# Developments *in Grassland Farming*

## *Potentialities in the Full Development of Grassland under Mesophytic Conditions En New Zealand*

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NEW ZEALAND is wonderfully endowed with its mesophytic and temperate climate to produce food (mainly flesh and fats) and clothing (wool) as primary staple articles for export.

The exportable surplus in 1946-47 was 262,670 tons of dairy produce, 347,700 tons of frozen meat, 10,000 tons of canned meat, and 167,800 tons of wool (1).

The outstanding feature of the animal products is that these are derived mainly froni in situ-grazed grasslands on a minimum of home-grown fodders and hay and silage derived from grassland.

In 1947 New Zealand fed 32,682,000 sheep, 4,634,000 cattle (of which 2,586,000 were dairy stock), 611,000 pigs, and 206,575 horses.

The acreage of supplementary feeds, roots, and fodders grown in New Zealand and used for stock food was only 638,436 acres in 1947, and the amount of hay and silage conserved from grassland was 991,866 tons of hay (500,000 acres) and 159,000 tons of silage (39,825 acres). In addition 42,642 acre's yielding 109,612 tons, mainly hay, was derived from lucerne or lucerne-grass combinations (2). Practically no imported concentrate foodstuffs are used nor are the cereal cropping areas within New Zealand drawn on with the exception that some autumn-sown cereals may be grazed before they are let go for a grain crop in the spring. The total grain crops of New Zealand in 1947 occupied 359,049 acres (144,006 acres wheat, 181,469 acres oats, 19,276 acres barley, and 14,298 acres maize) (2).

Practicaly the sole food of New Zealand's livestock comes from in *situ*-grazed grassland, all stock living out-of-doors day and night the whole year round. This factor contributes greatly, not only to lower costs of production and to a low labour demand, but the mere presence of the grazing animal at a high density per acre over the farm ensures a high turn-round of soil fertility ingredients -nitrogen, phosphate, potash, and lime-that are contained in the food eaten and which pass out in the dung and urine of the grazing animal. On the thesis of carrying sufficient well-fed animals under a controlled grazing technique to consume a large volume of herbage per acre and to excrete excess waste residues back uniformly on to the growing sward in sufficient quantities to cater for high continued production from the sward components our grassland economy is largely based. Our temperate climate, which permits of practically an all-the-year-round growth from a combined grass and clover sward, makes this economy feasible.

Refrigeration has made it possible for New Zealand to spread its products over the export year and yet to take full advantage of the power to coincide the high female-animal demand with the flush periods of pasture growth, with the result that the greatest possible amount of high-protein-content pasturage can be converted into dairy products, fat lambs, and prime beef for shipment abroad in fairly widespread consignments over the most of the year. This coincidence of flush of pasture. production and seasonal female-stock. demand is a vital part of our pasture economy.

Special-purpose pastures and grazing control, however, can figure progressively more prominently in sustaining a longer period of flush of growth to avoid undue herbage conservation practices which depreciate to a marked degree the potential value of the crop of grass produced on the farm.

Our researches in hay and silage making put that depreciation of value of conserved grass roughly at 50 per cent. for good hay and good silage with a corresponding greater loss in poorly-saved hay or badly-made silage. (10).

The manpower in New.- Zealand engaged in the primary agricultural industries is perhaps, per ton of food consumed,. the lowest in the world. Clark (3) estimates that net productivity per head in New Zealand is twice the Argentine level, nearly four times that of Denmark and the United States of America. and five times that of Britain. Climate, out-door grazing of stock, an extensive grazing practice, and the possibility to produce perennial high-yielding pastures by merely topdressing once or twice a year with phosphatic fertilisers, together with a full and adequate use

of machines, are contributory to the high per-man production in our primary industry.

In other words New Zealand agriculture is extensive rather than intensive, and until such time as a greater per-acre production is demanded by our national economy, by an increase in population on the land or by a world-wide search for more food, the cheap extensive system will dominate our farming practice.

With an intensive farming system in New Zealand involving a greater use of improved strains of grasses and clovers, more frequent break-up of old grassland and resowing of special-purpose pastures to provide more spread of flush periods of pasture growth to avoid some at least of wasteful conservation practices, with an increase of topdressing, with a greater control of the grazing animal, and with the higher labour supply that these entail, dairy, beef and fat lamb production on the lowland dairying and fattening country could be doubled in 10 years time, while the production of store stock, with an increasing amount of fat lamb and fat beef on the deforested hill country, could easily be doubled or trebled within a period of 10 years, provided also that phosphatic fertilisers were available at a reasonable price per ton and labour was available to clear scrub, fern,, gorse, blackberry, and other rubbish that abounds on the hills, to fence the country, to give a better control of stock, and to help generally with the management of that stock.

Some 5,000,000 acres of virgin country in scrub, fern, etc., still awaits development, and of this possibly half is capable of being ploughed and developed to milk or fat lamb production. Grassland research work has shown, and individual farmers have verified, that the above potentialities for development are not just wishful thinking but are capable of attainment.

By the use of the best grassland species and strains under a rotational system of grazing, and with reasonable topdressmg with artificial fertilisers, some 12,000 to 15,000lb. of dry matter per acre per annum can be produced in the more amenable climatic conditions of the North Island, and up to 9000 to 10,000 lb. dry matter in the somewhat longer and harder winters of the South Island (4). The North Island pastures are capable of producing 75001b. starch equivalent per acre per annum and up to 5001b. butterfat or 7501b. increase live-animal weight per acre per annum, with a somewhat corresponding decrease in the South Island (4).

Very large areas of the North Island hill country are capable of producing up to 60001b. dry matter, and a measured production of some 9000lb. dry matter per acre per annum has been recorded on the better slopes and ridges where stock habitually camp (11). This but serves to show that,, given fertilisers and a reasonable grazing management, much of our hills could be producing 6000 to 9000lb. dry matter or about 4 to 5 sheep, mainly ewes, plus cattle per acre.

Further, by increasing growth and carrying capacity by topdressing and the introduction of better clovers and grasses not only is production of growth increased, but also the food value of that growth can be doubled. This is shown in Table 1 (11).

This table serves to indicate the high potentialities for production in New Zealand under the mild and equable climatic. and mesophytic conditions that appertain over most of the country.

**Table 1**

| Hill country | Total dry matter per acre lb. | Crude protein Per acre Total lb. | Per cent. of D.M. |
|---|---|---|---|
| 1. No overseeding or manuring .. .. .. .. | 2909 | 327 | 11.2 |
| 2. With overseeding and manuring after 2 years .. | 5129 | 750 | 14.6 |
| 3. On stock-concentration areas . . .. | 9338 | 1700 | 18.2 |
| **Lowland country** | | | |
| 1. Grass without clovers and without return of dung and urine (Plots) .. .. .. .. .. | 1614 | 210 | 13 |
| 2. Grass without clovers with return of dung and urine (plots). .. .. .. .. .. | 3458 | 553 | 16 |
| 3. Grass with clovers and with return of dung and urine (plots) . . .. .. .. | 12410 | 3294 | 26.6 |
| 4. Grass with clover under lenient rotational grazing with sheep .. .. .. .. .. | 10739 | 2620 | 24.4 |
| 5. Run-out dairy farm, Kairanga .. .. .. | 5913 | 784 | 13.3 |
| 6. Grass with clover plus special-purpose pastures rotationally grazed with sheep . . . . | 11700 | 2504 | 21.4 |

**Table 2**
**FEED, AND FEEDING COMPARISONS PRE-WAR (1937)**

| Country | Grassland cut for hay and silage | | Roots and fodders | Imported feed | Days stall fed |
|---|---|---|---|---|---|
| | Acres | Per cent. | Acres | £ | |
| Great Britain | 6,574,000 | 33 | 1,476,000 | 31,000,000 | 160 to 180 |
| Denmark | 1,000,000 | 46 | 1,000,000 | 10.000.000 | 180 |
| New Zealand | 682,000 | 4 | 700.000 | Nil | Nil |

It is relevant in a treatise of this nature to offer some comparison between the potentialities of New Zealand and its way of farming with competitor overseas countries with their intensive stall-feeding methods of home-grown and imported feed-stuffs.

From Table 2 it is evident that New Zealand is self-sufficient as far as the feeding of its animals is concerned and, while it is admitted that the animal is an inefficient machine for the conversion of feeding stuffs into flesh, fats, and wool, yet it is this very inefficiency that assures. partly at least, that the soil fertility will not be depleted under the grazing animal, provided, of course, that its residues are returned to the land either automatically as it grazes its in situ feed or by efficient collection and spread of dung and urine from stall-fed animals. Country, however, and this has special reference to store-stock and wool-producing hill country, that is raising animals and quitting them for other country to fatten, must in. time deplete its fertility unless minerals are returned and clovers are grown to make good the loss that goes off the farm in the bodies of the store stock and annual crops of wool.

Countries which are high importers of grain and other concentrate materials tend to build their soil fertility, but woe become the lands whence those concentrate materials are grown and exported. The wide open spaces of the new world up to the last decade have been able to provide cheap grain for the densely-populated countries to convert into whole milk, butter, cheese, and fat stock either for internal consumption or for re-export. Maybe the economy built on this structure is warranted where milk and fats are in short supply compared with grain and its elaborated products, flour, bread, meals, etc., but it is an economy dependent on the whim, of exporting countries to sell their birthright as far as soil fertility is concerned; in this regard the broad expanses of marginal grain-producing land that has of recent years been converted into dust-bowls, forcibly impressed upon the community, may alter considerably a country's future policy as far as excessive grain production for export is concerned. Certainly export of grain must demand rebuilding of soil fertility and of soil structure. Large-scale contour-cropping systems and other soil-conservation measures must become an integral part of any such cropping system. Gone are the days of migratory. farming and of the rape of large continents of their virgin fertility and of the thin veneer of cover that just managed to keep the surface of the soil in place.

Grain producers will still produce grain, and methods to do so without permanent injury to the land will be devised, but on this basis of redeemed soil fertility the days of cheap grain for the concentrate feeding of stock may be over.

New Zealand grows annually some 360,000 acres of grain (wheat, oats, and barley) and the practice proceeded. without much thought to soil fertility maintenance for some 5 decades, at the end of which the yield of grain had dropped to about half its original per-acre yield and the "heart" had gone out of the soil. It was only by interposing grassland, constituted by persistent strains of grasses and clovers and grazed upon by stock in larger numbers per acre than hitherto, that soil fertility appreciated and crops of grain returned to and even surpassed their original per-acre yield.

-The New Zealand grain-growing belt in its natural state was dominated by tussock, equivalent ecologically to the vast prairies of the New World, but with a greater and more assured rainfall (some 25 to 30in. per annum). These areas, ploughed. cultivated, and sown to grass, will hold high-producing pasture for 2 to 4 years, and it is these short-rotation pastures that produce Prime Canterbury lamb and which rebuild fertility between the one grain crop, or series of grain crops, and another. Within these belts clovers thrive and are essential-red clover, white clover. subterranean clover, lucerne, lupins, and the like. Bulky, palatable grasses, mainly of the *Lolium* group, are used to associate with the clovers and to utilise effectively clover-given nitrogen and stock-returned nitrogen. Grass and clover seed production IS a feature of these cropping areas and tends to build fertility, but not at the rate of the grazed pastures on account of the sold-off seed crop and the

reduction of grazing while the area is shut up for seed.

In so far, therefore, as grain production for export or for domestic human consumption is indulged in by any country, so must be regarded as essential (if the land is to remain productively fertile from generation to generation) some rotation of crops, providing a legume (or fallow) for nitrogen intake, or combined clover-grass pasturage fed in situ by grazing animals, rotated advisedly to ensure full and efficient spread of the animal residues containing nitrogen, phosphate, potash, and lime that are in excess of the grazing animal requirements.

No country can export animal or animal products without some loss of soil fertility. The animal cannot create soil fertility; it can only convert, within 24 hours or so, excess nitrogen and minerals contained in consumed plants or plant products above those required for its body building and for products that are extracted from its system. The energy-giving foods, extracted by the plant from the air, provide energy for the animal's mechanical and vital functions of living, and in the case of the fully-grown animal, in putting on fat or in producing fat, there is no drain on soil fertility, animal fat being a derivative of plant photosynthesis elaborated into animal fat by physiological processes within the animal body.

Research in New Zealand by Sears, Goodall, and Newbold (5) has shown that fully-grown animals (wethers) fully fed and grazing on a 14,000lb.-dry-matter-per-acre pasture return per acre the following fertiliser ingredients in their dung and urine:—

| | | | | |
|---|---|---|---|---|
| Nitrogen | equivalent to that in | 25cwt. | sulphate of ammonia | |
| Potash | " | " | " | 17cwt. 30 per cent. potash salts |
| Phosphate | " | " | " | 7½cwt. superphosphate |
| Lime | " | " | " | 3cwt. carbonate of lime |

It has deen computed by reference to English standards (6) that stock remove in their carcasses or in their animal products the fertiliser ingredient equivalents as shown in Table 3.

In comparison with animals the drain on soil fertility when the total crop is removed from the land is shown in Table 4 on the next page (6), (11).

These observations bring out the vital question of the need for the ultimate return to the land of those elements extracted and lost to the land, particularly in regard to nitrogen, phosphate, potash, and lime.

The nitrogen can be made good by legumes. Measurements by Sears (4) at the Grasslands Division show that a sward of New Zealand pedigree white clover can extract from the air nitrogen to the equivalent of 1 ton of sulphate of ammonia per acre per annum. The minerals, however, must be provided from the world's stores and these should be regarded as more precious than gold. This is particularly true of phosphate and potash.

Recent research work at the Grasslands Division has shown the close interdependence of manurial elements once the supply of any one in the soil becomes insufficient for plant growth at a high-production level or for the potential expression of growth by any such plants (11).

**Table 3**

**SOIL FERTILITY DRAIN PER ACRE BY DISPOSAL OF ANIMAL PRODUCE OR CARCASS**

| Class of stock and nature of its products | Sulphate of ammonia lb. | Superphosphate lb. | 30 per cent. Potash salts lb. | Carbonate of lime lb. |
|---|---|---|---|---|
| 1. Milking cow at 600 gall. milk per acre, or 275lb. butterfat per acre. | | | | |
| (a) Whole milk sold off farm .. | 160 | 60 | 30 | 21 |
| (b) As cheese, the whey returned to farm .. .. .. .. .. | 140 | 35 | 3 | Nil |
| (c) As butterfat, skimmed milk returned to farm .. .. .. | | Losses negligible | | |
| 2. Cattle beast (1000lb.) one beast per acre | | | | |
| (a) Raised and fattened on farm .. | 116 | 77 | 5½ | 40 |
| (b) Bought-in stores and fattened on farm .. .. .. .. .. | | Losses negligible | | |
| 3. Sheep at 6 per acre at 150lb. live-weight each | | | | |
| (a) Raised and fattened on farm .. | 105 | 48 | 43 | 21 |
| (b) Bought-in stores and fattened on farm .. .. .. .. .. | | Losses negligible | | |
| 4. Fat lambs at 6 per acre at 75lb. live-weight each .. .. .. | 57 | 24 | 24 | 10 |
| 5. Wool 72lb. per acre (6 sheep) .. | 43 | | 32 | |

Table 4

**SOIL FERTILITY DRAIN PER ACRE BY DISPOSAL OF CROPS OFF FARM**

| Crop | Sulphate of ammonia lb. | Super-phosphate lb. | 30 per cent. potash salts lb. | Carbonate of lime lb. |
|---|---|---|---|---|
| Wheat 30 bush. per acre— | 170 | 70 | 31 | 2 |
| Straw | 80 | 34 | 65 | 15 |
| Total | 250 | 104 | 96 | 17 |
| Turnips 34 tons per acre | 610 | 224 | 724 | 90 |
| Beasts | 490 | 107 | 268 | 173 |
| Total | 1100 | 331 | 992 | 263 |
| Meadow hay 2½ tons per acre | 560 | 140 | 373 | 140 |

New Zealand's immediate future, for the task of doubling our production, lies in a plenteous supply of raw phosphate. Initially a great deal of New Zealand was infertile and lacking in nitrogen, phosphate, and lime. The supply of potash seems ample meanwhile, but there must soon come a day when potash will be the limiting factor in production unless some steps are taken to make good the outflow.

The New Zealand climate is such that, *given* phosphate and good strains of clover, the cycle of soil-fertility building can be implemented, and the fact that we can grow bulky clovers and can graze animals on these out-of-doors all the year round ensures such turn-round of fertility as almost to keep the high production cycle going. The all-essential impetus is phosphate and clovers, clovers and phosphates, or phosphates and lime.

It can be said that most of our exportable foodstuffs-dairy produce and meat-comes off our 4¼ million acres of topdressed grassland. We have some 18,000,000 acres of sown grassland with a further potential area of *some* 5,000,000 acres.

The war interfered with fertiliser supplies, as shown from imports in Table 5 below (1).

The fertiliser industry is again getting into its stride and it can be confidently affirmed that if fertiliser output could be doubled in the next 10 years the exportable surplus of food from New Zealand would be double that at the present time.

This presupposes a good deal of break up and resowing, a good deal of stump, log, scrub and fern clearing, plus the introduction of suitable clovers into the existing and new swards. To use phosphates efficiently, clovers must precede or accompany topdressing with phosphates.

Grazing management trials at the Grasslands Division have shown (4) that, given properly-constituted pastures and their rotational grazing, production may be increased by 50 per cent. This implies greater farm subdivision to control the grazing of stock more adequately, and the limiting factor here is fencing wire and the high cost of fencing materials and erection. Prior to 1938 a standard 7-wire fence cost approximately £200 a mile. Present-day costs are between £500 and £600 a mile.

The farm labour position has deteriorated markedly since 1938. The present farm labour force is 112,921 males and 11,465 females, being 31,533 males fewer and 5108 females more than is recorded at the *Census* in 1936 (1)

During the Second World War 44.715 *males* and 666 females *were* overseas (September 25, 1945), and within New Zealand 41,000 males and 5000 females were in military service. Post-war adjustments are still far from complete. Of 180,129 returned and home service male personnel in June, 1947, 157,706 are re-established in employment (1). Despite the war and the heavy drain of manpower from the land and restricted supplies of phosphate, production from New Zealand was fairly well maintained. There was, however, *a* noticeable swing over from the more intensive, labour-demanding forms of production to less intensive farm activities. Thus pig production fell from a total of 1,031,000 head slaughtered in 1937-38

**Table** 5

| Year | Sulphur tons | Phosphate tons | Potash tons | Sulphate of ammonia tons | Nitrate of soda tons |
|---|---|---|---|---|---|
| 1938 | 52,477 | 371,601 | 15,815 | 5,445 | 2,634 |
| 1947 | 79,008 | 369,765 | 8,603 | 1,126 | 2,602 |

to 611,000 head in 1946-47. Dairy cows in milk fell from 1,763,775 in 1938 to 1,657,690 in 1947, whereas total cattle increased from 4,506,082 in 1938 to 4,633,000 in 1947: 484.000 were slaughtered in 1937-38 and 667,000 in 1946-47. Total sheep increased from 32,378,774 in 1938 to 321.682000 in 1947. this latter figure being a recession: however. from 33,975,000 in 1945. Sheep slaughtered, in 1937-38 were 3,287,000 and 4,348,000 in 1946-47, a recession of some 400,000 since 1945. Lambs stood at 8.263.254 in 1937-38 and at 7,708,000 in '1947, a recession of 1,180,000 since 1945. Lambs slaughtered in 1937-38 were 9,458,000 and, 11,736,000 in 1946-47, a recession of 514,000 since 1945 (1).

The reduction in phosphate supplies during the war probably accounted for the recession since 1945, when the effects of the reduced applications were becoming manifest. The lack of phosphates also impeded the bringing in of new land. In 1943-44 about 1,000,000 acres less grassland were topdressed compared with the period following the outbreak of war and before the supply of raw phosphate rock was interfered with by enemy action.

A development of considerable interest to the dairy industry and a possible means of a wider world distribution of dairy products is the increased production of canned milk products, these having increased from 13,200 tons in 1937-38 to 27,870 tons in 1947-48 (1). The war gave a big impetus to factory-preserved products, and it would appear that this aspect of the primary industry has grown largely at the expense of the farm-produced products. For example, the decline in pigs is offset to some extent by the rise in canned milk products and, as mentioned before. this development may be all to the good as affording a wider world spread of milk products in a non-refrigerated *form*. It will be noted also that, while there has been a considerable drop in the number of dairy cows milked, yet the exportable surplus of dairy produce has fallen by less than 2000 tons, from 264,600 tons in 1938 to 262,670 tons in 1947. Butter rationing in New Zealand will have contributed to this small decline in exports of dairy produce.

The development of canned farm products, whereby the total raw product is exported, must ultimately have its repercussions on soil fertility. The export of fat-butterfat, bacon fat. beef fat. or mutton fat-takes with it practically no soil fertility out of the country. The decline in the pig and the dairy cow populations and the rise in whole milk, wool, bone, muscle, sinew, hide, etc., exported means a somewhat greater drain on our soil-fertility resources, although it is in no wise comparable to the loss in, soil fertility when the entire plant produced is exoorted from the country of its production.

## ANALYSIS OF PRESENT POSITION AND PLAN TO INCREASE FARM PRODUCTION

It will be readily understood that wartime production of food in New Zealand was kept going largely by an aged or rapidly-ageing population and by the wonderful efforts of the country womenfolk. It is only by the incorporation into the industry of new and young blood that the next stage in production can be obtained. Perhaps one of the greatest drawbacks of primary industry, particularly the dairy industry, is that it has relied overmuch on single-man labour, and also that a farmer-owner can outlive two generations of young people; hence often too little encouragement is given the first generation to stay on the still-paternal-run farm,, and self-establishment on an entirely new farm is often financially impossible. Farming today is an exceedingly profitable undertaking, but it does demand greater financial resources to establish new holdings and even to rejuvenate old holdings or sub-divisions of these. Rehabilitation loan authorisations by the Government to returned servicemen up to May. 1948. showed 4877 rehabilitations at a cost of £19.938.000 or approximately £4000 per rehabilitation (1). On a relatively small farm it is extremely difficult for a farmer-owner to set up his son or sons without considerable State, bank, or stock and station agent financial assistance on mortgage. Actually some plan by the industry itself, by the State, or by some world-food sponsoring body needs to be worked out for the adequate settling of young people on the land.

It will be seen from Table 6 (1) on the next page that there is ample security in the land at present prices for products that have a guaranteed sale for the next 7 years at least.

Costs of production of primary products in New Zealand are rising rapidly as a result of higher prices for raw materials and tools of trade and on account of higher wages to bring the farm worker into line with dairy factory workers and industrial workers in respect of labour reward and the ramifications of application of the 40-hour week.

The basic guaranteed price for butterfat for butter manufacture in 1937-38 was 14.380d. per lb. and in 1947-48 is 25.907d. per lb. The guaranteed price for cheese manufacture was 16.380d. in 1937-38 and is 27.907d. in 1947-48. In these 10 years farm working and maintenance costs and labour reward have practically doubled (7).

The rising cost, of labour, although taken mto account in the guaranteed price structure, together with the question of providing house or board and lodgings, is tending toward replacement of hired labour by labour-saving machines or reduction in farm activity to a point where the farmer-owner, his wife, and family can handle the output. There is in this latter concept some reluctance on the part of the farmer-owner and wife to employ additional labour, and a tendency to work harder themselves rather than share the profits of the farm with hired labour. There is in the human make-up this particular urge to sacrifice oneself unduly to amass wealth and to deny to others that possession. Maybe the reluctance to hire labour manifest today is induced by the over-all demands of that labour and in many instances by a failure by that labour to measure up to demands rightfully expected and due by that labour. A surplus labour demand over labour supply has contributed to this position.

This general question of farmlabour and of the efficient housing of that labour, either by self-contained cottages on the farm or by rural community centres, is a vital one for the primary industry itself to face up to. The dependence of the primary industry on single male labour that is housed or boarded on the farm in the family home always has been a weak feature of the industry. No other industry, trade, or profession imposes on the womenfolk of the home the billeting of staff,. and the sooner the great primary industry accepts as inevitable the need for independent housing of labour with a greater provision for married couples the sooner will the labour requirement for the industry be satisfactorily met. The days when labour is hanging over the fence waiting for a job are, we hope, for ever gone. It is up to the primary industry to place its labour on the same footing as that in trades, professions, and industrial concerns, and at the same time to play fair with increased adjustment costs allowances that are granted the industry on the contract of higher outgo in the matter of labour costs. For the farmer-owner, his wife, and children there is nothing but praise in the early years of establishment of the farm and home and for the great effort and long hours of work put in to make that farm produce and pay, but there is a tendency for this to continue unduly long with a real neglect of the home and its surroundings.

This state of affairs does not mean neglect of the farm or a lowering of its productivity. The time is fast approaching when food production must be met by the retirement from the land and the replacement of the delinquent occupier. It is imperative that the land produce to the limit of its potential capabilities, and that state can be obtamed only by greater labour force and expenditure than has hitherto gone into the land. It is not sufficient in this cry for food that people should occupy such areas of land that the immediate financial return to the occupier is handsomely provided from broad acres of mediocre productivity rather than from smaller areas intensively worked, or from the same large areas more intensively farmed by adequate establishment and the employment of the necessary manual labour, reasonably and effectively homed on the farm or in some rural community centre The word "homed" is emphasised, as adequate housing is direly needed to attract labour and to keep labour on the farms. The lack of labour today and the movement of what labour is available to towns and secondary industries is in itself an indictment against the primary industry itself and its organisation. I say again it is up to our primary industry to so organise itself that it may be in a position to compete with its rivals in the matter of labour supply and labour reward rather than to remain inactive, lamenting and criticising State policy and the fact that its rivals had outdone it in the matter of labour supply, labour reward, and in social amenities offered. Better homes and home facilities and conveniences, rural reticulation of electricity, better labour reward; better schools or means of getting children to local consolidated schools, better roads, organised recreation, and social amenities, must come to the primary industry, and it is up to that industry itself to see that these things are provided for its own expansion and for-its-own justification.

Table 6

| | Year | Tonnage exported | Realisation £ | Index 1909-13 = 1000 |
|---|---|---|---|---|
| Dairy produce .. . .. | 1938 | 264,600 | 22,872,000 | 1210 |
| | 1947 | 262,670 | 42,535,000 | 2189 |
| Meat | 1938 | 268,700 | 16,073,000 | 1752 |
| | 1947 | 347.700 | 32,323,000 | 2725 |
| Wool . | 1938 | 121,100 | 12,185,000 | 1176 |
| | 1947 | 167,500 | 31,933,000 | 2290 |
| Total . . .. | 1938 | 654,400 | 57,801,000 | 1000 |
| | 1947 | 777,870 | 127,713,000 | 2210 |

The land is sadly in need of closer political co-operation and co-ordination, for there is so much that the State itself must do to aid the full development of its national resources latent in the land. Of the 18,000,000 acres of sown grassland over SO per cent. is not fully developed. There are millions of acres of dairying and fat-stock land producing today some 5000 to 60001b. of dry matter per acre per annum, whereas the capabilities of much of this land are from 12,0001b. to 14,0001b. dry matter per acre per annum. There are possibly some 8,000,000 acres of hill country doing 1 to 2 sheep that could carry 3 to 4 sheep per acre plus cattle. There are some 5000,000 acres still in fern and scrub, some half of which could be ploughed and developed into dairying or fat-lamb country. Only a few hundred thousand acres are really pulling their full weight and are striking examples, individually and collectively, of what the country could do with a close, and full co-operation and co-ordination of farmer-owner and the State, or the industry itself, together with a greater individual efficiency in the owner-occupier of the land. There is no question but that the individuality of the owner-occupier and his mode of applying himself and whatever knowledge he can get to the land often mean productive farmland as against waste and unprofitable land where the owner just lacks that knowledge and personal application of himself to the land.

Statistically the present-day overall reward for farm production looks particularly rosy and, while it may be sound economic planning to develop fully the flat and easy workable areas first and to pay greater attention to lifting production from these lands, yet nationally it is essentially sound that the harder and more difficult hill country and marginal lands develop synchronously with the good: the one being complementary to the other. particularly in regard to the meat and wool industry. For some 4 decades the hill country has been supplying store stock for the lowlands to fatten, and with a further development of topdressing and pasture renewal on the lowlands the ratio of breeding stock to fattening stock will be deleteriously affected by lack of corresponding development of the hills.

### Prices of Produce

Higher prices for produce do not necessarily mean increase of production: rather the reverse. On . this point Hamilton (8) . sets the position out thus:—"Following the definite upward trend of prices after 1934-35 the number of cows in milk showed a drop of approximately 83,000 in 4 years and the number of suppliers declined by approximately 2000, probably due largely to the cessation of supplies from sheep farmers and others who had kept a few cows to supplement income during the depression. At the same time the area saved for hay and silage, which had been increasing rapidly over a long period of downward-trending prices, became almost stationary, while the area topdressed increased rapidly. The trend in pig numbers is similarly closely correlated with price trends for dairy produce, tending to increase when dairy prices fall and to decline when prices rise."

### The Problem of Youth and Old Age

The land, in common with many other industries, demands health and strength and a virile mind and body. Youth is often denied control and is forced off the farm into other occupations. The single male labourer on attaining the married state must necessarily move out because of the lack of rural housing. The land, particularly hill country,, is beyond old age, and the primary industry should be so organised to provide some superannuation scheme whereby retirement to small allotments in the village, town, or city is possible. Primary industrial pools should be established for this purpose.

### Land Values

It is seriously contended by some people that pegging of land values at the 1942 price level is deleteriously retarding retirement of old people from the land and their replacement by young people, and is militating greatly against land sales for subdivision purposes. In any development, aided directly by the primary industry itself or by the State, it is imperative that any accretions to production are not reflected in undue accretions to land values. If land values are allowed to rise beyond that concomitant with improved production, and once that incremental value is claimed by the occupier and is passed on in higher land values to the incoming occupier, the vicious circle of additional State or other assistance must be gone all over again to maintain production, and to increase production to give the newcomer a livelihood equal to that enjoyed by the previous occupier. Undue or unwarranted incremental land values will always cripple land, will annul! any improvement wrought by outside assistance, by research, or by education: it will cripple production and ultimately must cripple the great industry dependent on the land. It

seems imperative that a farmer's reward must wholly (or nearly so) be from the production of his farm, and prices and adjustments should be made to give the reward from that source.

### The Guaranteed Price

The above contention is based on the understanding that the guaranteed price structure applies to all farm products. The guaranteed price machinery, for the first time in the history of farming, gives the primary producer some say in what he is to get for his produce. It will at least cushion any violent price upheavals due to overproduction or revolutionary changes or adjustments in industrial development and so give the producer time to adjust his line of farming or his obligations to the State or to other financial institutions. The guaranteed price also takes the gamble out of farming.

As a factor in production the guaranteed price and a guarantee of consumption would do much to accord confidence in the land and in any scheme of long-term improvement that may be embarked upon by the industry or by individual components of that industry. Perhaps one of the present-day fears in the heart of the primary producer is that the demand for primary produce at present prices will collapse overnight, leaving him in mid-air as far as his planned long-term development is concerned. The recent 7 years' contract with Great Britain will do much to allay these fears, but it would give a great feeling of security in the land if international long-term contracts were made at a guaranteed price, fixed from time to time to ensure consumption of the food and raw products produced from the land.

### Subsidies

What is needed to initiate a great forward development is some impulse which will first stimulate the urge and then provide the means and essentials for production to every land owner in New Zealand, even to the point in some cases of providing these free to the occupiers provided they will be applied to the land.

Re-institution of subsidies on fertilisers and fertiliser transport and a bettering of other subsidies directed toward providing the all-essentials for greater production, labour, fertilisers, lime, good seeds, machinery, fencing materials, housing, roading, schooling, etc., seem to be the best all-over expedient to boost and increase production.

A full developmental policy and subsidies by the State or by the primary industry itself from specific pools provided by that industry must be envisaged in the call for more food, and the producer must play fair in the full application of those subsidies. The call for more food has now been insistent for 10 years and we still have Britain stressing the need for more food on every possible occasion. It is not to the credit of the State or the industry itself that we find today but little response to that appeal as shown in the total tonnage of food available to meet that demand or to answer that call. All that we have done is to ask Great Britain to pay twice as much for it. I have full confidence in the potentialities of the country to devise a policy of subsidisation for development under appropriate control, and whether that subsidy is provided by the State or from the industry's pool accounts the expenditure will be more than *recouped as the development proceeds and as the industry expands. Sound agricultural development in New Zealand must pay.

In the case of a central world-sponsored movement to produce more food, naturally attention will be given and efforts directed toward those countries that are most fitted to and that can most economically provide specific articles of diet. New Zealand's natural resources lie largely in grass and in its temperate grassland climate, and the main products it can contribute to the world's larder and wardrobe are fats, meat, and wool.

New Zealand is but 9th in the list of meat-producing countries, but she stands second to Argentina as an exporter of meat.

**MEAT EXPORTS OF MAJOR EXPORTING COUNTRIES, 1947 (9)**

| | Tons |
|---|---|
| Argentina | 736,000 |
| New Zealand | 391,000 |
| Australia | 260,000 |
| Canada | 188,000 |
| Denmark | 124,000 |
| Uruguay | 124,000 |
| United States of America | 111,000 |
| Brazil | 77,000 |

It is my conviction that if everyone pulls his and her weight in a fully co-ordinated State -primary • industry scheme of development, New Zealand could become export country No. 1 by the end of 1958.

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