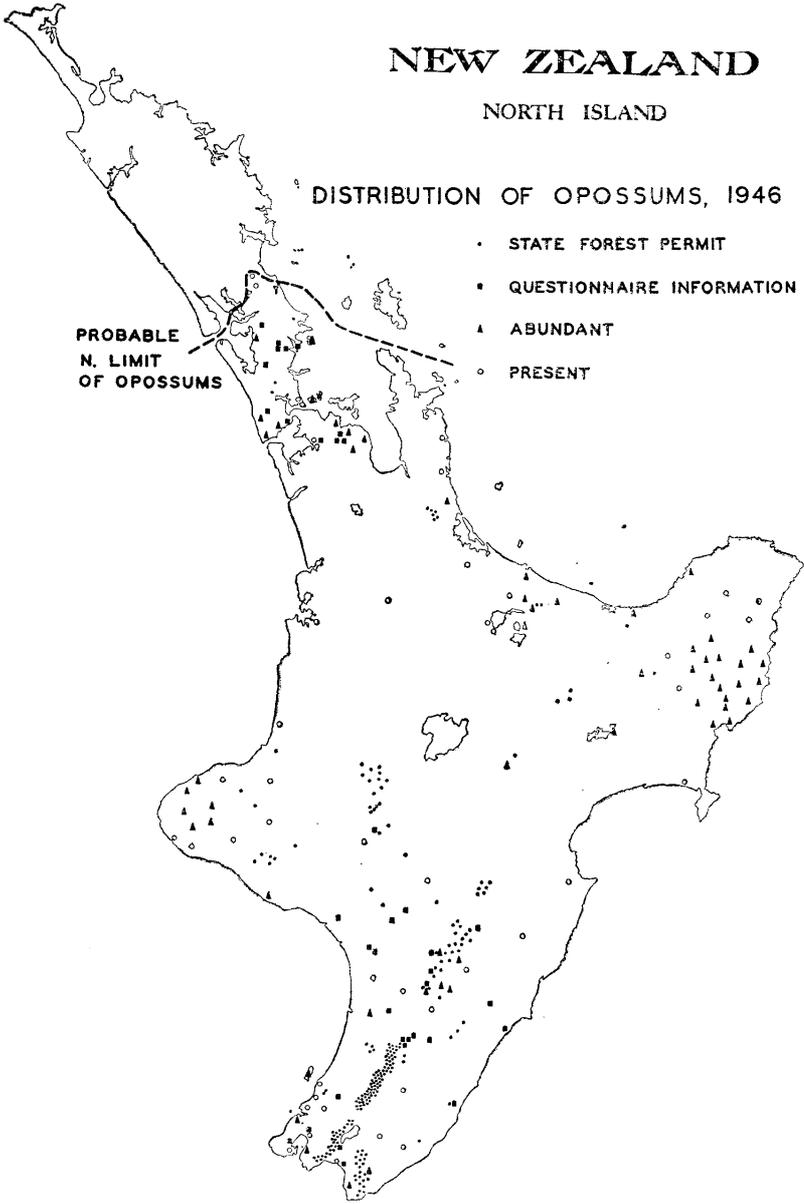


FIG. 11 (v).—DISTRIBUTION OF PESTS : OPOSSUMS, NORTH ISLAND.

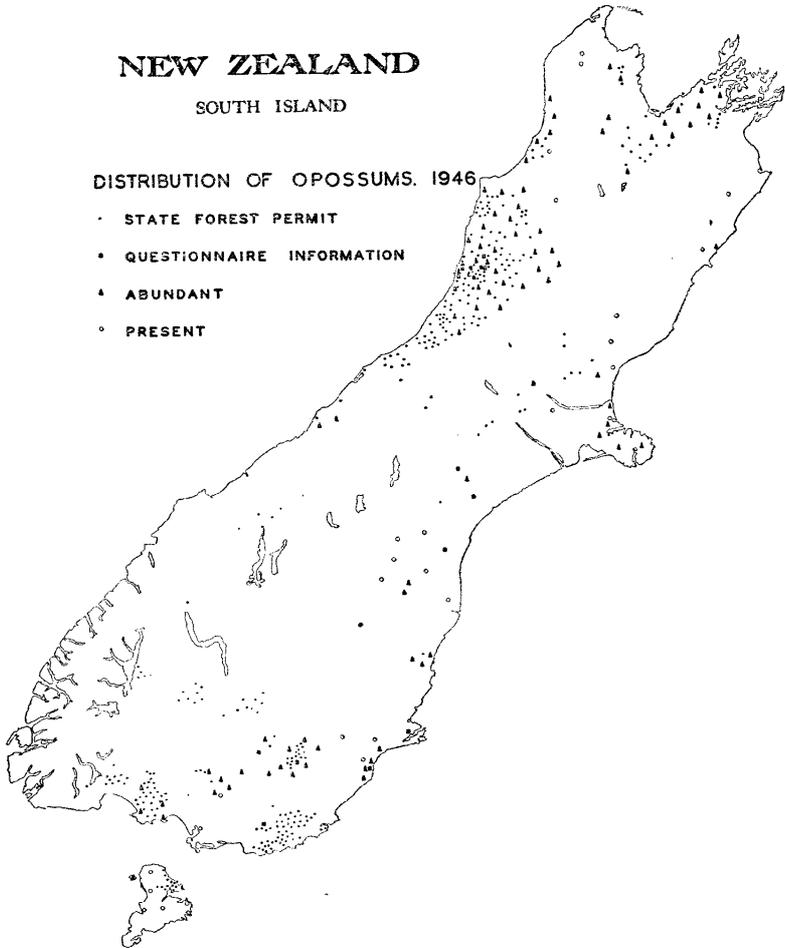


FIG. 11 (vi).—DISTRIBUTION OF PESTS: OPOSSUMS, SOUTH ISLAND.

NEW ZEALAND

NORTH ISLAND, 1946

DISTRIBUTION AND LIBERATION OF

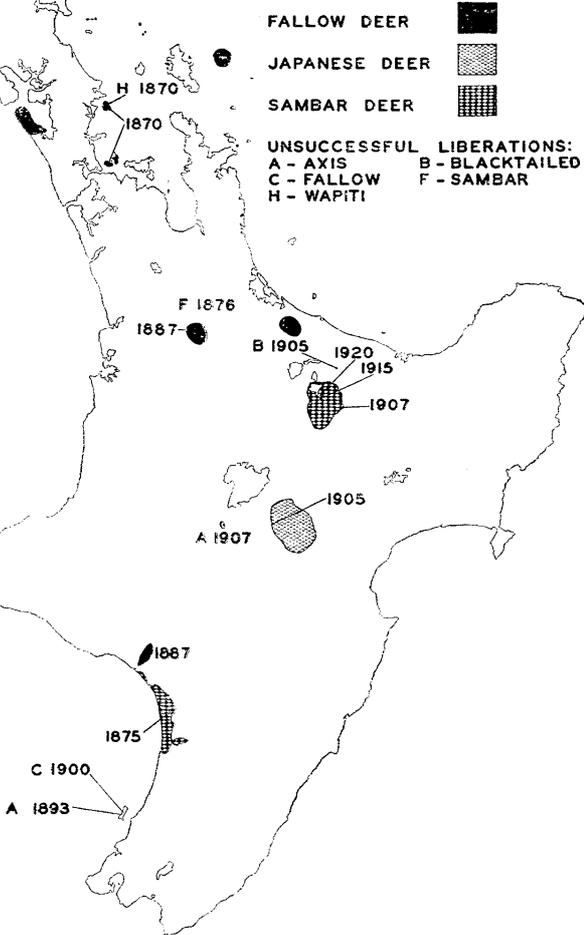


FIG. 11 (vii).—DISTRIBUTION OF PESTS: LIBERATION OF DEER, NORTH ISLAND.

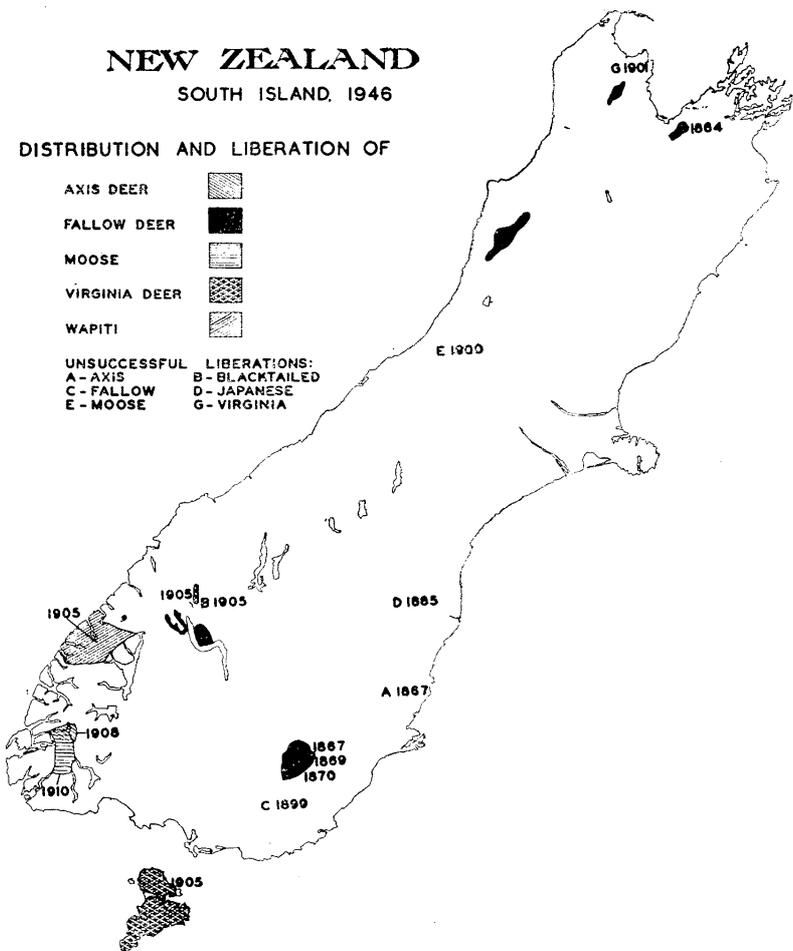


FIG. 11 (viii).—DISTRIBUTION OF PESIS: LIBERATION OF DEER, SOUTH ISLAND.

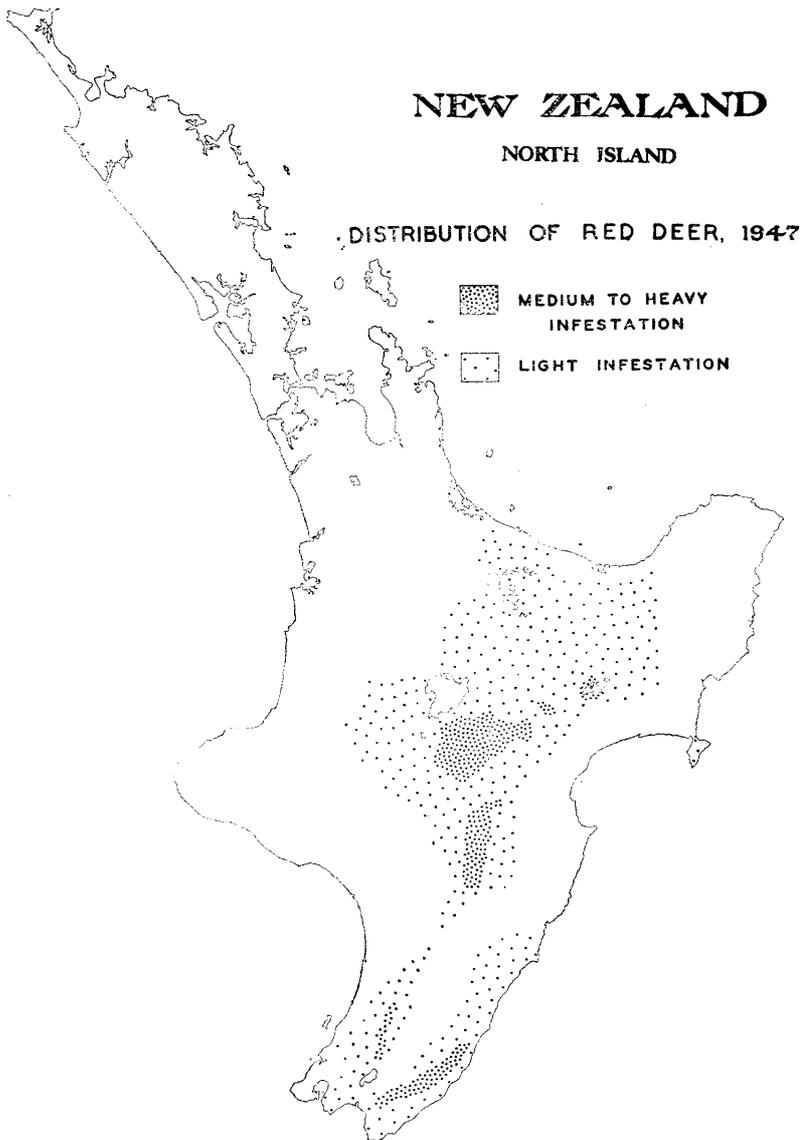


FIG. 11 (ix).—DISTRIBUTION OF PESTS : DISTRIBUTION OF DEER, NORTH ISLAND.

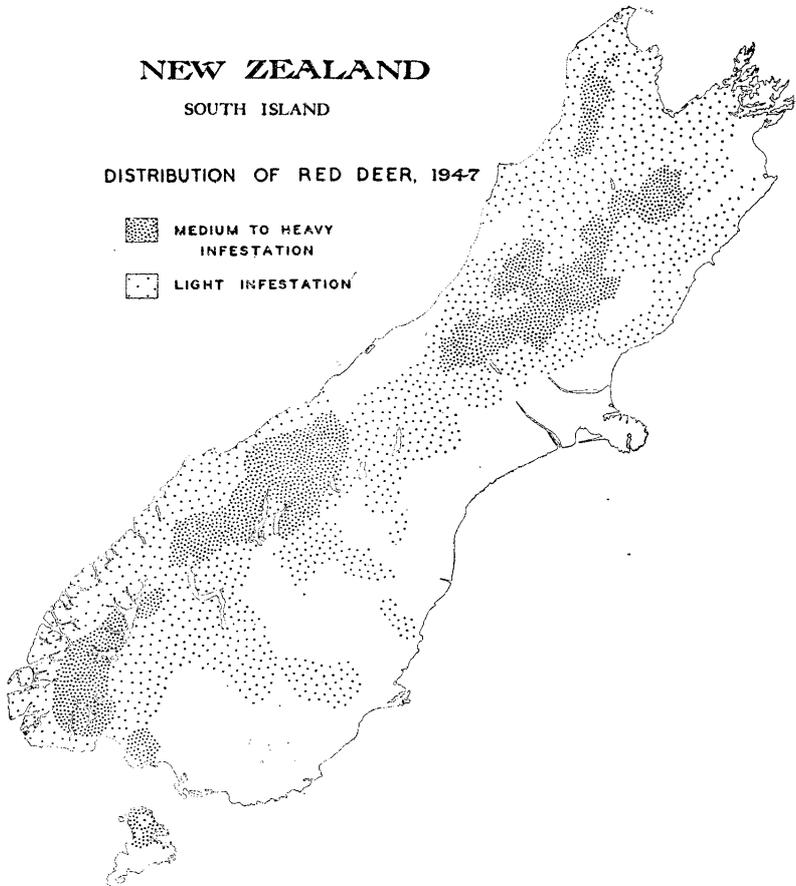


FIG. 11 (x).—DISTRIBUTION OF PESTS: DISTRIBUTION OF DEER, SOUTH ISLAND.

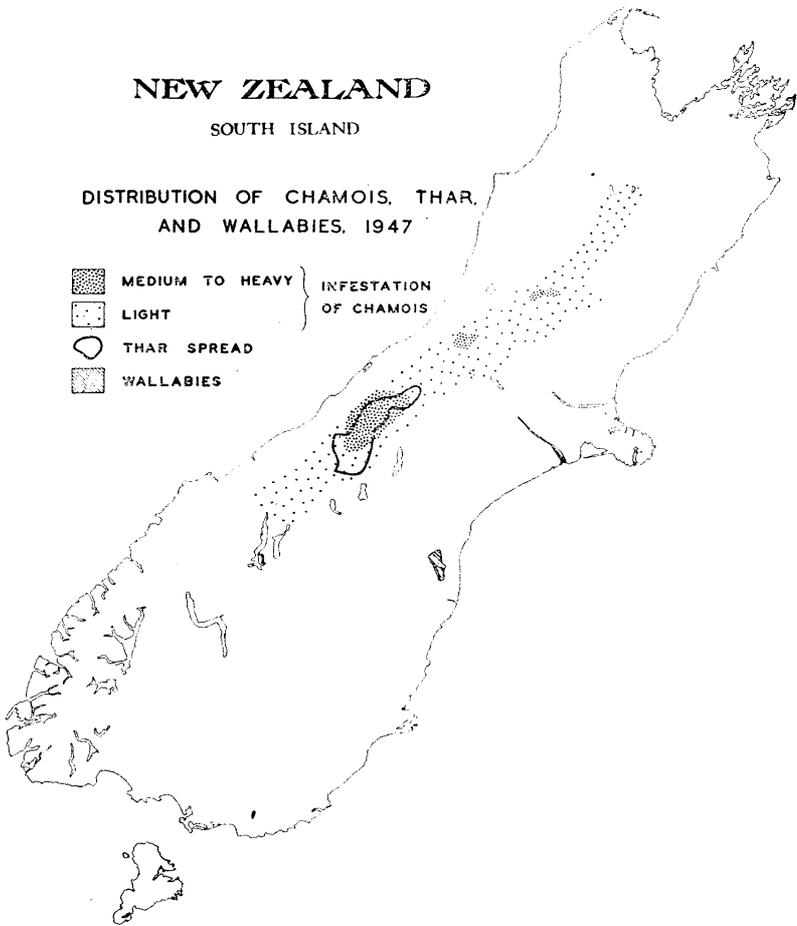


FIG. 11 (xi).—DISTRIBUTION OF PESTS: DISTRIBUTION OF CHAMOIS, THAR, WALLABIES.

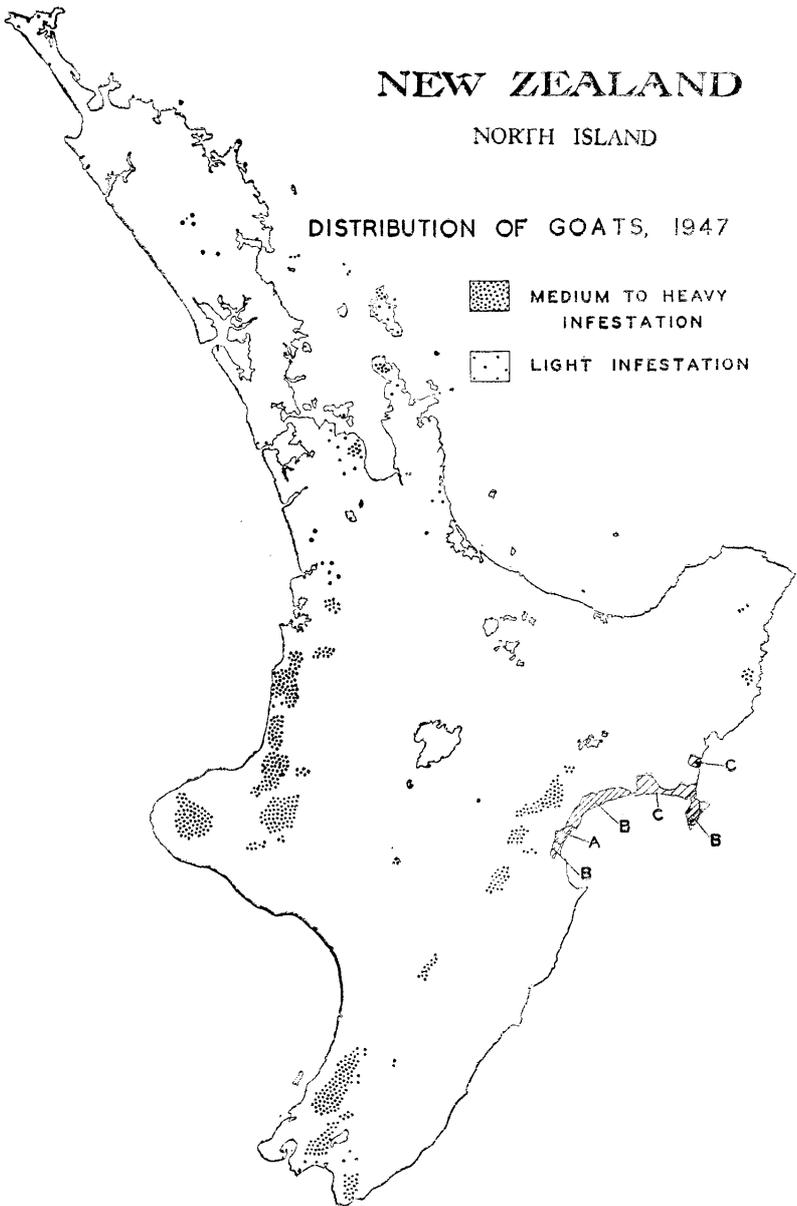


FIG. 11 (xii).—DISTRIBUTION OF PESTS : DISTRIBUTION OF GOATS, NORTH ISLAND.

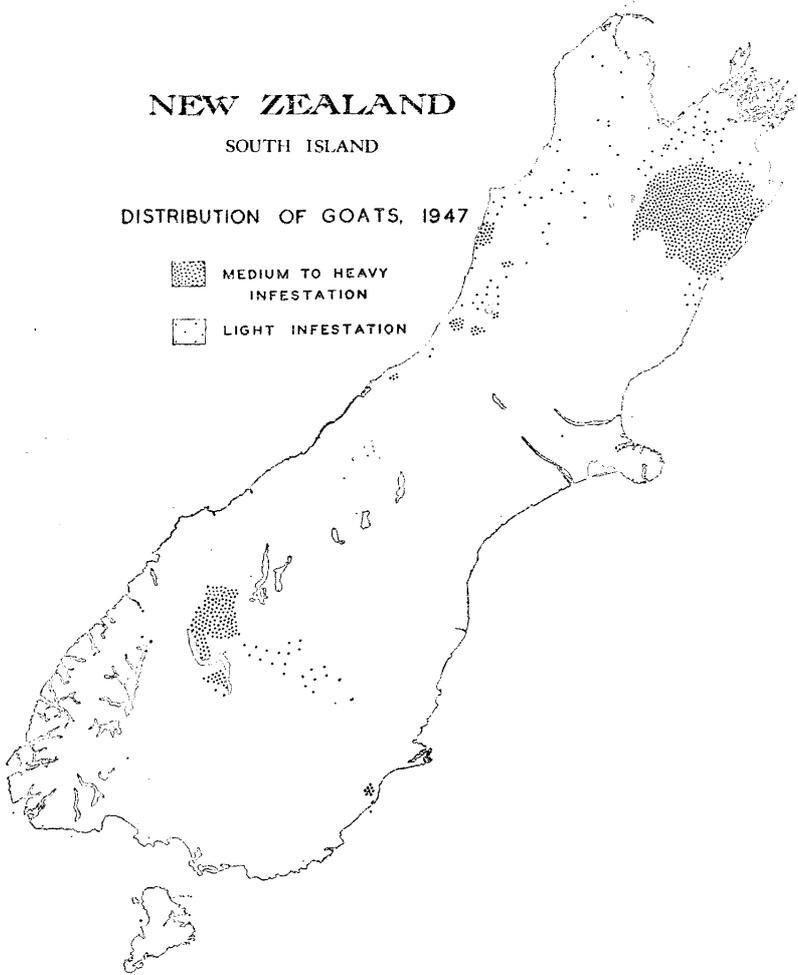


FIG. 11 (xi' i).—DISTRIBUTION OF PESTS : DISTRIBUTION OF GOATS, SOUTH ISLAND.

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