

The Pastoral Economy of New Zealand and Some Comparisons with Ireland

By LESLIE SYMONS.

(Read before the Society in Belfast on May 16th, 1961, and in
Dublin on May 19th, 1961.)

New Zealand is a small country. The two main islands have an area of about 102,000 square miles, only about 4/5ths of the area of the British Isles. The South Island, with an area of an eighth greater than that of England, has a population of only about 700,000 or less than one-fiftieth that of England. The North Island has about twice as many people as the South Island but the total population of the two islands is only a little over 2 million. In comparison with Ireland, New Zealand is three times as large but has only half as many people.

A substantial part of New Zealand is mountainous or steep country which is not suitable for cultivation or for intensive grazing (Figs. 1, 2 & 3). Land use statistics are not strictly comparable but a rough picture is obtained from Table 1 :

TABLE 1.—LAND UTILISATION

Category	New Zealand	Eire	Northern Ireland	Total Ireland
	1958-9	1959	1959	1959
	Thousand acres			
Pasture (sown grasses in N.Z., grass in Ireland)	16,614	8,118	1,251	9,369
Grasses, clovers and lucerne for hay or silage and seed	1,237	1,881	437	2,318
Total grass &c.	17,851	9,999	1,688	11,687
Field crops, excluding hay	1,107	1,654	354	2,008
Total crops and grass	21,059	11,653	2,042	13,695
Other grazings	13,000(a)	3,000 (b)	736	—

(a) Includes large areas of negligible grazing value.

(b) Estimate. Private communication from Dr. M. D. McCarthy, Central Statistics Office.

Sources : *N.Z. Official Year Book*, 28th Annual Report of the Minister for Agriculture, 1958-59, Dublin, and Return of Agricultural Statistics, N. Ireland, at 1st June, 1959.

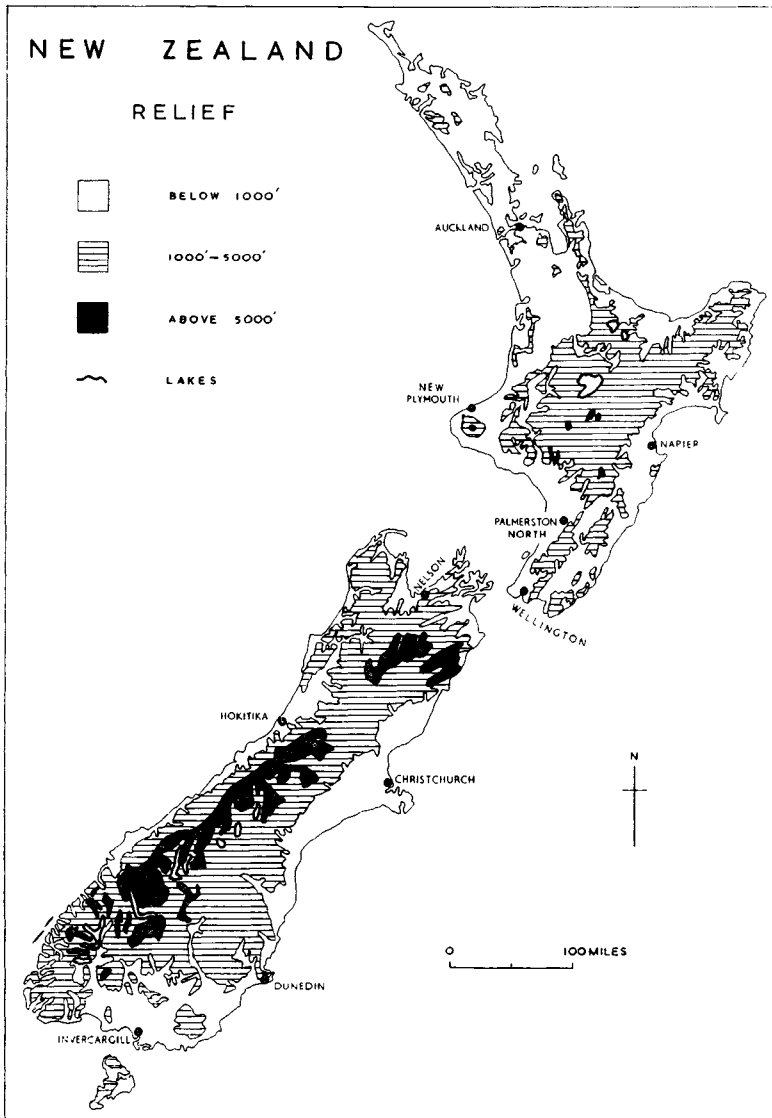


FIG. 1.—The relief of New Zealand. Some of the advantages which accrue to New Zealand as a result of its latitudinal position (34° to 47° south, i.e. wholly nearer to the equator than the British Isles) are offset over much of the country by altitude. Most of the mountain and hill land over 1,000 feet is capable only of a low level of utilisation. (See Fig. 3).

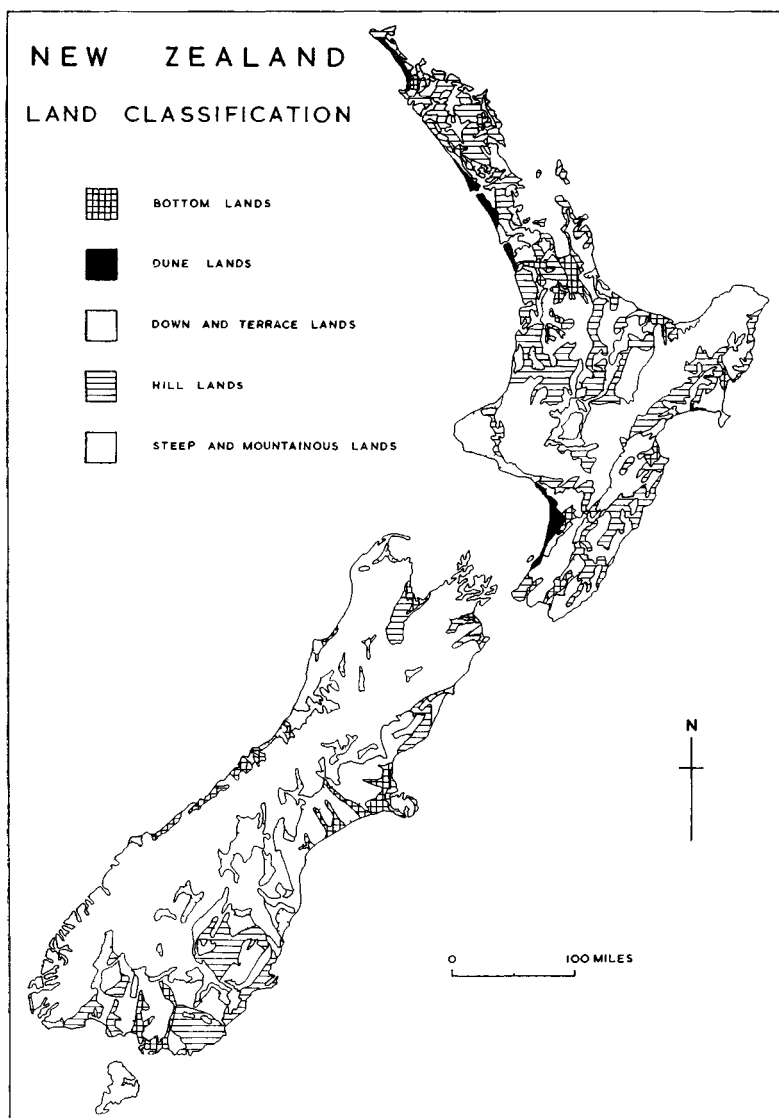


FIG. 2.—Land classification. This map is complementary to the relief map and shows that much of the land below 5,000 feet, as well as that above, is mountainous. Large areas of the North Island below 1,000 feet are classed as hill land because of the steep slopes that are the dominant feature.

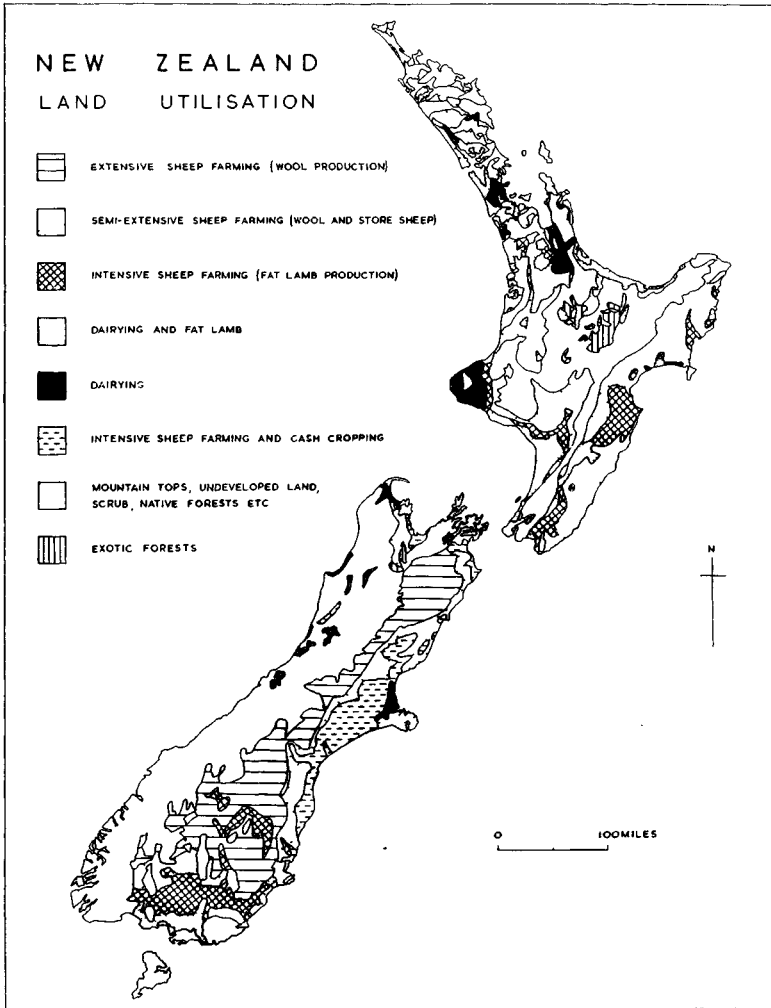


FIG. 3.—Land utilisation. Intensification of production has reduced the area devoted to extensive sheep farming which is now important only in the South Island mountain zone, east of the Southern Alps. Much of the low hill country of the North Island is, however, unsuitable for enterprises more intensive than raising store sheep combined with wool production. The highly productive areas therefore represent only a small proportion of the total area. The great extent of the agriculturally unproductive land in the mountains of the South Island and on the North Island volcanic plateau is evident. The exotic forests are softwood plantations.

It is thus evident that New Zealand has about 50 per cent. more land under cultivation than has Ireland as a whole. In both countries grassland is the dominant land use, some 85 per cent. of the cultivated land in the case of New Zealand, and about 80 per cent. in the case of Ireland. Other grazings in New Zealand, mainly tussock grasslands on the mountains and uncultivable hill lands, add considerably more to the area used for pastoral production in New Zealand than do the rough grazings and bogs of Ireland, but comparison is here extremely difficult. In both cases, however, it would be true to say that the cultivated lands support all but a small proportion of the livestock.

From the foregoing comparison it will be evident that New Zealand's agriculture relies on grassland, and therefore, it may be expected, on livestock, to an even greater extent than does that of Ireland. The numbers of livestock supported are indicated in Table 2.

TABLE 2.—LIVESTOCK NUMBERS.

Category	New Zealand	Eire	Northern Ireland	Total Ireland
	1958-9	1959	1959	1959
	Thousands			
Dairy cows in milk ...	1,931	1,272	215	1,487
All other cattle . . .	4,042	3,412	749	4,161
Sheep (incl. lambs) . . .	46,876	4,412	1,011	5,423
Pigs	692	852	849	1,701
Horses	123	234	16	250

In this table the most striking difference is in the numbers of sheep supported, New Zealand having about nine times as many as Ireland. In addition, New Zealand supports nearly as many more dairy cattle as it has proportionately more cultivated acres, though not proportionately more other cattle. Ireland has twice as many pigs (with, incidentally, a similar proportion of breeding sows) but in terms of land utilisation it must be remembered that a large proportion of the feed used for pigs in Ireland is imported. Figures for poultry (not shown in the table) reveal about 25 million birds in Ireland compared with about 4½ million in New Zealand, but again in terms of land utilisation the comparison is complicated by imported feed. Finally, there are about twice as many horses in Ireland used for agricultural purposes, but the total number is not sufficient to affect greatly a comparison of livestock.

The physical character of New Zealand

The outstanding characteristic of New Zealand is the exceedingly high proportion of the surface which is of steep or moderately steep slope. Steep slopes are by no means confined to the mountains, as shown in Table 3.

TABLE 3.—PERCENTAGE PROPORTION OF NEW ZEALAND OCCUPIED BY MAJOR LANDFORMS

Category	New Zealand	North Island	South Island
	Percentage		
Mountain	49	18	70
Steep and broken hill country	25	45	12
Downland and easy hill country	15	26	9
Plateau	3	5.5	—
Plain	8	5.5	9

Source : K. B. Cumberland and J. W. Fox : *New Zealand : A Regional View*. Table 1.

The only really substantial area of flat land is to be found in the Canterbury Plains. From the Canterbury Plains there is a sharp transition to high mountain country. The Southern Alps run almost the whole length of the South Island and constitute a major barrier to communications as well as restricting agriculture. They also profoundly affect the climate of the Canterbury Plains and the inland basins and rolling downland country of the east of the South Island. East of the ranges the rainfall is low, averaging 20 to 30 inches on the Canterbury Plains and less than 20 inches in Central Otago. Dry farming techniques and irrigation are practised on the Canterbury Plains, while in Central Otago semi-desert conditions obtain. Across the divide, however, the west coast averages well over 80 inches of rainfall, and the coast lands as well as the ranges, with their yet much higher rainfall, are covered with dense rain forest. Forest, or bush, to use the New Zealander's term, once covered most of the country, but in the lower and drier areas there has been widespread clearance for pastoral purposes.

Only a small proportion of the North Island is mountainous and there is less striking variation between one area and another in both landforms and climate than there is in the South Island. Nevertheless only very small areas can be described as plains. Most parts of the North Island have between 30 and 50 inches of rainfall and the predominating colour in the landscape for much of the year is a green not much less striking than that for which Ireland is famed. In the North Island, however, as in the South Island there are large areas of golden-brown tussock grassland. The tussock grasslands are the natural vegetation of the zone between the bush and the high mountains (Plate 1) and of the drier lowland areas. Elsewhere tussock grasses replaced bush following burning and clearing before the white settlers arrived. Since European settlement much of the tussock grassland has been replaced by sown English grasses, and much of that remaining now includes a large number of exotic species. Tussock is, however, a name in New Zealand still practically synonymous with extensive grazing, and much discussion and argument surrounds the use and management of the tussock lands.

The physical characteristics of steep slopes and heavy rainfall,

much of which falls as moderately intense rain rather than beneficial drizzle, result in rapid erosion. Clearance of the bush, and overgrazing and burning of the tussock grassland, have given rise to serious problems in soil erosion. In some areas where rainfall is not high, as in the Canterbury Plains, accelerated erosion is caused by high winds; the Nor'wester, a warm föhn-type wind from the Alps, is particularly destructive because it desiccates the ground and makes the powdery soil easy to remove.

Settlement and economic development

Although Abel Tasman sighted the Southern Alps and landed in the North Island in 1642, it was left to Captain Cook to begin the survey of the islands in 1769. Successive visits by Cook and other explorers were followed by the establishment of shore sealing and whaling stations in the last decade of the 18th century. The first organised settlement took place in 1840 and in the following ten years the present four main centres, Wellington, Auckland, Christchurch and Dunedin were all founded. The colonisation of the North Island was hindered by difficulties of acquiring land which was occupied by the Maoris who had colonised the country centuries earlier. In the South, the Maori population was small and the same difficulties did not arise. The South Island escaped the tragedy of the Maori wars of the 'sixties. The discovery of gold in large quantities accelerated its progress and gave it a lead in political and economic development which it maintained well into the 20th century, but then lost to the North Island.

Agriculture was limited in the early days of settlement by the lack of available markets, but the suitability of the tussock lands for grazing led to their division into large runs which were stocked with sheep imported from Australia. During the 'seventies a substantial export trade in wool was developed. In 1882 refrigeration made possible the export of meat and dairy produce, closer settlement was stimulated and the support of a larger population became practicable. The world-wide economic depression that followed the 1914-1918 war provided the first major setback to New Zealand's economic progress. The value of exports fell from nearly £55 million in 1929 to less than £35 million in 1931. Recovery was slow until, as elsewhere, it was hastened by the rising prices that preceded the outbreak of war. Since 1945 there have been fluctuations in prices which have in some years made the balance of payments an extremely delicate affair and necessitated strict control of imports, but in general the economy has been strengthened with increasing production of the principal agricultural and pastoral commodities. In the industrial field there has been considerable development and diversification which has to some extent reduced the burden of imports, though not without protests from consumers whose choice of goods has thereby been limited.

Since New Zealand first became a significant exporter of primary produce the bulk of the trade has been with the United Kingdom. Sentimental ties are very relevant to the orientation of trade, but



PLATE 1.—High country tussock grazings in the South Island of New Zealand ; sheep going out after dipping at West Wanaka. On large sheep stations in the mountains wool is still commonly the main product but cross-breeding for store sheep and lambs is becoming common.

more important has been Britain's position during the past century as the world's principal importer of primary produce. Britain, then, is New Zealand's natural market, strengthened by Commonwealth preference. Dependence on the British market in addition to reliance on so few commodities all of pastoral origin places New Zealand in a weak trading position, however, so much effort has been devoted to developing other markets. This has been reasonably successful as shown by exports to the United Kingdom as a percentage of total exports, with a steady fall from 73.3 per cent. in 1948 to 55.78 per cent. in 1958. At the same time the proportion of imports from the U.K. has not changed significantly and at about 52 per cent. is in balance with the export position. Trade with other Commonwealth countries has changed but little, while exports to other European countries have increased from 14.14 per cent. to 16.88 per cent. during the period. The value of trade with the principal trading partners in 1958 is shown in Table 4.

TABLE 4.—PRINCIPAL TRADING PARTNERS OF NEW ZEALAND 1958

Country	Exports (total)	Imports (by country of purchase)
£ (N.Z.) 000		
United Kingdom	139,105	133,685
Canada	4,066	5,848
Australia	10,266	44,342
France	14,680	1,738
German Federal Republic	7,028	7,449
Italy	6,231	1,445
Japan	5,514	2,821
U.S.A.	36,449	16,528
Total Commonwealth	161,036	203,346
Total foreign	88,366	49,455

Source: *New Zealand Official Year Book* 1960, pp. 297-8.

It will be noted that the United States has become the second most important destination of exports and third most important source of imports. This is a recent development with the export of frozen and chilled beef and veal, four times as much being shipped to the U.S.A. in 1958 as in 1957. Before the end of bulk purchase agreements 80 per cent. of the beef went to Britain, now the figure is only about 11 per cent. The second export to the U.S.A. is wool. The meat exporters see in the U.S.A. a large potential market for mutton and lamb but this is largely denied them by the tariff policy which protects the American farmer from the full brunt of New Zealand competition.

The three commodities, wool, frozen meat and butter, each earn in the United Kingdom between £30 million and £45 million annually, the relative positions varying according to the respective

prices. Thus, between 1957 and 1958, the sales of wool in Britain increased in volume by some 6 per cent. but the value fell from nearly £40 million to £30 million.

It is only to be expected that New Zealand is much concerned at the prospect of Britain entering the European Common Market. New Zealand fears loss of Commonwealth preference without compensating access to European markets. The Prime Minister of New Zealand on his recent visit to Britain declared that his country was not opposed to Britain's entry into the Common Market, it merely wanted fair rights to trade itself in Europe consequent upon its traditional position in the British market.

The New Zealanders are rightly conscious and proud of the efficiency of their agricultural and pastoral industries. They compete from 12,000 miles away with the added disability of irregular shipping services, almost inevitably associated with the distances involved and the necessity of collecting produce in New Zealand from the large number of ports. Yet they can undersell their competitors in Britain, principally Denmark, Australia and the Netherlands. They consider that they can only be beaten in price by dumping and subsidies. They regard the subsidies paid to British farmers as excessive and the practice of other countries in selling their butter at below home prices and full costs as iniquitous.

The organisation of the pastoral industries

The methods by which the New Zealanders achieve their efficiency in production and marketing of meat, butter and wool are of interest to any country seeking to improve its agricultural efficiency, but more especially to those who similarly rely on grassland.

Specialisation is the keynote of the industry. Few farmers have more than two main enterprises; usually one is clearly pre-eminent, and the whole farm economy is built around it. The majority of lowland farms can be classed as dairying, or fat lamb producing, or a combination of these two. Pigs are found mostly in association with dairy farms particularly in the north of the North Island—both north and south of Auckland. Pigs, however, compete for attention with cows, there is little skim milk because milk is sent whole to the factory rather than separated on the farm as commonly in earlier days, and for these reasons and the unreliability of prices, pig-rearing has tended to decline. On many dairy farms it has been replaced as a subsidiary by fat lamb production. Sheep can be combined in maximum pasture utilisation and help in control of weeds. Hay and silage are the principal winter feeds in the northern regions.

By contrast, at the other end of the country, Southland with its colder, damper climate, not unlike that of southern Ireland (though sunnier), has also had a history of intensive dairying. Because of the severity of the winter, supplementary fodder crops have to be grown and little milk is produced in winter. In recent years there has been a marked swing in Southland from dairying into fat lamb production. In Southland and neighbouring Otago

the combination of sheep farming with arable land is distinctive, turnips, rape, kale and oats being important for fodder.

In the hill country the emphasis is on rearing of sheep and cattle for sale as replacements for the lowland farms, and beef cattle are reared, and where possible, also fattened. In the High Country, i.e. the mountains, sheep are the most important livestock. The merino, producing the finest wools, is still common on these extensive stations, though in general the trend has been to introduce breeds more suited to lamb production wherever possible. (Plate 1.)

Specialisation is facilitated by the relatively large size of farms. 38.3 per cent. of all farm holdings exceed 200 acres in size. 8 per cent. exceed 1,000 acres. The largest farms are the High Country stations with a low rate of stocking. More comparable with farms in this country are the holdings of less than 200 acres. There are about 18,000 holdings (21.2 per cent.) of between 100 and 200 acres, and 12,000 (14.1 per cent.) between 50 and 100 acres. The smaller units are mostly dairy farms, this being the most intensive form of farming for export. Of the dairy farms, however, over half are of more than 100 acres. 61 per cent. of the holdings are owner-occupied, and the majority of farms can be called family units. Labour is not easy to obtain. Many farm workers are recent immigrants, often lacking in experience. Those who intend to stay on the land will be saving for their own farms.

As a result machinery is used wherever possible. Nine-tenths of the dairy cows are machine-milked and four-fifths of the sheep flocks are shorn by machine. The capital invested in machinery is therefore high but specialisation spreads costs. Outlay is also high on fencing, gates, shelter belts and other features which make possible efficient land utilisation. In some of the wetter areas intricate drainage is essential and, in dry parts, irrigation raises costs. On the other hand the climate is such that stock need not normally be housed, so farm buildings need not be extensive.

Examples of actual farms are always helpful in creating understanding of agricultural systems and I propose briefly to describe two holdings which are reasonably representative of the types of farming and the regions to which they belong.

A sheep and arable farm in Southland (Fig. 4)

This farm is on the edge of the plains, and its boundaries climb the slopes of a mountain to about 2,000 feet. Beyond this altitude the mountain rises to 4,800 feet and is part of another holding. Within the boundary of the farm I have chosen for description the rough, uncultivable hill land extends to about 900 acres, of which 20 acres are in timber plantations. The remaining 800 acres are flat land in 14 paddocks. In 1960 I found four of these paddocks devoted to grass-seed production—a local specialisation. The seed for sale was cocksfoot, red clover, and Cheving's fescue, which is a grass exported for making fine, close turf on airfields, sports grounds, etc. These four paddocks totalled 200 acres, and a further 50 acres were in oats, which was also a cash crop. Winter feed provision included 50 acres of turnips, on which the sheep will be

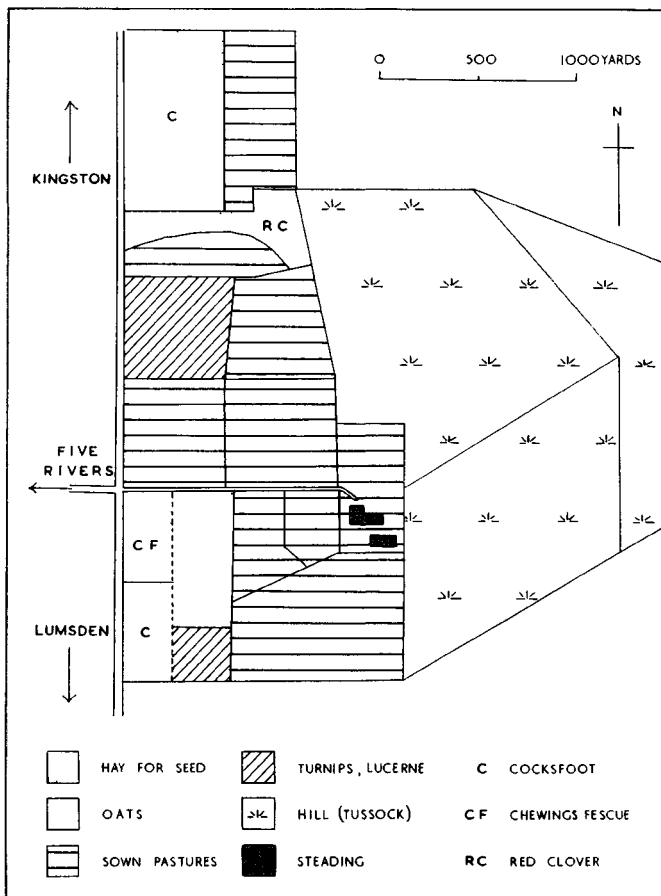


FIG. 4.—The Southland sheep and arable farm described in the text. The tussock grazing rises steeply to about 2,000 feet beyond the area in the diagram. The steading is at about 1,000 feet with the cultivated land sloping gently to about 900 feet.

folded this winter, and 15 acres of lucerne for hay. This leaves nearly 400 acres in grass, ranging in age from newly-sown to 14 years.

The hill land is snow-covered in winter and so is essentially summer country. It has, however, been much improved in recent years by being fenced off into blocks, so that management could be more precise. Top-dressing with superphosphate and over-sowing with grass and clover mixtures has been carried out from the air.

Typical stock is 1,900 ewes of the New Zealand variety of the Romney breed, 400 hoggets, about 40 wethers for mutton, and one ram per 50 ewes. Lambing is about 100 per cent. on ewes put to the ram. Lambs are sold at a weight of 30-35 lb. Last season's prices at the freezing works averaged about 22d. per lb. The average ewe fleece is about 8 lb. yielding 3s. to 4s. per lb.

A considerable amount of machinery is maintained to deal with the cropping, including 2 wheeled tractors, a crawler tractor, disc and harrows, a chisel plough and a swamp plough, 2 combiners and hay baling machinery. All work is at present carried out by the farmer and his son, though normally an additional hand is employed.

A small North Island dairy farm

In contrast, this farm is of only 70 acres, one of many similar holdings on the Hauraki Plains, south and east of Auckland. Only 25 years ago the land was an undrained swamp of scrub and rushes. Drainage remains the principal problem. A main drain runs down each of the long boundary fences and a third runs down the middle. Each of the 22 paddocks is bounded by drains, all double-fenced, and the paddocks themselves are cut by shallow drains (a few inches deep) which feed in to the fence-line drains. With good drainage assured, pastures were established without difficulty and graze well. They are, however, liable to poaching, and for this reason the farmer has acquired some 40 acres of nearby low hill country to which part of the dairy herd can be moved for a period in the winter, and which can support young stock most of the year.

On the main farm, a further measure to ensure clean working is the provision of a concreted stockrace or path running down the centre, giving access to all paddocks. Gates are hinged to open into the stockrace so that they block the race when opened and divert stock into the desired paddock. Another useful device is a home-made tramline which carries the churns to the roadside easily in wet weather when a cart or sledge would be awkward to use. Ten acres of hay are cut and baled annually by an outside contractor, but no silage is made and there is no cropping. Strict rotational grazing—a paddock never in use for more than one day at a time—reduces poaching. On this farm 50 to 60 cows are milked, with replacements being reared on the hill area. All the work is done by the owner and his daughter. To maintain such farming requires hard work, but it is minimized by much thought to the layout.

These examples illustrate many of the features common to most

New Zealand farms—the attention to detail in fencing and access, mechanisation, and specialisation. Farm houses are better cared-for and equipped than in most countries. There has been a wave of rebuilding in recent years. The traditional “ colonial ” type of house, usually painted cream, with a red corrugated iron roof and verandah is giving way to houses of contemporary designs in a range of bright colours.

*Land development*¹

Farm production in New Zealand is far from static. A decade ago the annual total output of lamb carcasses was about 12 million, last year it was 18 million. The increase will continue as more land is brought into intensive production.

The state is the main agent of land development in New Zealand. Most of New Zealand’s modern history is bound up with problems of allocation and tenure of land. Large farms and sheep-runs have had to be divided as population has grown and the need to increase export earnings has increased. Various measures were introduced to facilitate this process, including high valuation and taxation of large estates. The first world war brought the need to resettle soldiers and many estates were carved up to provide farms for them. Many of these farms were too small for economic operation and land was not always properly developed before being handed over, but present-day methods have benefited by these experiences.

In 1929 Parliament gave the Lands and Survey Department power to hold and develop land in all ways needed to fit it for settlement. Many of the properties taken over by the Department were already in grass and the work that was necessary consisted simply of that required for sub-division—putting in roads and fences, houses and buildings, water supply and electricity, and perhaps improving the pastures. If there was any doubt about the potential of the land it could be retained for a period as a government farm, and released only when the productivity of the land, and therefore the size of unit necessary for economic operation, had been proved. Good progress had been made on this type of work before the second world war, but once again the return of men from the services stimulated activity.

The government had also, before the war, turned its attention to bringing into cultivation land which had hitherto resisted attempts to make it productive. The resources of the state made possible experiments which were beyond the means of the private individual. Furthermore, the large scale of operations made for many economies in the use of machinery, materials and labour. Most of this work has been carried out on lands which had remained in Crown ownership because they had previously been considered unsuitable for farming, but similar methods have also been applied

¹ Statistics quoted in this section are based on reports issued by the Lands and Survey Department

to range-lands which have been leased for grazing but have been found to be suitable for cultivation.

When an area is brought into the development scheme—it may be a block as large as 60,000 or 70,000 acres—the first tasks are the removal of scrub by crushing and raking and the installation of roads and drains. The land is then ploughed or, as is increasingly the case, cultivated with giant discs. Advantages of the discs include the ability to cultivate steep slopes which would be dangerous or impracticable to plough, and the ease with which stony soils can be worked. In this case the limit is the size of stone that can be passed by the discs and if there are many boulders too large even for this method the land is over-sown without being cultivated. Lime is applied, pastures established and, after a suitable period, cattle and sheep are put on to graze. As many beasts per acre are maintained as possible, the essence of the system being that they are there to improve the land, rather than to be improved by the land. (Plate 2.) The latter comes later, when the pastures are firmly established. Care is, of course, taken to see that the pastures are not over-grazed, particularly in dry periods. While the pastures are being consolidated, houses, fences and roads are built or improved.¹

The magnitude of these schemes is indicated by the total area at present under state development—900,000 acres, equal to more than half the total area of crops and grass in Northern Ireland. The stock carried on these development blocks in their present state comprises 730,000 sheep (Northern Ireland flocks total about one million) and 124,000 cattle. The past year's work included laying down to new grass, 41,000 acres and preparing for grass, 20,000 acres. This it will be noted is present development. The scheme has already provided 1½ million acres for settlement in 3,640 farms.

As an example of development in one area, the Te Anau district in Southland has 148,000 acres under development in two blocks. At the beginning of development this land was almost all tussock grassland of low grazing value, with a little cultivation in the river valleys. The full development programme is to be spread over more than twenty years, but the first of the new farms will be disposed of next year. On this block there were only 1,000 ewes when development started. Now there are 7,000 sheep and 1,000 cattle, and these numbers will be doubled when the private settlers take over. Subdivision will be based on units of 500 to 3,000 acres, each capable of supporting in the first place 1,000 ewes and replacements, with a potential of at least 1,500 ewes, together with 30 to 40 cows. Another development project in Southland is dealing with conditions similar to those encountered in reclaiming bogland in Ireland. The Lands and Survey Department have 4,400 acres of peat land under development (Plate 3) and private interests have

¹ R. G. Ward, "Land Development in the Taupo County," *New Zealand Geographer*, Vol. 12, No. 2, October, 1956, pp. 115-132. Numerous articles will be found in the *N.Z. Journal of Agriculture* (Government Printer, Wellington, monthly).



PLATE 2.—Land development in the Rotorua district of the North Island. The former poor tussock grassland and scrub was broken and grass mixtures sown 12 months before the photograph was taken. Two-year-old polled Angus cattle consolidate the new pasture and hold the growth of grass during the flush season, so checking rough growth. They will be fattened and sold as prime $3\frac{1}{2}$ to 4-year-old bullocks. Coniferous plantations can be seen in the background on the higher plains.



PLATE 3.—Land development, Seaward Moss, at the extreme south of the South Island. Here, with peaty soils, difficult to drain, and a cool, damp climate, conditions are not dissimilar to those found widely in Ireland. On the left, cultivated land drained by the 6-foot deep channel; on the right, the original marsh and scrub vegetation.

recently proposed a scheme to develop 19,000 acres of this difficult terrain.¹

An important aspect of development work is cost. Gross development costs at the present time vary from £30 to more than £60 per acre. The prices at which farms are sold when completed vary similarly in range, though since land expensive to improve is not necessarily the most productive, disposal prices are not closely related to improvement costs. Farms are sold at the prices they are considered to be worth, but in the whole venture the state works at a profit. Audited accounts for the blocks wound up in the last five years showed a net profit of £874,275. This shows clearly that land development in New Zealand is an economic proposition.

The balance sheet of one of the recently settled farms may be of interest in showing not only that a reasonable income can be made off such farms, but also some indication of the balance of costs and income on a representative farm. This farm is a dairy unit of 150 acres, 145 acres being in grass. It carries 70 dairy cows and replacements and last year produced 19,600 lb. butterfat (the standard of measurement in New Zealand).

EXPENDITURE	£	INCOME	£
Casual labour	92	Butterfat	2,940
Stock purchases	104	Pig meat	490
Fertiliser and seeds	383	Cattle	337
Fuel and power	195		
Repairs and Maintenance	155		
Contract work	150		
Cartage	12		
Farm requisites	172		
General expenses	136		
Insurances	44		
Rates	65		
Depreciation	230		
	1,738		3,767
		Less expenditure	1,738
		Surplus	2,029
CAPITAL INVESTED			
		Total	Per acre
		£	£
Disposal value		9,360	62.4
Further essential improvements		800	
Stock and plant		4,980	
		15,140	100.93
Surplus		2,029	
Managerial reward		850	
	Balance	1,179 = 7.8%	

¹ L. Symons, "Land Development in Southland," *New Zealand Geographer*, Vol. 17. No. 1, April, 1961, pp. 87-93.



PLATE 4.—Top dressing tussock grassland from the air in the Waiouru District of the North Island. The normal application is superphosphate at the rate of 2 cwts. to the acre. Grass and clover seed is frequently added for sowing at the same time. Note the plantation of exotic coniferous trees on the right. In the background is Mount Ruapehu.

An arbitrary assessment has been made for managerial reward. £850 represents approximately 40 per cent. of net income. If it be argued that the return for managerial functions should be higher, then the return on capital invested falls, e.g. a managerial reward of £1,000 reduces the percentage return on capital to 6.6 per cent. Either way, taxation and other personal expenses have to be met from the surplus.

It must be stressed that these figures are for one farm only and have no wider application. It may, however, be noted that on one development block average production from the farms now in private ownership was over 18,000 lb. butterfat plus 496 lb. wool and 59 lambs from 62 ewes. One farm first settled only four years earlier produced over 27,000 lb. butterfat from 150 acres.

In this development work the state is acting as a business firm in that it expects to make a profit from its operations. The community as a whole is not called upon to bear any part of the costs of providing the persons selected with their new farms. This is in line with the attitude that since farm production provides almost the whole overseas income of New Zealand, there can be no payment of subsidies for the basic items produced. There are a few minor exceptions but in general subsidies are paid only towards special works for conservation purposes—in particular to control soil erosion. Any such works have to be approved by inspectors and a national board before they qualify for assistance. Subsidies are accepted as necessary in this case because of the urgency of preventing further loss of soil, which has been much depleted in the past 100 years.

Aerial topdressing

The use of aircraft for agricultural purposes is one of the major developments in New Zealand farming in the last decade, and one which has made possible widespread improvement on steep and rolling country, which was too costly to improve by ordinary methods. (Plates 4 & 5.) In each of the last four years over 400,000 tons of fertiliser have been distributed from the air over some 4 million acres. It is in the higher hill country that aerial top dressing has been most used but it is also used on all other major types of terrain.¹ The usual dressing is 2 cwt. of super-phosphate per acre at a cost of between 30s. and £2 per acre. In addition, aircraft are used for sowing seed, spraying poison to combat rabbits and weeds, distributing trace elements, spotting stock on large runs, and many other tasks. Agricultural aviation is a firmly established business with an investment in aircraft and ancillary equipment estimated at £1½ million.

Farm output in comparison with Ireland

At the beginning of this paper it was shown that from an area of grass about 50 per cent. more than that in Ireland, sup-

¹ W. J. Brockie. "Some aspects of aerial topdressing in New Zealand. *Proceedings of the Second New Zealand Geography Conference, 1958.*



PLATE 5.—Aircraft are also widely used for spraying crops and pests. This helicopter is being employed to spray broom and gorse, which, having been introduced into New Zealand, have become serious pests like other introductions such as the rabbit and deer. The helicopter sprays a 60-foot swathe and the ground is covered four times to give the required saturation for effective killing. The photograph shows the complete service unit filling the tank of the helicopter with the hormone weed killer.

ported by a greater area of rough grazings but a smaller area of field crops, New Zealand supports nine times as many sheep, as well as additional dairy cattle nearly in proportion to its cultivated area. Because of the high sheep population it is evident that the rate of stocking must in general be higher than in Ireland, but only by converting all stock numbers into livestock units can a useful comparison be made. A livestock unit is based on the starch equivalent requirements of a dairy cow yielding 700 gallons, it being assumed for the present purposes that all the dairy cows considered average this yield—an assumption which is generous to production in Ireland.² The equivalents are :

Other cattle : over 2 years	0.75
1—2 years	0.50
under 1 year	0.25
Ewes (with lambs)	0.20
Other sheep over 6 months	0.05
Rams	0.40
Sows (including litters)	0.50
Pigs fattened	0.12
Poultry : over 6 months	0.02
under 6 months	0.005
Horses	1.00

Using these multipliers the total livestock units in the three statistical areas are presented in Table 5.

TABLE 5.—LIVESTOCK UNITS, NEW ZEALAND AND IRELAND

Class of Livestock	Number of Livestock Units 1958-9				
	New Zealand	Eire	N. Ireland	Total Ireland	New Zealand - Ireland
	Thousands				
Dairy cows ...	1,931	1,272	255	1,527	+404
Other cattle :					
Over 2 years ...	1,328	728	160	888	+440
1-2 years ...	539	616	136	752	-213
Under 1 year ...	298	285	56	341	- 43
Total cattle ...	4,096	2,901	607	3,508	+588
Sheep ...	7,406	423	93	516	+6,890
Pigs ...	119	137	139	276	-157
Poultry ...	4	174	150	324	-320
Horses ...	123	234	16	250	-127
Total stock ...	11,748	3,869	1,005	4,874	+6,874

² The *Survey of Livestock Management in Northern Ireland, 1959*, (HMSO) gives an average of 547 gallons per cow.

It is at once apparent that in terms of grazing units, the large number of sheep in New Zealand far outweigh the smaller number proportionate to acreage of the cattle, and the smaller numbers absolutely of pigs, poultry and horses. The net result is nearly $2\frac{1}{2}$ times as many grazing units on $1\frac{1}{2}$ times as much cultivated land plus rough grazings. Further, it must be remembered that a high percentage of all livestock units in Ireland, especially in Northern Ireland, is made up from pigs and poultry, which are largely fed on purchased feed. Table 6 shows the rate of stocking if pigs and poultry are omitted.

TABLE 6.—LIVESTOCK UNITS EXCLUDING PIGS AND POULTRY

	New Zealand	Ireland	Eire	N. Ireland
Per 1,000 acres crops and grass + 1/5th rough grazings ...	490	300	292	325

Even with pigs and poultry being given full value the average number of livestock units per 1,000 acres in Ireland is only 336. A realistic value for Northern Ireland, obtained by allowing one-quarter of the feed required for pigs and poultry as being home-produced, is 355. This is still a long way short of the New Zealand figure of 490, or 496 including pigs and poultry.

It will require the agricultural specialists to say whether the Irish average could with good results be advanced to close this large gap with New Zealand. I will only add in passing that in New Zealand the density of livestock is widely held to be capable of considerable further increase.

Prices of livestock products

From the point of view of the farmer, livestock units have their ultimate significance in their profitability. Here the New Zealand farmer is at a disadvantage compared with his counterpart in Ireland. Distance from the market and restriction in meat and butter to frozen produce mean that he must accept lower prices if his products are to sell in competition with their fresh equivalents produced close to the market.

Roughly comparable figures are given in Table 7 :

TABLE 7.—REPRESENTATIVE AVERAGE FAT STOCK PRICES

Category	1957	1958	1959	Source
CATTLE :				
New Zealand Ox—schedule price quotation (per cwt. dressed carcase weight) .	94s. 7d.	133s. 5d.	144s. 9d.	a
do.—(per cwt. live-weight)	51s. 0d.	72s. 0d.	78s. 1½d.	b
Dublin, fat cattle :				
per cwt. dead-weight . .	212s. 3d.	223s. 6d.	232s. 0d.	c
per cwt. live-weight . .	121s. 3d.	127s. 9d.	132s. 6d.	a
N. Ireland, fat cattle .				
per cwt. live-weight	142s. 1d.	144s. 5d.	139s. 2d.	d
do. excl. guarantee payments	112s. 8d.	134s. 2d.	136s. 0d.	d
FAT LAMB :				
New Zealand—schedule price per 1 lb. carcase weight . .	26d.	20½d.	18½d.	a
Dublin, per 1 lb. dead weight	31½d.	30d.	26d.	c
N. Ireland fat sheep and lambs per 1 lb. estimated dressed carcase weight	35½d.	35½d.	35½d.	d
do. excl. guarantee payments	29½d.	29d.	22½d.	d

Sources : a. Commonwealth Economic Committee, *Meat* 1960 H.M.S.O. (1961).

b. do. assuming killing-out percentage of 54.

c. *Statistical Abstract of Ireland*, 1960.

d. Supplied by Livestock Marketing Division, Ministry of Agriculture for Northern Ireland.

Farm size

Some comments have already been made concerning the size of farms in New Zealand. That New Zealand farms are generally larger than their Irish counterparts is well-known, and Table 8 gives a brief comparison.

TABLE 8.—FARM SIZE

Acres	Per cent. of all farms over 1 acre in		
	New Zealand (1957)	Eire (1955)	Northern Ireland (1957)
1- 10*	13.9	17.9	21.6
10- 50	12.3	56.2	56.9
50-100	14.1	16.6	15.9
100-200	21.2	7.0	4.4
Over 200	38.3	2.2	1.2

* New Zealand : 1 and under 10, etc. *New Zealand Official Year Book*, 1960.
Eire : Above 1 and not exceeding 10, etc. *Statistical Abstract of Ireland*, 1960.
N. Ireland : 1 acre to 10 acres, 11-20, etc. *Ulster Year Book*, 1957-59.

in brief, whereas over half the farms in Ireland are of between 10 and 50 acres, only one-eighth of the New Zealand farms fall within this group. Nearly 60 per cent. in New Zealand exceed 200 acres compared with 9.2 per cent. in Éire, and 5.6 per cent. in Northern Ireland.

Thus, the New Zealand farmer with heavy stocking also has a good many more acres, and can carry many more livestock to offset the lower prices that he can command.

Finally then, we may look at the net result of all these factors, the income available to the farmers.

Income of farmers

For comparison of farmers' incomes we have available income surveys for various types of farms in New Zealand, published annually;¹ the financial results of the National Farm Survey in Ireland for the years 1955-56 to 1957-58² and the results of the sample enquiry conducted annually by the Ministry of Agriculture for Northern Ireland.³ Strict comparison is not possible because of the variation in the form of each survey, the size and structure of the samples and the differences between superficially similar types of farming. Also, it must be borne in mind that the same amount of net income in each of the countries has different purchasing power, though the position is simplified by the British, Irish and New Zealand pounds being equal in exchange value.

We must recognise then that only limited conclusions may be drawn from any comparison of incomes, but if a comparison of farming in the three areas is to have meaning in terms of the living provided for its adherents an attempt must be made. I have selected for comparison in the first instance the "dairy farmers" of New Zealand, the Irish group, designated "dairying, mixed, with cash crops," and the Northern Ireland "mainly dairying" group. The New Zealand group comprises only dairy farmers, and excludes cases where the farm is owned by a company, a partnership, or a small part-time dairy farmer. The term dairy farmer is used as applying to dairy factory suppliers, and excludes town milk producers, but in explanation of this practice it may be noted that the majority of dairy farmers in New Zealand are supplying factories. A farmer is also included only if the gross income from dairy farming products and pigs is at least 90 per cent. of the total gross income.

In the Irish survey the major group "Dairying" is sub-divided into

- Mainly Dairying;
- Dairying Mixed—without cash crops;
- Dairying Mixed—with cash crops.

The first of these sub-divisions would compare most closely in

¹ Supplements to the *Monthly Abstract of Statistics*.

² Supplements to *Irish Trade Journal and Statistical Bulletin*.

³ Summary results are published in the *Monthly Report* of the Ministry of Agriculture, renamed *Agriculture in Northern Ireland* from September, 1960.

type of farming with the New Zealand dairy farms, but figures are not published in this sub-division for farms of over 100 acres. Consequently, although reference is made later to this sub-division in a comparison of medium-sized units, for the initial comparison I have chosen the third sub-division, for which figures relating to farms of 100-200 and over 200 acres are available. It may be noted that according to these average figures this is the most profitable sub-division in dairying in each size-group given, and is also more profitable than any other type of farming in the corresponding size-group (with one minor exception). In this Irish survey no figure is given for all size-groups combined so it is necessary in Table 9 to quote the range.

TABLE 9.—ANNUAL AVERAGE INCOME OF DAIRY FARMERS
1955/6—1957/8

Category	New Zealand	Eire			N. Ireland (average 77 acres)
		acres			
		15-30	100-200	Over 200	
		£			
* Gross income ...	3,067	909	2,766	4,217	3,326
* Total farm expenses ...	1,724	335	1,512	2,558	2,452
* Net income ...	1,343	575	1,254	1,659	874

*Differences in the corresponding terms in the three surveys are not important. Net income is in each case the sum available, after all farm expenses have been paid, for the remuneration of the farmer for labour, management and interest on capital invested by him in the farm.

This comparison shows that the average dairy farmer in New Zealand has a net income (£1,343) approximating to that of the average Irish dairy farmer with 100-200 acres (£1,254). The average for Northern Ireland dairy farmers of this size group is not published but in the group "over 100 acres" for all types of farm it is £1,183 (not shown in the table). The average for dairy farms of smaller size groups in Eire, and the average for all dairy farms in the Northern Ireland sample are both well below the New Zealand average.

In the summary of the survey of the New Zealand dairy farmers' incomes three size groups are given, division being according to the number of cows. The smallest group is 0-39 cows and the figures for this are compared in Table 10 with the Irish survey groups "mainly dairying" 30-50 and 50-100 acres, which between them include most farms of acreage comparable to the New Zealand group. Indeed, the average number of cows in the New Zealand group is 31, which would normally be carried on about 50 acres.

TABLE 10.—INCOME OF SMALL-MEDIUM SIZED DAIRY FARMS

Category	New Zealand 0-39 cows*	Ireland		N. Ireland av. 77 acres
		30-50 acres	50-100 acres	
		£		
Gross income ..	1,681	754	1,276	3,326
Total expenses ..	817	211	524	2,452
Net income ..	864	543	751	874

* 1957-8 only.

Sources as for Table 9.

The table shows that the average New Zealand income in the group is some 40 per cent. higher than in the Irish 30—50 acre group, and would be much higher than this but for the very low expenditure on the Irish farm. The New Zealand figure is also higher than the Irish 50—100 acre group. The Northern Ireland net figure for farms averaging 77 acres is also higher than that of the 50—100 acre group in Eire, and very close to the 0—39 cows average for New Zealand.¹ Most farms of the 50—100 acre size-group in New Zealand, however, would have many more than 39 cows. Most of them would in fact come into the 40—79 cow category, for which the average *net* income is £1,412.

From these tables although the statistics are not strictly comparable, it is clear that the New Zealand dairy farmers have higher net incomes as well as higher gross incomes and expenditures than their counterparts in Ireland.

To report further detailed comparisons must be judged beyond the scope of this paper. I will merely add that dairy farming is by no means the most profitable form of farming in New Zealand. Sheep farmers between 1956 and 1958, working with much larger acreages in general, achieved an average net income of £2,556.

The last section of this paper has, rather laboriously, confirmed statistically the general impression that I obtained in New Zealand, that the farmers there have a much higher standard of living than those at home. But for subsidies and preferential treatment in rates and taxes for farmers in the British Isles the gap would be much larger. It would be in the economic interests of Ireland if the gap could be reduced. Some increase in incomes could probably be achieved by stocking the land at a higher rate. Even in the case of dairy cows, with the market for liquid milk and butter virtually saturated, this would have economically desirable results if the smaller producer could be eliminated from milk

¹ The reason for the differences between the gross income and total expenses amounts in the Northern Ireland group compared with the Eire groups is not apparent to the author.

supply.¹ If this occurred, however, what would be the alternative for the small farmer, with competition so high for bacon, an ample supply of eggs, a climate unsuited to grain and lower profit per acre with beef cattle?

I believe, however, that there are other, as yet little tried, possibilities. Does not the emphasis on sheep in New Zealand suggest that we should examine sheep-farming more carefully? The Irish farmer can command higher prices for home produced lamb than can the New Zealand farmer for his exports. A few weeks ago we learnt that the British wool crop was fetching the highest prices on the world market. Until recently British wool has been considerably cheaper than Dominion varieties. Now "with the fashion trend away from fine fabrics" the British Wool Marketing Board says that the market has swung in favour of the medium and coarse wools, which form the bulk of British production. In recent months it has been sold at a premium of up to 6d. per lb. above Australian wools. The net average guaranteed price to producers in Britain this season will be 48½d.

With advantages both in meat and wool of this degree in Northern Ireland and not greatly inferior in Eire, there would seem to be a firm case for examining the possibilities of stocking at a high rate on limited areas of land. Fat lamb production from intensive summer grazing with creeps for the lambs on to grass denied to the ewes has been shown to be capable of producing outputs of £50 to £60 of fat lamb per acre, with a summer stocking rate of 6 to 7 ewes per acre. Proponents of the system claim that outputs can be raised still further and that fears of parasites, unthriftiness, and the problem of management of large flocks on limited areas deter farmers. There is no denying, however, that outputs per acre of over £40, with attendant profit margins per acre of £20 and upwards should be a considerable incentive to experiment.²

The alternative to developing new and more intensive methods of farming can, I feel convinced, be only much more drastic amalgamation of farms into larger units which can operate economically on a lower profit margin per acre. More extensive farming, however, means less employment for people on the land with consequent increase in Ireland's major social problem, unemployment, which, in turn, if we are realistic, can probably be solved only by increased emigration. The choice then, I suggest, if standards of living are to be improved, is between reduction in the numbers of people living on the land and the adoption of new and possibly revolutionary methods of farming.

ACKNOWLEDGMENTS

The author wishes to acknowledge help given by the New Zealand Department of Lands and Survey, the Central Statistics

¹ The *Survey of Livestock Management in Northern Ireland* (1959) found that the average herd-size on farms selling milk in its sample was only 9.68 cows.

² K. Dexter and D. Barber present this case forcefully in comparison with all main types of farming in *Farming for Profits*, a Penguin Handbook, 1961, pp. 189-190.

Office, Dublin, and the Ministry of Agriculture for Northern Ireland. Financial assistance was given by the Queen's University of Belfast towards fieldwork in New Zealand in 1960, when the author was Visiting Lecturer in the University of Canterbury, Christchurch, and in meeting the cost of illustrating this paper. Plates 1, 2, 4 and 5 are reproduced by permission of the High Commissioner for New Zealand, London, and Figs. 1, 2 and 3 are based on maps in *A Descriptive Atlas of New Zealand*, Government Printer, Wellington, 1959. The author alone is responsible for all interpretations.

DISCUSSION (BELFAST MEETING)

Mr. W. J. Traill, of the Ulster Farmers' Union, in proposing the vote of thanks said they had heard a very interesting paper. Northern Ireland agricultural problems must be looked at in a different way from those of the South of Ireland, but both have basic differences when compared with New Zealand. Farms are smaller and there is greater density of population. With the large number of small farms there is a lack of capital necessary to achieve maximum efficiency on a national basis. Also, a striking difference, New Zealand is primarily an agricultural country and it is Government policy to promote production for export. In Northern Ireland, the Government is not so concerned. New Zealand's experience and intentions may not be achieved here because of difference in Government policies. If we could reduce our costs, improve net profits, and encourage farmers to specialise and produce more intensively in some commodities agricultural production would rise. Dairy farmers do not get adequate encouragement and egg producers would like to produce more but are not encouraged in Northern Ireland. Farmers have not all the efficient shipping facilities they need. Northern Ireland is dependent on the U.K. market but it would appear to be Government policy to give free access to the traditional suppliers, therefore, farmers face keen competition. New Zealand knows exactly what this is, having to accept low prices for butter.

Mr. Atkinson, in seconding the vote of thanks, said that the paper was most interesting and the slides extremely good. Mr. Traill was put on the defensive and that was a great tribute to a provocative paper. There are fundamental contrasts in the historical background of the countries discussed. In Northern Ireland we have small farms bedevilled by lack of capital, climatic conditions and the past difficulties of the farming community. Our average unit is smaller than in New Zealand and if small farms could be formed into more economic units this would help, but it can only be done very slowly, and whether Government action can play much part in this is doubtful. It appears that New Zealand goes in for bulk development and large-scale invest-

ment in the land. The scope for spectacular development is not as great here, though more might be done in some ways, e.g., in improvement of grasslands. The New Zealand authorities are also encouraging the search for new markets particularly in the United States, and have made great efforts to increase lamb sales there—a beef country. We could follow New Zealand in increasing our numbers of sheep and lambs and we could become more competitive in price. There seems to farmers no reason why we in Britain should have to import so much food but imports have helped in the economic policy of keeping prices low. Our problems cannot be solved easily. We are landed with this small farm problem with many holdings making losses or only very small profits and growth is handicapped.

Dr. Symons expressed thanks for the comments made. He said that the New Zealand farmer would not agree with Mr. Traill that U.K. farmers do not receive adequate encouragement from the Government. They are very conscious of the level of U.K. subsidies and deficiency payments. It is true that New Zealand farmers have some advantages and are encouraged to exploit them, to produce the commodities for which they are best suited and to market them through producer boards. But the New Zealand farmer has ultimately to rely on his own efforts and up-to-date methods. He must keep his costs down. He is confident that he can compete with anyone on open terms in the U.K. market and could undersell in most commodities the home producers if the European markets were not protected. Naturally, he views the possible entry of Great Britain into the Common Market with great concern, as he stands to lose his traditional access to British markets on special terms without corresponding gains in Europe.

Dr. Black asked *Dr. Symons* if he could tell the meeting a little more about land tenure in New Zealand. Could a newcomer expect to acquire a substantial holding?

Dr. Symons replied that the general policy was to foster owner-occupation. In the early days large tracts of land were bought from the Maoris and sold in lots to settlers. Other lands, especially large pastoral runs, were let on leases by the Government. It is not easy for the newcomer today to obtain land because prices are high. In the State schemes balloting is the means of selecting occupants for newly created farms but returned servicemen are given preference. Long-term loans are available to assist purchase of farms.

Dr. Black thanked *Dr. Symons* for an extremely interesting and well illustrated paper. The discussion, he said, had been lively and well informed and he thanked also the other speakers who had taken part.

DISCUSSION (DUBLIN MEETING)

Dr. M. Neenan : Mr. Chairman, I am happy to propose a vote of thanks to Dr. Symons for the excellent lecture which he has just delivered. You will agree, I think, that he has provided us with a graphic description of that most interesting country.

I am no doubt expected to make some comment which will provide a basis for discussion. This being a statistically minded Society, great accuracy is expected so I will begin by drawing attention to a few points, which might bear with some verification.

I think the reason for so few pigs is lack of building and cereals material such as straw, rather than shortage of skim milk. The impression is given that there are large areas of Tussock grasslands in the North Island—actually there is only about 1 per cent. of the North Island under tussock (figures from the Soil Survey).

I have great doubts about the sentimental ties between Britain and New Zealand especially since the United Kingdom now seems likely to walk out on New Zealand by joining the Common Market. I think that New Zealand has been treated very much as a colony providing Britain with cheap food.

I cannot entirely agree with the suggestion that New Zealand can without the aid of subsidies undersell all their European rivals. New Zealand farmers do not receive any direct subsidies, but they do receive quite a lot of help from Government sources in other directions.

For example, State Advances (the Agricultural Credit Corporation of New Zealand) lends money at very low interest rates and with the minimum of security. When I visited New Zealand the rate of interest was in the region of 4 per cent. at a time when the Agricultural Credit Corporation in this country was charging 6½ per cent. This interest was subsidised by the Government.

It is an old saying that it takes money to make money. This is so in farming. To farm efficiently one needs capital for seeds, fertilisers, machinery. Most important of all our needs, is credit to purchase the additional livestock which are necessary to utilise the improved pasture. Here at home if a farmer manured all his grass he could perhaps double his yield in a matter of 4 - 6 weeks. He would have no hope of getting the additional cows or cattle to eat this grass. By the time the Banks would have given this, the grass would have rotted into the ground. We all have seen this happen with the Land Project Fertiliser Scheme. This same Scheme gave excellent results in tillage areas like Wexford in which credit for seeds (the only essential) could readily be obtained. This ease with which credit could be obtained in New Zealand is, I think, one of the major factors of success.

The main criticism one could make of the New Zealand farmers is that they sold their butter at 3/- a lb. or little more during the War and put by the surplus for the rainy day. These funds which

amounted to about £25 million were paid out to farmers over the past four or five years. This is much the same thing as a subsidy.

Furthermore this £25 million was not left lying idle—it was lent to farmers co-operatives at about 1 per cent. interest for setting up fertiliser factories and for the purchase of aeroplanes for aerial top dressing. There is also a cheap source of rock phosphate from Christmas Island—this was acquired by conquest during the last war, probably at some expense to the Government.

In brief, therefore, there is a certain element of subsidisation in New Zealand butter.

I think it is relevant also to mention the enormous volume of agricultural research which goes on in New Zealand. At Ruakura you have what I believe to be one of the best animal research stations in the world. There are in all over 20 major research stations in New Zealand—Ruakura alone costs (in 1956) £600,000 annually.

To get back to some of the main points of the paper, I could not agree more with Dr. Symons when he points out that the major difference between Ireland and New Zealand is in the number of stock units per acre. Dr. Symons estimates that Irish pastures carry one cow (or its equivalent) for every 2.8 acres. Our figure for the 26 Counties is 2.6 which is virtually the same. Dr. Symons' data would suggest that New Zealand pastures carry one cow per 1.8 acres—Smallfield's paper at the 7th International Grassland Congress suggests 1.85 acres which is the same thing. New Zealand pastures therefore are 50 per cent. more productive than ours. In Ireland a cow has been kept on as little as 0.8 acres (with high fertilisation).

Recent data produced by the Grassland Division of the Institute have shown that with phosphates we can increase the yield by 20 per cent., potassium 7 per cent, and nitrogen 15 per cent. Stated another way 1/- per acre invested in phosphates will increase the produce of the average pasture by 1 per cent ; for the same increase 2/- must be invested in nitrogen, and 4/- in potassium. With a suitable combination of Lime, P, K and N, the output of any reasonably dry pasture in this country can be increased by 50 per cent.

Two other points in the paper deserve special mention—firstly that there is no great reduction in efficiency as the size of farm is increased. The figures quoted show that, in fact, the larger farmer is the better farmer. This is also the experience in a survey which the Institute is carrying out in West Cork. In this survey butterfat per cow is higher on the larger farms. One would have thought that the man with the smaller herd would give them more individual care and feeding and so get better results. The reverse has been the case. This may be because the larger farmer can afford to buy better heifers or can afford to feed the good cows up to their full potential. I have been very interested in the point brought out by Dr. Symons that the Irish 100-200 acres farmer approaches within 12 per cent. of the average New Zealand farmer.

Finally there is the question of specialisation. If the mixed

farmer is to be properly equipped for all his activities, the cost of depreciation would exceed his output. As a result, the farmer who can afford a milking machine cannot afford a silo-pit; the farmer who has a range of implements for tillage work cannot afford buildings to fatten pigs, and so on.

The New Zealand farmer being specialised can afford to be equipped efficiently for one enterprise, without at the same time having too high outgoings due to depreciation. Specialisation is risky, but a great deal of this risk in the way of plant or animal disease can be eliminated by research.

I will conclude, therefore, by saying that I found this paper most stimulating and I trust that Dr. Symons will continue his enquiries on this important subject.

Dr. V. E. Vial. Mr. Chairman, Gentlemen, I am grateful for the opportunity to concur with Dr. Neenan in moving a vote of thanks to Dr. Symons for his most comprehensive paper. It is true I am a New Zealander, but it's 10 years since I left home, and conditions have changed considerably in that time.

Firstly, I must take up Dr. Neenan on his statement that New Zealand's dairy industry enjoys a subsidy. In fact, the consolidated Fund which has been used since 1956 to bolster butterfat prices was built up from contributions from the dairyfarmers themselves at a time when butterfat prices were sound. It was not a charge on the taxpayers, but a most reasonable system for smoothing out the troughs and peaks in returns to the dairy farmer.

Perhaps the most striking difference between the systems of farming in Ireland and New Zealand is the productivity per man. The guaranteed price for butterfat in New Zealand is based on the "average efficient unit" of 1 man to 64 cows. The servicemen from the 1939-45 war were settled on sheep farms of such a size that each man would have an 800-ewe unit. Lowered productivity per cow and per ewe is offset by this very high productivity per man on large farms.

Another big difference is that New Zealand is quite convinced, and has demonstrated, that land development can pay its way. Dr. Symons points out that cost per acre of development ranges from £30-60 per acre, yet, New Zealand's Land and Survey Block Development Department had a profit of £0.87 m. for the 5 years' operations up till 1960. To my mind, much of the development attempted in New Zealand has presented greater technical problems than has bog reclamation in Ireland. Nothing would do more to promote expansion in agriculture in Ireland than a scheme which would enable us to carry more breeding ewes on the hills and, at the same time, allow some improvement of upland grazings. New Zealand has a very real disadvantage as a lamb producer in that she has an economy based on low-fertility Romney ewes. For every lamb produced either for sale fat, or as a flock replacement, she has the overhead on one ewe. Ireland has high-fertility Scottish Blackface ewes on the hills, capable of producing at least

1½ lambs per ewe. Through bad management, neglected pastures, commonage grazing and lack of capital the Irish hill farmer weans between 55 and 70 lambs for every 100 ewes put to the ram.

The changing pattern of meat merchandising has led to the development of primal cutting of all forms of meat, in place of the traditional carcass trade. New Zealand has shown that her well-known Down 2—a 26 to 32 lb. carcass from Romney X Southdowns—is unsuitable for primal cutting: the loins are much too small for separate chops, and the only lamb New Zealand can export as primal cuts is the overweight, second-grade 40 lb.-plus carcass. Ireland's planners should bear this in mind when formulating a national sheep policy and exploit the potential of animals which have a large mature size and grow fast, and kill them at an early age: the Galway, half-bred and Greyface flocks would appear very much more useful for this trade and allow diversification at present denied the New Zealand sheepfarmer.

We all know the difficulties in finding a market for butter. Ireland can learn a great deal from New Zealand in this respect and should look upon her Shorthorn dairy herd as a mixed blessing. Whilst our production per cow is deplorably low, at least we can utilise the milk in a variety of ways, including drying, condensing and soft cheese manufacture. New Zealand is stuck with 2 million Jerseys producing milk of the wrong quality for cheese and for drying. Furthermore, the cull cows are useless for beef despite attempts to disguise the Jersey with a dash of Aberdeen Angus blood. Perhaps Dr. Wm. Hamilton, Dr. McMeekan and the other leaders of the New Zealand dairy industry realise now the implications of over-specialisation. Ireland should go all out to exploit the genetic potential of the Friesian to topcross on to her mediocre Shorthorns, forget about the term "dual purpose" and regard her beef industry as a by-product of the national dairy industry. Dairy beef with its 20-30 per cent. carcass fat is more acceptable to the U.K. and the continental market than Shorthorn, Hereford and Angus crosses with 50 per cent. carcass fat.

Finally, might I elaborate a little on the question asked earlier "How does New Zealand ship lamb 12,000 miles and still compete with English farmers on their own home ground?" Perhaps it is not realised that the bulk of New Zealand's lambs are slaughtered at less than 20 export freezing works. Such units may kill 20,000 lambs a day, continuously, for 5 months. The carcass meat may not make a profit, indeed is often sold at a loss, which is offset by properly organised by-product marketing. Livers, edible and inedible, hides, slipe wool, sausage casings and pharmaceuticals are all produced, blood is collected and dried and nothing is wasted. These are the spheres of activity by which the New Zealander could teach his Irish counterpart the fundamental theorem that a 75 lb. lamb has more to him than 32 lbs. of carcass meat. River pollution in Ireland means dead fish and obnoxious smells. In New Zealand it means loss of profit and is just not tolerated.

With these few observations, Gentlemen, might I conclude by saying how pleased I am to second this vote of thanks to Dr. Symons for his most stimulating paper.

Dr. R. O'Connor : I would like to be associated with the vote of thanks to Dr. Symons for his most interesting and informative paper. It is very useful to have papers of this nature read to the Society as they give us a picture of what is happening in other countries and develop ideas concerning some of the things we should be doing here. On the 25th November, 1943, Dr. Beddy read a somewhat similar paper relating to Danish Agriculture. Beddy's paper had a very profound effect on our thinking at the time. Let us hope that this one will have a similar effect.

The figures given in this paper show that in comparison with ourselves New Zealand has a very high rate of stocking per acre. We must be careful with international comparisons of this nature, however, since the conditions in the two countries while in many ways similar are very divergent in some respects. Though the mean annual temperature in the two countries is not very dissimilar the climate in the North Island of New Zealand is much kinder than ours. Apart from the Central Plateau the winters in the North Island are very mild and in many places pastures maintain almost continuous growth. This is a wonderful advantage. It would appear also that the soils of New Zealand are inherently more fertile than ours. Practically all the fertiliser applied in New Zealand is superphosphate and the rate of application is only about 2 cwts. per acre. In Ireland this rate of application would be considered very low. Usually about 4 cwts. per acre are recommended for pasture. Nor can it be said that New Zealand has built up her fertility over the years and has now only to maintain it. Nature seems to have endowed the fertility, for in pre-war years only one-eighth of her total area of crops and grass received fertiliser. Today about one-third of this area is fertilised but the rate of application has never been sufficient to build up fertility on inherently poor soil. Actually in 1959 New Zealand farmers applied a total of only about 717,000 tons to lowland pastures (excluding aerial topdressings on the hills). In the same year in Ireland our total application of fertilisers of all kinds to tillage and pasture was about 618,000 tons. When it is considered that our acreage of crops and grass is only about half that of New Zealand and that our rate of fertiliser use is low by European standards the New Zealand figure must be regarded as surprisingly low for a country with such a high stock carrying capacity. It should be mentioned however, that in recent years a further 3.4 million acres of hill land is annually fertilised by aerial top-dressing. About 450 thousand tons of superphosphate are applied by this method.

Though New Zealand is usually classed as an agricultural country only about 22 per cent. of her national income arose in the agricultural section in 1954. The corresponding figure for Ireland

in that year was 27 per cent. (more up to date figures are not readily available for New Zealand). The proportion of national income accruing to industry in New Zealand was 32 per cent. as against some 26 per cent. in Ireland. Industry in New Zealand is, however, considerably based on agriculture, the meat packing and milk processing industries being very important. New Zealand exports consist mainly of three commodities: wool, dairy produce (mainly butter) and meat (mainly lamb). This is not the type of economy which one would feel too happy about at present. Butter is becoming very difficult to sell profitably, wool is fighting a very stiff battle with synthetic fibres, and at the present time, there is only one really important outlet for lamb in the world, namely, the British market. New Zealand is, however, developing other markets in U.S.A., Canada, and Japan. In 1960, she exported 15,000 tons of mutton and lamb and 2,800 tons of beef to Japan. This is considered a most important development since with rising standards of living it is expected that the Japanese will become large meat importers.

The figures for dairy cow numbers shown in Table 2 of this paper are not directly comparable with Irish cow statistics. The Irish figure of 1,272 thousand cows includes all cows in the State. The New Zealand figure of 1,932 thousand cows represents so called dairy cows only. There are a further million beef cows in New Zealand included with other cattle in Table 2 so that in all there are about 3 million breeding animals in that country. Thus, cows form about 50 per cent. of the total cattle herd in New Zealand as against about 30 per cent. here. Over 1,000,000 calves are slaughtered in New Zealand each year, a fact which contributes to the high cow/cattle ratio.

The lecturer says that there is little skim milk available for pig feeding. Nowadays, skim milk may not be separated on the farms but it certainly seems to be available in the country generally. According to the most recent C.E.C. Bulletin on Dairy Produce, New Zealand produced 762 million gallons of skim milk from butter making in 1958/59. Of this, 292 million gallons were used for manufacturing leaving 470 million gallons for food and feed. Allowing for human consumption the balance if fed to pigs, would supply every pig produced in New Zealand in that year with over 2 gallons per pig per day. Our nutrition experts claim that $\frac{1}{2}$ gallon per pig per day is adequate. Lack of skim milk, therefore, can hardly be considered as being in any way responsible for low pig numbers in New Zealand.

Dr. Symons: I am gratified by the interest shown in this subject. So many points have been raised that to deal with all of them now would hardly be practicable so I trust I shall be forgiven if I reply only to some of them.

Regarding statistics *Dr. Neenan* quotes a figure, which he ascribes to the Soil Survey, of only 1 per cent. of the North Island as under tussock. According to the Farm Production Statistics

(1958)¹ tussock and naturally established *Danthonia*² covered 6.6 per cent. (1,175,000 acres) of the *occupied* area of the North Island. The total unimproved occupied land exceeded six million acres. In the South Island the tussock and *Danthonia* areas occupy over twelve million acres. The significance of the magnitude of these areas is their hint of the challenge offered to improvers.

Dr. O'Connor points out some absence of the comparability of the statistics for cows in New Zealand and Ireland. It may be noted, however, that the exclusion from the New Zealand figure of cows other than dairy cows in milk results, in my calculations, is a conservative estimate of the livestock units attributed to cows. Giving them their full weight in grazing requirements would increase the disparity in rate of stocking between New Zealand and Ireland.

It is true that the climate of New Zealand is more favourable, on the whole, than that of Ireland. To compare only with the North Island is however a little unfair to the Southland farmers who produce at equally low prices in a climate much more like ours. In any case my purpose is not to say "this is what is done in New Zealand, it ought to be done here". Rather is it my object to indicate the highly competitive organisation of farming in New Zealand, to suggest the extent to which home producers are dependent on their geographical advantages of nearness to markets and subsidies to maintain their position, and to hint at the increases in produce of which New Zealand is capable.

There seems to be general agreement that Irish agriculture is handicapped by the smallness of the farm unit. The problem of amalgamation is, of course, beset by numerous problems of a political as well as an economic nature, but I think it is economically necessary that amalgamation should continue and should be officially encouraged. Dr. Vial's point about improvement of upland grazings is linked with this question of size of unit, and consequent lack of capital as well as the survival of commonage. Some years ago I presented a paper to this Society on the use of the Ulster hills,³ and illustrated the continuing predominance of holdings of utterly inadequate size, and the deterioration of land with unbalanced grazing. As far as I am aware there have been few changes, except where the Hill Farming Scheme has been taken up by farmers able and willing to invest in improvements, and these are mainly to be found on the larger farms. Compared with the 800-ewe ex-Servicemen's unit mentioned by Dr. Vial, the position in Ireland is illustrated by the 1952 Hill Sheep Subsidy figures, only 145 hill flocks in Northern Ireland then having over 200 ewes, as against 2,550 flocks with fewer.

¹ *Report on the Farm Production Statistics of New Zealand, 1957-8*, Department of Statistics, Wellington 1959, p. 66 and p. 69.

² *Danthonia* spp. are accepted as "tussock" vide V. D. Zotov, *Survey of the Tussock Grasslands of New Zealand*, *N.Z. Jnl. Science and Technology*, XX, 4a, pp. 212a-244a, 1938.

³ L. Symons, *Hill Land Utilisation in Ulster*, *Jnl. Social and Stat. Society of Ireland*, Vol. XIX, 1955-6, pp. 58-81.

I am grateful to Dr. Vial for having shown clearly that the New Zealanders have made their mistakes, and serious ones at that, and that in spite of these mistakes it is high productivity per man and avoidance of waste that enables them to compete from a distance of 12,000 miles. I have no doubt that Dr. Vial could deal more adequately than I with the reasons for New Zealand having so few pigs, and I will, therefore, ask him if he will be so good as to say a few words on this subject.

Dr. Vial : My own impressions are that the New Zealander's dislike for the pig is fundamental. As far as skimmed milk is concerned the manner of its use is different from here. Those few co-operatives and bigger pig farmers in New Zealand who feed skim think nothing of calculating sow requirements at 4 galls./sow and 1 gal./piglet up to a daily maximum of 16-18 galls, the only other source of feed being good pasture. In nearly every case the only meals fed will be barley meal—meat meal creep ration, and perhaps some barley meal in the last couple of weeks of finishing. The New Zealand dairy farmer with pigs is not a pig specialist in any sense. He crosses shamelessly between Berkshires, Large Whites and Tamworths, hoping all the time to get the best of both worlds by finishing his first litter each year as baconers on skim, and the second litter as porkers on skim, grass and roots; he tends to change overnight, as it were, between baconer and porker production. His grading might be bad, but, since he needs no housing to speak of, and since feed efficiency has very little effect on his profitability, the pigs are remunerative to those few farmers with them. They would like to have Large Whites but because of sunburn are forced to use the dark-coloured breeds and crosses.

New Zealand had 750,000 pigs when I was at school, and, I see that, according to Dr. Symons' figures, that total hasn't changed much in 20 years. The New Zealander's dislike of pigs is so deep-seated that lamb, wool and butterfat prices would have to drop a long way below today's values to bring about any real change in breeding sow numbers.

P. Callinan : Having heard with much interest the paper by Dr. Symons, I am prompted to enquire as to the average price of good agricultural land in New Zealand. I understand it is higher than in this country, anything up to £150 per acre. Of course against this high price is that stock (except pigs and poultry) graze out all the year round in both North and South Islands. A good grade cow would be much cheaper than in Ireland—about half the price. Building where it has to be done is expensive; a solid type structure such as has been erected recently in Co. Offaly by the Irish Land Commission would cost £30,000. Another type building, which I believe is largely of timber and is erected as a farm dwelling house, costs somewhat less than £3,000. Climatic conditions favour the cultivation of grass land to an extent which is hardly possible in these latitudes.

Dr. Symons: The price of good agricultural land in New Zealand is another subject with which I do not feel sufficiently acquainted to be able to quote fully representative figures, but I agree that it is true that land is expensive and so are buildings. It is clear, however, that high fixed costs do not make cheap production impossible provided other costs can be kept low. This is facilitated by holdings being large enough for all costs other than that of land to be spread to an economic level.

Dr. Vial has already taken up Dr. Neenan's suggestion that New Zealand agriculture is subsidised in fact if not in name. I would merely add that any funds used to help particular agricultural exports at particular times in New Zealand must be derived from the agricultural industries themselves, since they earn over 90 per cent. of the country's overseas earnings. Using the proceeds of sales in years when prices were high to help out in years when prices are low can hardly be called subsidising the industry. The difference is that in Britain the subsidies for agriculture derive from non-agricultural sources. On the continent of Europe high tariffs protect agricultural products and there can be no doubt that if New Zealand produce were allowed free entry it could undersell the home product in most cases.

I entirely agree that New Zealand farmers appear to make the maximum use of their credit facilities, and in employing their capital. The governments of the country have had to back agriculture and facilitate borrowing because the farms are their only significant source of exports. It may be that we could benefit from a similar attitude here on the part of farmers as well as governments. Similarly, is there any reason why Ireland should not maintain agricultural research establishments equal to those in New Zealand? If this is one of the reasons for the success of New Zealand's farmers—and I accept that it is—the expenditure pays off handsomely.