INTRODUCTION TO FARMING IN NORTH AUCKLAND PENINSULA

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In Northland, as elsewhere in New Zealand, the Maori was the first tiller of the soil. He used fern roots for food supplemented by produce of the forest and sea, but he also cultivated areas for the kumara, the taro, the gourd, and the yam. Possibly the first reference to Maori agriculture in Northland was made by Captain Cook in December, 1769, when he spoke of 40 to 50 acres of land cultivated and planted with roots on an island in the Bay of Islands as well- as considerable areas of kumaras on the mainland. It was through the action of Cook and other early visitors that the Maori added pork to his diet.

In addition to being the first cultivator of the soil in New Zealand, the Maori was also the first to trade in agricultural produce, particularly in Northland, where he provisioned many ships with pork and kumaras. The early missionaries also had to rely on him for their food supplies until they became established--on-their-new-farms.

MISSION FARMING

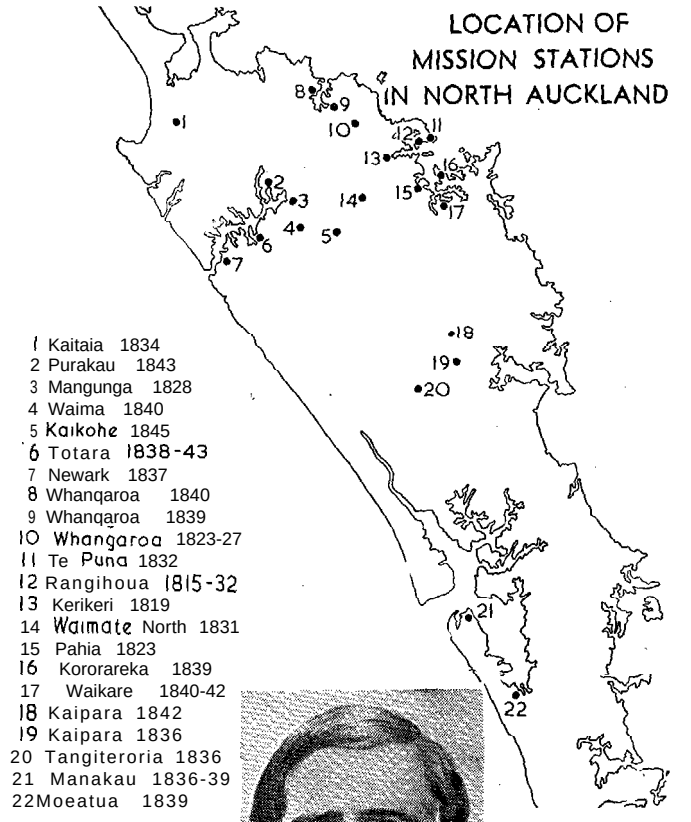
Northland has the distinction of being the cradle of European farming in New Zealand, for it was in the Bay of Islands at Keri Keri in 1819 that a commencement was made to establish the first mission farm, with the Rev. Samuel Marsden the driving force behind it. Besides his work as a chaplain and missionary, Marsden was a successful farmer at Parramatta, New South Wales, and he made sure that the missionaries sent out by the Church Missionary Society to New Zealand were supplied with livestock and seeds to enable them to establish the mission stations. It was Marsden who arranged for the first sheep, cattle, and horses to be brought to this country and also the first farm implements. He was firmly

of the opinion that the mission stations must become self sufficient in food.

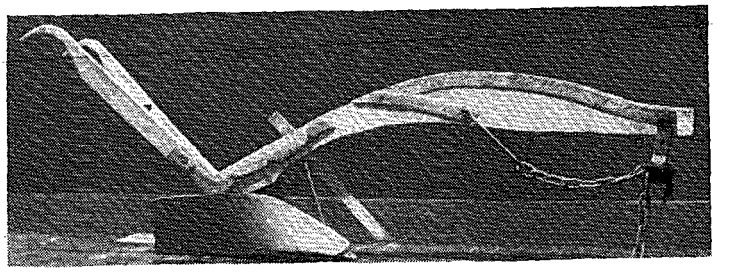
The Rev. John Butler, who established the Keri Keri Mission Station in 1819, has many references in his diary to early mission farm activities and perhaps the most historic is that dated May 3, 1820, which reads: "The agricultural plough was for the first time put into the land of New Zealand at Kideekidee (Keri Keri) and I felt much pleasure in holding it 'after a team of six bullocks brought down by the 'Dromedary'. I trust that this day will be remembered with gratitude and its anniversary kept by ages yet unborn." On the two succeeding days he speaks of sowing two acres of wheat and this crop was reaped in December, 1820. Other crops grown included Indian corn (maize), oats, peas, barley, hops, and many kinds of vegetables. Fruit trees were also planted' out. He also writes of sowing the first two acres in English grasses in July, **1821.**

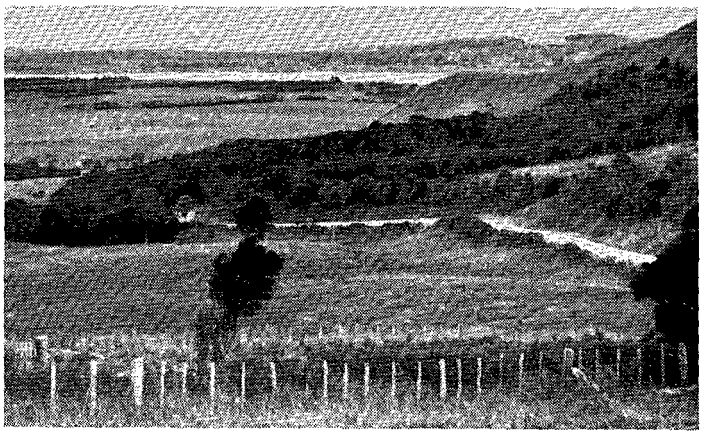
Intended as the main mission farm, Keri Keri did not develop, mainly because the land purchased was unsuitable for farming. In 1829 the missionaries decided to shift to Waimate, 9 miles inland from Keri-Keri, where 250 acres of land were purchased. Here the first successful farm in New Zealand was established, due largely to the efforts of the Rev. Richard Davis. A Dorsetshire tenant farmer and a man of strong religious convictions, he was tireless in his efforts to help the Maori to improve his food production methods. At Waimate he established orchards and vegetable gardens, cropped the land with wheat, barley, and potatoes, and laid down pastures for sheep and dairy cows and draught cattle. By 1840 80 acres had been fenced and sown in grass, 25 acres were in wheat, and gardens and orchards occupied about the same area ; 200 sheep were carried as well as milking cows and draught cattle.

Post and rail fences and gorse hedges on earth banks were erected to enclose the fields and protect the orchards, gardens, and plantations, and it was these gardens which caught the eye of visitors. Charles Darwin, who visited Waimate in 1835, wrote: "At length we reach Waimate. After having passed over so many miles of uninhabited useless country, the sudden appearance of an English farmhouse and its well-dressed fields was exceedingly pleasant. On an adjoining slope fine crops of barley and wheat were



The first plough (below) used in NEW Zealand by the Rev. John Butler (above) at Kerikeri, Bay of Islands, 3 May 1820.





Dairy farming in North Auckland is confined mainly to the alluvial flats of the river valleys, and this area along the Northern Wairoa River is one of the principal dairying districts.

There are over 1 million sheep in North Auckland, and the emphasis is on the production of fat lambs. Sheep farms are the feature on the rolling and hilly land.

standing in full ear, and in another part fields of potatoes and clover. But I cannot attempt to describe all I saw; there were large gardens with every fruit and vegetable which England produces and many belonging to a warmer clime.". Darwin also spoke of the stables, threshing barn with winnowing machine, blacksmith's forge, and a large and substantial water mill.

Such was New Zealand's first farm, which reflected the energy and perserverance of Richard Davis, our. first successful farmer. A noble monument to him stands in the form of an oak tree, the oldest in New Zealand, and which he raised from an acorn grown in Dorset. He planted the acorn at the Mission Station at Paihia and in 1831 he took it to Waimate and planted it where it still stands.

As well as farming themselves, the missionaries gave every encouragement to the Maori to grow the new crops of which potatoes and Indian corn, or maize, were most popular. Assistance was given in the milling of grain and later a commercial flour mill was erected at Waimate. This still exists, but in a dilapidated condition.

KAURI GUM, TIMBER, AND FLAX

Although Northland was the birthplace of European farming in New Zealand, little real progress in farming took place for many years and it was other products of the soil-timber, kauri gum, and flax-. . which--brought-the-north-into-prominence and earned the colony much wealth.

For many years the ring of the bushman's axe, the screech of the timber mills' saws, the whine of the flax strippers, and the dull crunch of the gum digger's spade sounded widely throughout. the north.

Kauri gum was perhaps the greatest lure to Northland, as gold was the magnet in some other parts of New Zealand. For a number of years kauri gum was an important export and by the 1870's approximately 4000 tons per annum were exported and in 1899 the figure reached 11,000 tons. up to the end of last century its value exceeded the export value of both butter and cheese and on a few occasions it brought over $600,000 per annum to the colony. A large number were engaged in the industry and at

times as many as 7000 diggers were working in the fields north of Auckland. Though the colony gained wealth from the export of the gum, it was a doubtful blessing, because the burning and working over the land in the search for it left many problems. The problem of the utilisation of the land after the extraction of the gum caused the State much concern and the Kauri Gum Industry Commission of 1898 enquired into the problem. The Commission went so far as to advocate the sowing of gorse as a means of providing sheep feed on the burnt-over gum-lands. They quoted the case of one settler who sowed the gorse with a drill in rows 3ft. apart and the gorse paddocks were rotationally grazed. The Commission's report stated that by sowing gorse, land which formerly would not fatten 1 sheep per acre had been made to carry and fatten 5 and 6 sheep per acre, and they urged the Government to set aside a portion of the poor gum-land as an experimental farm for gorse pastures only.

EARLY FARM SETTLEMENT

Between 1852 and 1860 settlers came to Waipu and later others to Port Albert, Puhoi, and elsewhere. They took over worked-out timber land, cleared the stumps, drained the swampy flats, sowed pastures, and grazed sheep and cattle, supplying the local settlement with beef, mutton, milk, butter, pork, and vegetables. Occasionally surplus cheese and kegs of salted butter were shipped to the growing city of Auckland. The production of wool increased after the 1880's, but it was not until after the advent of refrigeration and the turn of the century that the meat industry and later the dairy industry were able to develop. Although steady progress was made, Northland lagged behind other areas in the Dominion. Roads were few and mostly unmetalled and access to the peninsula depended on shipping services to the numerous harbours and waterways. Although a railway was opened between Whangarei and Kaikohe about 1915, it was not until 1927 that direct rail connection was made between Whangarei and Auckland. After the First World War many new roads were formed and existing roads improved, which enabled growing motor services and the direct rail connection with Auckland to replace largely the coastal shipping services'. The timber, gum, and flax industries declined, new settlers took up land, and real progress was made in farming.

FARM DEVELOPMENT, 19221953

'Favoured by climate, the northern peninsula is well suited to grassland farming. Of the total area of 3,794,560 acres, some 2,771,923 acres are occupied, of which the area in sown grass is 1,500,591 acres. Grassed areas on flat land cover about 250,000 acres, on easy and rolling or undulating, country 650,000 acres, and on moderately steep to steep country 600,000 acres. Grassland farming consists of dairy farming and fat lamb raising with some stock fattening, mainly on the flat and undulating land, and the more extensive types of sheep and cattle farming on the hilly land. Cropping is of little importance, some 9000 acres being cropped each year. Small areas of green feed and root crops such as turnips and chou moellier are grown on some farms for supplementary feed, while on the more fertile soils up to 3000 acres of swedes are sown, mostly during the bringing in of land to grass; 400 to 500 acres of maize for grain are grown, mainly for pig feed.

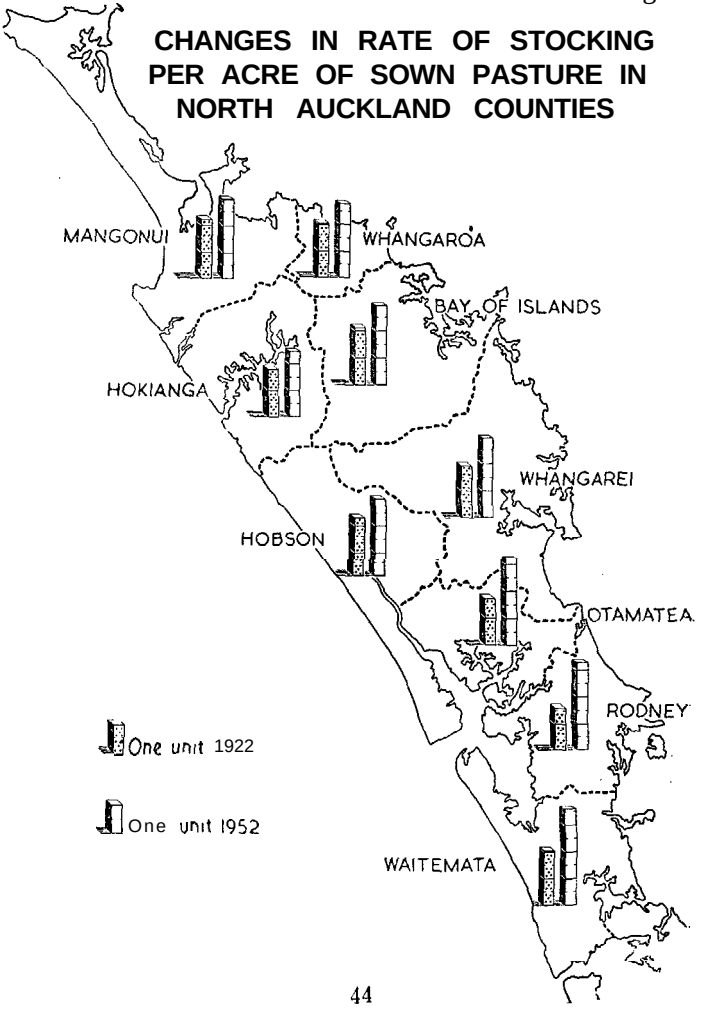
Orchards and market gardens occupy 5000 acres, particularly just north of Auckland City. At Keri Keri in the Bay of Islands 440 acres of citrus fruits and 110 acres of other subtropical fruits, mainly tree tomatoes and Chinese gooseberries, are grown. Plantations of timber trees on farms and in State and privately owned blocks at places such as Riverhead, 'Topuni, Mamaranui, and Glenbervie cover 41,000 acres.

Of a total of 12,171 holdmgs, those used predominantly for dairying number 7663; for sheep and cattle grazing 1567; and for horticultural activities and small-scale enterprises 1030.

Pasture changes have been considerable, not only in the actual areas in grass, but in their composition and productivity. In 1922 the total area in grass was 1,190,706 acres. In the next 30 years 410,227 acres of virgin bush and scrub land were cleared and grassed. In addition 342,000 acres previously in grass were worked up and resown to pastures; but 100,342 acres of pasture reverted to scrub and fern, as did also much of the area regrassed. The total area in grass reached 1,500,591 acres in 1952, a net gain af 309, 885 acres or 26 per cent.

In 1922 the carrying capacity per acre of sown grass was equivalent to 1.95 breeding ewes per acre. Over the three decades the improvement in pastures and their management as well as the more efficient utilisation of the feed produced has increased the carrying capacity per acre of sown grass by 57 per cent to 3.06 breeding ewes per acre. This appears impressive but the average increase was only 1.9 per cent per annum. Increases varied considerably within the period. During 1925-27 the carrying capacity per acre of sown grass decreased, It commenced to rise in 1929 and this was intensified until 1935 owing to

CHANGES IN RATE OF STOCKING PER ACRE OF SOWN PASTURE IN NORTH AUCKLAND COUNTIES



more highly productive pastures resulting from the burning off and sowing of large areas of bush land, and the economic position of this difficult period causing farmers to stock up to the maximum to augment the low incomes of that time. Then in the following years carrying capacity per acre of sown grass remained steady and a gradual increase was resumed in 1941 until in 1951-52 a 7 per cent increase was recorded over that of the previous year. Variations also occurred from county to county within the area. The counties that were outstanding in increasing the efficiency of their pasture production were those closest to Auckland City-Waitemata, Rodney, Otamatea, and Whangarei.

STOCK NUMBERS : NINE NORTHERN COUNTIES.

Class of Stock	1922	1952	Percentage Increase or Decrease
Total cattle . .	351,887	701,994	+ 99.5
Dairy cows in milk .	94,957	318,476	+235.4
Beefs cows and heifers	44,344	76,698	+ 72.9
Total sheep . .	544,668	1,003,116	+ 84.2
Breeding ewes . .	284,076	605,624	+113.2
Pigs . . .	33,750	99,959	+196.2
Horses . . .	24,762	20,001	— 19.2

These figures are translated into standard stock units; the stocking of the area doubled over the 30-year period.

If these figures are translated into standard stock units the stocking of the area doubled over the 30-year period.

In addition to the increase in the numbers of stock, there were marked changes in the types of stock carried. Farming has been intensified, and dairying, which made most progress, is now the chief farming industry of the area. In pastoral farming the emphasis is now on meat production—fat lambs and fat cattle—with wool in a secondary role, rather than on wool and the production of store stock. Features associated with these changes since 1922 are the increase in the proportion of breeding ewes to total sheep (from 52 per cent to 60 per cent) and the

rise in the proportion of Southdown rams to total rams (in 1922, 3 per cent, now 23 per cent). The proportion of breeding beef cows and heifers to total run cattle has also increased. Breeding cows now replace the 3- and d-year-old steers previously carried to control fern.

DAIRY FARMING

Dairy farming is confined mainly to the alluvial flats of the river valleys, the ploughed grassland of the easier and more gently sloping hill country, and some reclaimed tidal flats. Shorthorn cattle formed the foundations of the early dairy herds, but Jerseys now predominate. In some herds Shorthorn blood is still evident and there are quite a few Ayrshire herds as well as some Friesians.

The number of cows in milk increased 235 per cent. from 94,957 in 1922 to 318,476 cows in 1952. In 1921-22, 6,825 tons of butter and 455 tons of cheese were produced. In 1952-53, 16 butter factories manufactured 36,310 tons of butter and one cheese factory 258 tons of cheese. In terms of butterfat, production increased from 5800 tons to 30,000 tons, an increase of approximately 420 per cent. This results not only from the 235 per cent. increase in the numbers of cows in milk, but also from the better feeding and breeding of stock. In 1922 the effective production per cow is estimated at 140lb. of butterfat per annum, whereas at present it is approximately 215lb., and this will increase further. Improved pasture production and the more efficient utilisation of the feed grown have enabled dairy cows to be calved down earlier and to be better fed The season's peak of butterfat production has been brought forward from mid or late December to early November and is maintained longer. The production of butterfat from the nine northern counties is 14.2 per cent. of the Dominion's butterfat production.

SHEEP AND CATTLE

Sheep grazed in Northland are now with few exceptions Romneys. On the easier country where fat lambs are raised Southdown rams are used. The

total wool clip increased by 99 per cent., reaching 22,300 bales last season. The lambing percentage increased since 1921-22 from 80 per cent. to 95 per cent. Hereford cattle are greatest in numbers, but are very closely followed by Aberdeen Angus. Shorthorns, once predominant, now represent only a small proportion of the beef cattle. There are many Jersey cross steers. Apart from the introduction of purebred breeding stock, the nort is self-supporting in both sheep and cattle. Small numbers of surplus breeding ewes are sometimes sent south, as well as store cattle. for fattening.

The only freezing works in the area is located at Moerewa, 9 miles from the port of Opua on the Bay of Islands. These works serve the northern and central areas of the region; stock from the southern area are forwarded to Southdown or Westfield Freezing Works at Auckland.

PASTURE DEVELOPMENT AND MANAGEMENT

Early settlers, after clearing the remaining bush and scrub by cutting and burning, surface-sowed the land Small areas were laboriously cleared and ploughed. Seed mixtures varied greatly, and good pastures usually deteriorated in a short period. Where drainage was poor pasture plants were replaced by rushes and swamp growth. Where drainage was fairly good, but grazing management poor, tall fescue: became dominant, and on the easy undulating country browntop formed the main pasture constituent. With the spread of paspalum, later followed by the sowing of good strains of ryegrass and white clover accompanied by topdressing and good pasture manage-, ment practices, many thousands of acres of high-producing paspalum-ryegrass-white clover pastures. have been established. During the past 20 years northern farmers have realised that paspalum combined with the other useful species gives an all-the-year-round pasture. The valuable role that paspalum fills is a marked feature of pastures in Northland.

The inadequate drainage of the flats and heavy clay undulating land has brought about the practice. of dairy farmers wintering-off stock on hill run-offs..

This practice, avoids undue damage to pastures by poaching during the wet winter, but though it increases total production, it has some radical weaknesses to which progressive farmers are giving attention.

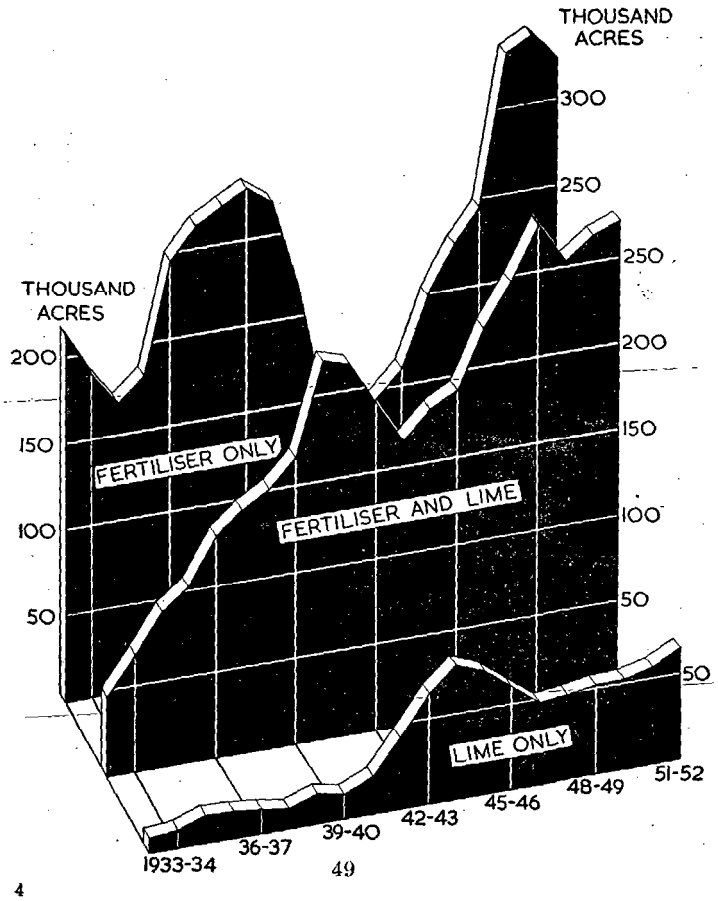
Surface-sown pastures on the hill country gradually deteriorated into danthonia swards on the poorer and drier faces and brown top on the better and slightly moister soils. Ratstail became dominant on the limestone hills and sandy ridges. Stocking decreased, insufficient cattle were maintained, and on many areas reversion to fern and scrub followed. During the past 30 years paspalum was widely introduced, but though it persists indefinitely under low fertility conditions, it forms a close, tight sward of low feed production. The! absence of clovers is noticeable on most hill pastures. However, with improved grazing management, an increase in the number of cattle in relation to sheep, and top-dressing, quite a number of farmers have improved their hill pastures, and the presence of adequate clover has turned sod-bound, matted paspalum into a good hill-country sward.

Though in earlier years some fertilisers had been applied to grassland in Northland, not until toward the late 1920s did topdressirig become at all general. Improved and additional roads and railways augmenting coastal shipping services aided the greatly increased use of phosphatic fertilisers. In this high-rainfall area with considerable leaching of soils, it was found early that applications of superphosphate were not very effective unless lime was applied. As only a few lime works existed and with transport difficult, basic slag and ground rock phosphate proved popular. During the 4 years 1926 to 1930, 44 per cent. of the area topdressed received superphosphate and 56 per cent. basic slag and ground rock phosphates. From 1925 to 1930 the quantities of phosphates applied increased steadily, but during the difficult years of the early 1930s both the quantity used and the area topdressed decreased. From 1934-35 the steady increase was resumed, usage reaching a peak in 1940-41, when 268,784 acres of grassland received phosphatic fertilisers only and 220,179 acres phos-

phates and lime. War-time rationing curtailed applications, but by 1947-48 the position had been regained, and during 1951-52, 323,571 acres of grassland received phosphates alone and 271, 216 acres phosphates and lime.

One of the most striking features has been the remarkable increase in the use of lime. In 1929-30 less than 3500 tons were applied to 13,015 acres and in 1936-37 slightly less than 15,000 tons were used on 98,000 acres. During the late 1930s imported fertilisers were in short supply and more costly to apply than superphosphate plus lime. Thus in 1939-40 about

AREA OF GRASSLAND TOPDRESSED IN NORTH AUCKLAND PENINSULA



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40,000 tons were applied to 169,006 acres. During the war increased areas were limed, at first to complement the increased use of super-phosphate when imported slag and ground rock phosphates were not. available and later to overcome phosphate shortages. In 1946-4'7, 109,000 tons of lime were used on 230,009 acres. The opening of additional works and the adoption of modern. bulk distributing methods, aided by subsidies on lime transport? resulted that in the 1952-53 season 33 commercial lime works produced 192,500 tons of lime, of which 185,000 tons were used. in the 9 northern counties.

During the 20 years 1932-33 to 1951-52 for which comparable figures are available the area topdressed with phosphates increased by 130 per cent. (from 258,000 acres to 595,000 acres) and the area limed, by 491 per cent. (from 55,000 acres to 328,000 acres).

All Northland soils require phosphates. Lime is. necessary on all types except the Red Hill sand and related loams formed from consolidated coastal sands, on which good to very good responses are obtained from superphosphate alone. Even these soils after being grassed for a period benefit from occasional light dressings of lime. On most soils, although basic slag and ground rock phosphates will produce better results than superphosphate alone, applications of lime in addition will increase the responses.

Soils of the "volcanic" country formed from basic and intermediate igneous rocks respond to potash, particularly the more leached or mature, a notable example of the latter being the ironstone soil Okaihau gravelly friable clay. The peat soils also respond to potash. Responses from potash are also obtained after lime and phosphate requirements are satisfied on the leached soils of both the clay and, sand country -the clay and loam gumlands and the sandy gumlands.

In 1945 the first but slight and measurable molybdenum response in Northland was obtained on the Okaihau gravelly friable clay (ironstone soil). Later an outstanding response was obtained on the Whangaripo clay, a partially leached soil from banded sand-. stone of the Puhoi suite. Further investigations. indicate that all the soils from this sandstone respond to molybdenum. Outstanding responses are being obtained on the more leached soils from various sand-- stones and some clay or mudstones as well as the sandy gumlands. It now appears certain that a con-.

siderable area of the northern peninsula will benefit from molybdenum. On hill country responding to molybdenum, and where lime cannot be applied, and with dressings from the air of basic slag or ground rock phosphate being impracticable, the use of a molybdated phosphate may offer opportunities to increase production. On easier land responding to molybdenum it may be likely that a small and inexpensive dressing of molybdenum will replace in part the initial or build-up dressing of lime and even replace part of the maintenance applications.

SUPPLEMENTARY FODDER.

In 1922 only 1'782 acres were cut for hay or silage. Dairy stock were generally wintered on the rough growth on the lesser developed areas of farms or on run-offs. Cropping provided a far greater proportion of the winter feed than it does today. As pastures improved from the mid-1930s, so did the provision of hay and silage. Today progressive farmers who winter-off their stock on run-offs save more hay on the home farms and cart it to the hill run-offs for feeding during winter. In 1951-52, 52,101 acres were set aside for hay and silage, but this would provide the equivalent of only 6½cwt. of hay for each milking cow wintered and none for all the other classes of stock which undoubtedly are fed some hay. Even after the more favourable climate conditions of the north are considered, it is apparent that except on the minority of farms, the amount provided falls short of the 12 or more cwt. required for each dairy cow wintered. The position has improved over recent years ; the pressing of hay is now common and the use of the buckrake is stimulating silage making.

On hill farms the provision of supplementary feed is the exception rather than the rule. Only a few hill country men make hay on their easier country for feeding out on the hills. In fact, many farms have not a sufficient area of flats and undulating country on which to make hay. Where hay is provided on hill farms more cattle are wintered and the hay fed from the ridges aids in improving the pastures.

FUTURE PROSPECTS

Over the past 30 years much real progress has been achieved. The carrying capacity of the peninsula has doubled, and this on only 26 per cent. more

acres in grass. The numbers of cows in milk increased 235 per cent., but butterfat production rose by 417 per cent., and the increased production of meat and wool is considerable. But despite these gains there still is a great potential.

Valuable increases in production will result from the grassing of scrub and fern land, but the improvement and more efficient utilisation of pastures on existing farms and the use of better bred animals capable of higher production will give rapid and not inconsiderable increase in farm production. The larger flats at Kaitaia, Northern Wairoa, Kaipara, and Waipu, as well as considerable areas in numerous river and stream valleys, are only partially drained. Many areas of clay land and gumland must benefit when farm drainage schemes are completed. A survey reveals that approximately 470,000 acres are in need of drainage in the north. Some pastures consist of well-balanced swards of ryegrass, paspalum, and white clover and are capable of extremely high production, but many are low yielding. In many swards there are insufficient clovers or clovers are absent. There is no doubt that the institution of a plough-up and resow policy or in some cases an over-sow policy will increase the production of land now in poor pastures. Suitable cultivation methods and seed mixtures of improved strains of grasses and clovers are well known and with energy and finance made available many farmers can increase the output from their farms.

The use of fertilisers and lime has increased greatly, particularly in recent years, but not sufficient is yet applied. Only 40 per cent. of the total area in grass is topdressed annually with phosphates. If it is assumed that nine-tenths of the phosphates used are applied to the flat and undulating land, this means that only 60 per cent. of the pastures which can be easily topdressed receive fertilisers. To raise the lime status of the soils on the flat and undulating land now in grass to a satisfactory level, as well as to maintain it where the lime requirement is already met, some 500,000 tons of lime are necessary each year for the next few years. After this maintenance applications amounting to 250,000 tons or more will be required. Lime applied to hill country and that for the initial and subsequent maintenance dressings on scrub land grassed down in the future will be additional to this estimated tonnage.

The more intensive, adequate, and regular top-

dressing will be, as in the past, a major factor in future increases. Numerous experiments on many soil types, supplemented by farmers' results, have supplied the information which enables the planning of suitable topdressing programmes. This knowledge is available, but if it is insufficient for particular problems, soil tests can be arranged with the local Instructors of the Department of Agriculture.

Increased topdressing will necessitate intensifying pasture, management and utilisation; to achieve this will involve the better layout of farms, improvements to water supplies, more subdivision, and the use of the electric fence. The more general adoption of these practices will then demand the making of more of the seasonal surpluses of pasture growth into hay and silage, thus increasing the number of stock wintered and maintaining dairy output during dry summers and autumns.

Improved production on hill country can well be brought about by making farm roads so that topdressing can be extended. The impact of molybdenum applied with phosphate from the air may prove to be of immense benefit on lands deficient in this minor element. The introduction of clovers into hill swards will then be necessary. A further factor which will raise the carrying capacity of hill farms will be the provision of and feeding out of hay to breeding and young beef cattle to provide a better proportion of cattle to sheep for pasture maintenance. The adoption of the new system of grazing sheep known as "mob-stocking" is well worthy of consideration.

The bringing in of scrub and fern land will directly result in more stock and thus increase production. Approximately 300,000 acres of easy land are available for immediate development and will in the main be used for dairying and fat lamb production. Methods to grass the gumlands have been well known for quite a number of years, while the realisation of the need for potash now makes the successful grassing of the "ironstone" country feasible. In addition there are some 400,000 to 500,000 acres of other soils mainly on the hills which will be grassed and used for sheep and cattle some time in the future.

During the past three decades the peninsula has progressed far in primary production, much more so than in the previous 90 years. The coming 30 years are certain to see continued and perhaps greater increases.

DISCUSSION

Q. Is it possible to build up the organic content of the soil by green cropping rather than the use of fertilisers and the promotion of clover growth?

A. (Ballinger) : In the early days ploughing in of green crops was tried, but it has now gone by the board. The use of good cultivation methods, good seed, fertilisers and lime is today achieving fertility build-up through the clovers and getting the country economically into grass. Farmers are cashing in on the built-up fertility as rapidly as it is built up by using the nitrogen fixed by the clovers.

Q. What amount of lime is required anually to replace losses on the clay soils of Northland? ,

A. (Ballinger): There has been a lot of experimental work on maintenance dressings. The generally advocated application is 4 or 5cwt. per annum. Many farmers are putting on more through the bulk topdresser. Soil tests should be arranged through the local Instructor: 3, 4, or 5cwt. may be sufficient.

Q. An area in Northland steeper than anything seen anywhere else in the country was carrying only dairy cattle. Why has this particular farming system developed ?

A. (Ballinger) : A dairying complex has been built up in past years. Subdivision was into small farms and they were farming only small areas for cows only rather than sheep or cattle.