In the past the increase in population in New Zealand has followed fairly closely increased primary production, and if for security or other reasons the development of a population two or three times as great as at present is desired, it is only logical to assume that the volume of primary production must be increased in similar proportions.

At present about 30 per cent. of total meat production, 20 per cent. of butter production, and 5 per cent. of cheese production are consumed in the country, and half the wheat requirement is imported. With three times the present population only a small volume of food exports would be available to exchange for necessary imports unless the production of primary products kept pace with the increased population.

There is no doubt that the Dominion's lands are capable of giving ultimately twice the present flow of food, fibre, and forest products, provided fertility building is widened to embrace gradually all the potentially-productive lands in the Dominion.

Land Under Occupation

New Zealand is a pastoral country. Of the 43 million acres under occupation, about 31¾ million acres consist of pasture lands of various types and only a little more than 1 million acres grow annual crops, of which about half are cereals and half fodder crops. The detailed classification of occupied land as at January 31, 1947, given in the following table excludes areas within cities and boroughs and holdings smaller than 1 acre:—

LAND UNDER OCCUPATION, 1946-47
(thousands of acres)

Sown pastures	18,077
Tussock grassland	13,827
Annual crops	921
Fallow land	124
Orchards and gardens	113
Plantations	870
Phormium tenax	34
Fern, scrub, and forest	7,425
Barren and unproductive	1,709
Total area occupied	43,100

Sown pastures consist of land sown to grass after being ploughed or after being surface sown following the burning of natural forest, fern, or scrub. Though no recent data are available of the areas sown by each method surface-sown pastures probably cover 10 million acres and pastures on cultivated land 8 million acres.

The pastures sown after ploughing are used chiefly for meat and milk production and are on flat and undulating land. In the higher-rainfall districts the pastures are permanent or long rotation and in the lower-rainfall areas short rotation. A feature of these pastures is that the swards generally consist of a mixture of grasses and clovers, and the clovers are essentially the fertility-building constituent. Where ploughable lands in the higher-rainfall areas are not naturally fertile enough to grow clovers the custom has been to top-dress with fertilisers, lime, or both to raise the fertility to clover level, thus providing for the subsequent rewards of clover fertility in increased carrying capacity.

The surface-sown pastures, on the other hand, are generally deficient in clovers and most of the area is devoted to the production of wool and of store and breeding stock which are transferred to the flat and undulating lands for meat production. However, where the land is naturally fertile or has increased in fertility through being topdressed the pastures consist of a mixture of grasses and annual or perennial clovers and fat as well as store stock are produced from them. Situated generally on steep and hilly land, these surface-sown pasture lands have suffered from sheet and slip erosion over fairly large areas, and gully erosion is a problem on certain restricted areas. In the high-rainfall areas the tendency for the land to revert to secondary growth is strong, and a constant struggle must be maintained to suppress it by grazing management, cutting and burning, and resowing to grass.

The pastures of tussock and other native grasses are on the hilly and mountainous country in the lower-rainfall areas east of the main divide in the South Island and are used for extensive pastoral farming. These pastures evolved in the absence of grazing animals and in the natural state were not particularly palatable to sheep. However, the grazier found that the fresh growth which followed the burning of the tussocks was eaten readily by sheep, and in the earlier years of settlement indiscriminate burning, overstocking, and the destruction of plant cover by rabbits led to serious deterioration and in places to depletion of vegetation. The development of methods for the improvement of the plant cover and regeneration of the native tussock remains a major problem.

The production of field crops is restricted mainly to the flat and undulating land in the lower-rainfall and colder districts where summer or winter fodder crops or both are required to supplement pastures for livestock feeding. The common crop rotations include cereal, pulse, fibre, food, and seed crops, as well as summer and winter fodders. After 2 or 3 years in crop the land is sown to pasture, which may remain down for 3 to 5 years, or longer on heavier soils or in higher-rainfall areas, and while under grass the land regains the fertility lost during the period under crop.

Systems of Farming

The 18 million acres of sown grass, 13¾ million acres of tussock grassland, and ½ million acres of root and green fodder crops support nearly 1¾ million dairy cows in milk and 3 million other cattle as well as 20¾ million breeding ewes. Systems of farming conform to the productivity of the pasture lands and comprise the following types:—

Type of Farming	Products
Very extensive sheep farming	Wool
Extensive sheep farming	Wool and store and breeding stock
Semi-extensive sheep farming	Wool and store and breeding stock, plus a proportion of fat stock
Semi-intensive sheep farming	Wool and fat stock with a proportion of store and breeding stock
Intensive sheep farming (a) Permanent grass (b) Grass and fodder crops (c) Grass and fodder and cash crops	Wool and fat stock
Dairy farming	Whole milk, cream, pig meat, and store and fat cattle

There are, of course, farms which combine more than one type of management. Dairying may be combined with sheep farming, and on a sheep farm intensive pastoral farming may be practised on one section and extensive farming on another.

The general locations of each type are given in the maps on the opposite and following pages. Very extensive sheep farming is carried out on the high mountainous tussock grassland of the South Island and extensive pastoral farming on the lower tussock grassland areas and over the major part of the surface-sown grasslands of the North Island. As pastures improve, fat as well as store and breeding stock are produced, but really-intensive grassland farming is confined mainly to the flat and gently-undulating country. The term arable mixed farming is commonly used where intensive pastoral farming is combined with the production of cash crops.

The sheep farmer usually grazes cattle as well as sheep, particularly on the sown grasslands of the North Island, for cattle are necessary to maintain pastures in a suitable condition for sheep. Surplus summer growth must be eaten down in autumn to keep pastures suitable for sheep, and on hill country cattle are necessary to crush fern and other secondary growth.

The different types of sheep farming are closely integrated: The extensive sheep farmer supplies the breeding ewes, store lambs and wethers, and store cattle to the intensive grazier. The trend during recent decades has been toward a marked improvement in carrying capacity on the intensively-farmed areas and a stationary or declining carrying capacity on the extensively-farmed areas. This tendency is so marked in certain areas that intensive pastoralists have had to turn to breeding at least part of their replacement stock.

Land Classification

A discussion of methods of land improvement is facilitated if land is first classified. Unfortunately, there is no general uniformity in methods of classification because of the diversity of emphasis which classifiers have placed on the physical, social, and economic factors involved in the definition of land classes. For the land improver the most useful classification is one based on the plants which the soil will produce and which may be converted into marketable products. In New Zealand pasture plants are a useful index of fertility and intensity of farming, and of pasture plants clovers are possibly a better index than grasses. The pastoral lands of