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PRESIDENTIAL ADDRESS

Some Animal Production Problems of the South Island

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This is the first occasion on which the Society has held its annual conference in the South Island, and I propose therefore to outline some of what I consider to be the main animal production problems of the Island and of Canterbury in particular. Your committee acting on the recommendation of last year's annual general meeting has chosen a programme almost exclusively of scientific papers describing experimental work of direct interest to research workers. Perhaps I might be excused therefore in assuming that you would be able to tolerate in this address a review heavily biased with personal opinion.

In the South Island we have only 11 per cent of the total dairy cattle, 11 per cent of the pigs, and 15 per cent of the beef cattle of New Zealand. But in sheep we can more than hold our own with the North Island. In spite of having significantly fewer sheep—15 million compared with 20 million in the North Island—we export 10 per cent more lamb carcasses which average nearly 3lb higher in weight than those of the North Island. We can do this chiefly because of higher lambing percentages, lower mortality, and a greater use of forage crops. The amount of wool grown in the South Island is somewhat less than in the North but a higher proportion of the South Island clip consists of the finer wools—halfbred and Merino—which in the main supply the country's requirements of fine wool. The importance of the South Island in animal production is therefore primarily in the growing of lamb and wool.

The most dense population of sheep is in Southland where tremendous progress has been made during the last 30 years. A rainfall of 35-50 inches, of high effectiveness and even distribution, provides a very satisfactory environment for a highly productive grassland system. There, the Romney Marsh, so typical of the North Island, finds a natural home on the heavy low land. In other wetter areas of the South Island such as Bank's Peninsula and the Marlborough Sounds, and on the clay foothill country of Otago and South Canterbury the Romney also reigns unchallenged. However, on the extensive high tussock country, and on the plains of Canterbury and Marlborough where the rainfall is generally less than 30 inches or is of low effectiveness, the fine-woolled breeds predominate. Merinos, to the tune of nearly a million inhabit the hardest of the tussockland. On the remainder of what is considered as the high country there are run upwards of two million halfbreds, while on the good tussock country there are both Corriedale and halfbred sheep. Over the whole of the South Island the relative importance of the different breeds is indicated by the order Romney nearly 60 per cent, halfbred 20 per cent, Corriedale 20 per cent, Merino 5 per cent.

A further important feature of South Island sheep-farming, especially in fat lamb production, is the necessity imposed by the dry summers and long winters for making extensive provision of supplementary feed—hay, roots, and greenfeed for winter, greenfeed for early spring and summer forage crops for fattening lambs.

THE HIGH COUNTRY

I should like to spend some time on the subject of the high country and the need for animal research there. There is no exact definition of the high tussock country because it passes imperceptibly into the ordinary tussock hill country or foothill country. By high country we generally mean rugged tussockland most of it over 2000 feet, of low carrying capacity, about one quarter or less of a sheep per acre, subject to snow risk, consisting of both summer country and safe winter country, and deriving almost all of its income from wool. The South Island contains a large area of this country estimated to be in the region of 15 million acres and carrying about 3 million sheep, mainly halfbreds and Merinos. Besides supplying much of our fine wool, the area forms the catchment of our eastward-flowing rivers, providing hydro-electric power and water for irrigation, and so its importance is greater than its stock-carrying capacity would indicate. There are many problems associated with this country, some of them recorded in the evidence to and the report of the Royal Commission on the Sheep Industry (1949). This land was occupied in the 50's and 60's of the last century, in a century when land was being exploited on a wide scale in the Americas and the British Dominions, at a time when soil science, plant husbandry and soil conservation were little understood or appreciated. To-day the land bears the marks of that era and our efforts now are toward halting the deterioration, and even, it is hoped, reversing it. Quite rightly, attention was directed first to the regeneration of pasture cover. Reseeding and aerial top-dressing of the easier and lower slopes, rabbit control, spelling, new pasture and lucerne establishment, irrigation and other techniques offer weapons the runholder is beginning to use in his fight against deterioration with most encouraging results. With the better understanding of land utilisation possessed by the present generation of runholders and their recent improvement of economic status there is to-day a new spirit of confidence and of support for research.

In the past, research in this high country has been characterised by haphazardness. Such work as has been done on the soils and pasture has been intermittent and non-continuous in nature; it has been done piecemeal by the Department of Agriculture, Department of Scientific and Industrial Research, Soil Conservation Council, Lands Department and Lincoln College with, until recently, little semblance of co-ordination. This is not to criticise the research work itself which has been done according to the opportunity and enthusiasm of isolated individuals in those institutions. But the first essential to a satisfactory rate of improvement is, I believe, the establishment of a research station in the high country itself. The establishment of such a station was, in fact, in mind when a conference of interested institutions was called by Lincoln College about three years ago; but no progress has so far been made due to obstruction in certain quarters and to lack of direct Government interest. There is increasing activity by some Government departments and the Soil Conservation Council in ad hoc research but there is still no co-ordinated research policy on a permanent basis. In repeating that such a research station should be established I personally am equally concerned with the need for animal research which in the past has been completely lacking. Of the whole field of range sheep nutrition we know virtually nothing. I have time to comment on one facet only of this, by way of example. From what little evidence we have assembled at the College about the herbage of the high country it appears that the nutritive value is very low. For too long we may have attributed the low lambing percentage, high mortality and low fleece weights to climatic conditions or natural hazards. Perhaps the generally low level of digestible energy, protein, phosphorus and sulphur—none of them sufficiently low to cause easily recognisable symptoms of deficiency—is reducing the productivity of the stock. In the range country of the United States where conditions are somewhat similar to those here and

where the nutritive value of the herbage is of the same order, significant responses in lambing percentages have been obtained through the feeding of small quantities of concentrate mineralised pellets just before lambing. The pelleting of fortified good quality lucerne or pasture hay grown under irrigation on the plains for use in the neighbouring high country, if shown to be beneficial might well open a new phase in the wintering of ewes and hoggets in the high country. An alternative solution may come from the establishment of clovers, cocksfoot and other grasses so that in traditional New Zealand manner we may avoid the manhandling of animal foodstuffs. But until such ideas as these are tested in properly designed experiments we will never be much the wiser.

The difficulty of rearing enough replacements to keep up flock numbers and to allow a margin for culling is characteristic of the high country. Basically this is the result of a low lambing percentage and high mortality. To what extent is this chronic replacement position affected by breeding? Already in the high country we have Merinos, three types of halfbred, according to whether the long-wool side of it is Lincoln, Leicester or Romney, two types of Corriedale—again according to the Lincoln or Leicester ancestry—and lastly, Romneys. While there is a general *raison d'être* for the gradation in types used, the choice of breed is often governed by purely personal preferences. The situation is confusing and systematisation is lacking. Considerable variations exist between individual runs, but I wonder whether these differences are greater than those that exist in the North Island where the Romney is almost universally used admittedly often with indifferent results. The choice of breed can be made more difficult by my suggesting two more types, the Border Leicester x Merino halfbred and the Cheviot x Merino halfbred, both of which would be worthy of study. Both were, I believe, tried many years ago and discarded on the grounds of lower wool yield and in the case of the Cheviots the difficulty of mustering. There is enough evidence available to suggest that both the Border Leicester and the Cheviot would substantially increase the lambing percentage and we have evidence that the wool may not be as bad as was thought. I have no doubt, too, that the Cheviot would increase the constitution and reduce the mortality, and possibly some management device such as paddock feeding as hoggets, would quieten them sufficiently to make mustering possible. These types of halfbred were discarded in the days when wool was wool and surplus stock were a drug on the market but that situation is now materially altered. The question of the different types of sheep in the high country is then an open field for scientific investigation and is also one of economic importance to the runholder.

These are merely two examples, one nutritional and the other ecological, of the many animal problems which could and should be investigated in the high country. A research station where the soil, pasture and animal interests can work in close harmony could make a very material contribution to the salvation of the high country. No doubt it would be argued that the high tussockland is unlikely ever to be very productive and that our financial and scientific resources would be better spent on the lowland and the good hill country where the potential is high. That is perfectly logical, but it is not an argument for having several research stations and two Colleges on the good land and none at all on the tussockland.

WOOL

From the high country one can proceed logically to consider wool and wool research. When it comes to wool improvement I must admit to being a pessimist. The greatest contribution to increased wool production seems likely to come from those knowing least about wool—namely, the soil scientist and agronomist. In surveying what

the wool scientist has done for the practical farmer in the last 25 years it would have to be admitted that it is not very significant compared with the contribution of the chemist, physiologist and plant breeder. He has shown how the various characteristics of wool are inherited, that the inheritance is multifactorial and that the heritability of the productive characters is low. No doubt it should enable us to make more intelligent selection and culling. It is to be regretted that we have as yet not evolved any heritability estimates for our South Island fine-woolled sheep nor have we tackled the very important problem of face-cover in these sheep, lacking as we do the time and facilities for the job. Much of the breeding work so admirably pioneered in the Western Sheep Breeding Station of the U.S.A. could be tested and applied if found suitable, among our fine-woolled breeds. These are more problems for our non-existent high country research station. The wool scientist has I think made a contribution to the practice of pre-lamb shearing though most of the credit must go to the farmers themselves. Perhaps his greatest contribution in the field of breeding is to show how low is the heritability of economic fleece characters and therefore how the great hope for improvement in production and quality must come through the environment, that is through pasture improvement and better husbandry. The slow progress made is no fault of the scientist for the task is exceptionally difficult and in the practice of farming is beset with seemingly insurmountable antagonisms. Results of progeny testing have not been spectacular and in any case the application is difficult. Improvement of wool quality through the elimination of faults is possible but is likely to prove difficult to achieve in practice. A higher margin of culling would be of great benefit to wool production but this can best come about through an increase in prolificacy and lower hogget mortality, which have little to do with wool itself. A factor in wool production which appears to be fundamental is the antagonism between wool and lamb production and even between quality and quantity of wool per acre. We get our best wool off non-reproducing wethers and dry ewes. The more lambs a ewe has and the better she does them, the greater is the detrimental effect on her fleece. Increasing lamb production, in itself is a very desirable objective, by crossbreeding or the use of new breeds is likely to decrease rather than increase wool production and quality, and is likely to reduce the amount of fine wool grown. Lastly, the management required for the greatest efficiency of lamb production from any given amount of feed is incompatible with that required for optimum fleece production. Hence we come back to the cause of my pessimism, namely, that improved wool production per sheep is limited by considerations other than of wool. Wool production can and will increase, but almost entirely by virtue of more sheep carried, and this depends on the soil, pasture and animal management.

LAMB PRODUCTION

I want to pass now to a subject of greater promise—the possibility of increases in lamb production. There are many aspects of this but three of them are more important than others. We can increase lamb production by (i) carrying more sheep, (ii) by increasing their fertility and (iii) by taking the lambs to higher weights. I will deal with the last first.

Obviously more lamb meat can be produced by taking each lamb to, say, 38lb instead of 34lb. This can be done either by not drafting so early or by using one of the heavier sires. The South Islander does both of these. Many grow forage crops for fattening lambs after weaning and so getting them to higher weights. The South Island has always been the home of the reactionaries who refrain from using Southdowns and so we have to-day 25 per cent of our rams used for fat lamb production being of breeds other than the Southdown. It appears that the U.K. market is prepared to pay a premium

for light lambs and also for light lean second-grade lambs. This high price for seconds is a fundamental change from our previous schedules and would indicate a relaxation in the requirements for the well finished, very blocky carcass. On the face of it the heavy penalty for over 36lb lamb spells the end of heavy sires. However, with the high price for "seconds" they can compete very strongly by drafting their lambs at the same weight and almost the same price as the Southdown but at two to three weeks earlier. I hope the Southdown breeders will see the wisdom of breeding for rapid rate of growth, for the present slow rate is the main defect of an otherwise excellent sheep. The Suffolk and Border Leicester if killed at under 36lb to get the light weight premium produce a leggy lamb which may harm our reputation unless Britain really does want second grade lambs in large numbers and for this reason there is more hope for the intermediate sires which have rapid rate of growth without being too leggy. Whatever the outcome, the work at Ruakura and here at Lincoln College, will at least ensure that the sire aspect of fat lamb production will not in future be overlooked. Indeed I feel that the time is not far distant after a season or two back on the open market when a new system of weights and grades should be introduced to overcome the anomalies in the present system. I think it would be true to say that increasing lamb weight by either method is not regarded favourably by those responsible for marketing our meat.

The second main method of increasing lamb production by increasing carrying capacity has, I think, been fairly clearly demonstrated by our work on the low-high system of feeding which permits maximum carrying capacity to be achieved, and by the rate of stocking trials conducted by Ruakura. The successful carrying of a large number of stock involves risks and difficulties and requires a higher degree of skill than does a lax system, for failure to control and to conserve leads to overstocking. The South Island where supplementary winter feed is grown, lends itself better I feel than the North Island to these systems of feeding. However, only by example and constant demonstration will it be possible to remove from farmers' minds the thought that high carrying capacity plus careful control is definitely not overstocking.

Here the sheepfarmer lags well behind the dairy farmer. To the latter butterfat per cow and per acre are household terms as well as measures of efficiency. How many sheepfarmers know their wool and lamb production per acre—very few indeed. Admittedly the more complex nature of sheepfarming production—of wool, lamb, mutton and beef all varying both in quantity and quality—makes it difficult to arrive at an easily determined figure representing the efficiency of land utilisation. Nevertheless it would be worthwhile attempting to do so.

The third factor mentioned was fertility. Here I use the common term "fertility" loosely, meaning in fact the prolificacy or fecundity of the ewe. All our New Zealand sheep research departments are actively engaged in studies of ewe fertility for herein lies real scope for improvement. There is a fairly constant difference of 3-4 per cent in the lambing percentage between the two islands, the South Island, in spite of its proportion of fine-woolled sheep of Merino background, having the higher percentage. This difference, I believe, is largely environmental for as far as Romneys are concerned our stock all lead back to the Manawatu and Wairarapa studs. Our lambing percentage by British standards is low. This, I believe, is more due to the breeds of sheep employed than to environment and management though the latter no doubt contribute something.

In New Zealand we have chosen as the basic ingredients of our national flock the Merino of recognised low fertility and three of the best woolled but lowest fertility breeds of England—the Romney,

Lincoln and English Leicester. From the point of view of fertility we could scarcely have made a worse choice. To this must be added almost a century of breeding in New Zealand with no conscious selection for twinning and, in fact, an unconscious selection against it. This contrasts sharply with breeding policy in Britain where on account of the high value of lamb compared with wool, selection for twinning is consciously conducted all the time at least in certain breeds. On fat lamb farms of Britain lambing percentages of the order of 150 per cent and higher are quite common whereas here and especially in the North Island, 125 per cent is regarded as very good and the average on fat lamb country is not much above the 100 per cent mark.

There are several ways of approaching the problem of ewe fertility, most of which are now reasonably well known. Firstly we can retain our existing breeds and attempt to improve their fertility by straight selection. U.S. geneticists reviewing all published literature on the subject, estimate the heritability of twinning to be of the order of 15 per cent though the results of various workers in different countries have been extremely variable. Assuming this figure to be of the right order, the continued choice of twin rams instead of the present random selection of singles and twins according to their natural frequency could be expected to increase the lambing percentage by $\frac{1}{2}$ per cent per annum. Some farmers are able to identify their twin-bearing ewes and their twin lambs so that selection for twinning in both sexes is theoretically capable of giving an improvement of over 1 per cent per annum and this is a permanent genetic improvement. Several farmers in Canterbury have followed this procedure over the last 5-10 years and have obtained spectacular increases, in fact far more than theory would indicate. This method is open to the objection that unless increases in milk production of the ewes are also achieved the larger number of smaller twins may be embarrassing. Very little attention is given to selection for milk production in this country. We know from studies conducted in New Zealand that variations of the order 2 : 1 exist and we have recently shown in our College stud flocks that variations of a similar magnitude occur in the growth rate of both twin and single lambs in the first two months of life when the lambs are dependent mainly on milk for their survival and growth. I believe it is practicable to select simultaneously for both twinning and milk production and that the sooner stud breeders pay attention to this the better for us all. Fundamentally this is a matter which only the stud breeder can solve for us but we have a duty to provide him with both the incentive and the technique for so doing. The next method is that involving the use of pregnant mares' serum to stimulate multiple ovulations. This is still in the experimental stages but shows some promise. It has the advantage of not altering wool production adversely, or of altering the breed, but it involves hard work, is not permanent but must be repeated each year and still does not increase milk production. As an adjunct to these two methods of increasing the lambing percentage without change of breed should be mentioned the prevention of prenatal mortality. Studies being conducted here have already shown that in Corriedale ewes giving a lambing percentage of 100-110 per cent under average-to-good conditions the potential is 140-150 per cent and that approximately 40 per cent of eggs shed fail to reach full term. A solution to this problem is no doubt difficult to attain but the stakes are obviously great.

The third possibility is to change the breed of sheep. There are a number of breeds of high fertility and high milk production which could be used in New Zealand. As we must give wool its rightful place, that is in proportion to its economic value, the breeds are narrowed down to those white-faced breeds with at least a reasonable fleece by our standards—to the Cheviot, an agile and hardy hill sheep,

the Border Leicester and the Dorset Horn both lowland sheep. I need not reiterate the work done by Massey College in proving the merit of Cheviot crosses on the North Island hill country, for that is now well known, but the hill sheep must be purebreeding so that the Cheviot must be stabilised at the full Cheviot, Cheviot-Romney half-bred or some other proportion. In the South Island the Cheviot has been slower to take on but I believe it has a future here too.

On the fat lamb country there is a definite possibility for the Border Leicester and/or the Dorset Horn. The Border Leicester is a long-wool, clipping only slightly less wool than the Romney or Corriedale and of count about 44s. Crossed with the Romney it gives a heavy strong crossbred fleece and on the Corriedale it gives a heavy fine crossbred fleece. The Dorset Horn on the Corriedale gives a halfbred type wool, slightly lower in weight but we have had little experience of this cross. Our own experience has been with the Border x Corriedale (and Border x Merino) crosses and the preliminary results obtained since the experiment began in 1950 are promising, showing at least a 20 per cent increase in lambing percentage. As far as the fat lamb farmer is concerned I believe that the use of these first-cross ewes, combining as they do high fertility and good milk production, instead of purebred ewes, offers the easiest and most practicable method of increasing production. There is every reason why all three methods of increasing fertility should be investigated simultaneously for they can all be complementary. Until we can get the lambing percentage up to 150 per cent, lamb production per acre in New Zealand is bound to be disappointing in relation to the pasture which we can grow.

LAMB AND HOGGET THRIFT

Lamb and hogget unthriftiness and loss constitute a definite problem in the South Island as they do in the North. The few observations that have been made indicate that lamb mortality prior to weaning on fat lamb farms amounts to about 15 per cent of which the great majority occurs at or immediately following lambing. Some of this mortality can be overcome by known methods such as more intensive shepherding and the use of incubators, but most of it seems unpreventable in practice at the present ratio of sheep to shepherds. We are therefore interested in the work on neo-natal lamb mortality being done by the Gisborne Veterinary Club and by Wallaceville, for anything they find must at least in part be applicable generally.

If lambs survive this first hazard they usually do quite well, at least in Canterbury, until the middle or end of November. There is a natural tendency for the liveweight increase of lambs to fall off as they reach this age but this particular unthriftiness is severe, lambs lose their bloom and the liveweight increase drops to a low figure. We sometimes associate this with the period of the ryegrass running to seed, but the coincidence may be purely fortuitous. It would be of interest, therefore, to ascertain whether this particular pre-weaning setback is also obtained on pastures which do not contain perennial ryegrass. It might be added that on the College farm itself perennial ryegrass is regarded very suspiciously by those responsible for the sheep and at the present time sowings of perennial ryegrass in new pastures are at a very low level. Lambs are usually weaned at a younger age than in the North Island; this earlier weaning is probably an advantage rather than the contrary, especially if the normal provision of weaning feed has been made. After weaning it is our experience that grass is a poor fattener in comparison with forage crops. While live weight gains of 2-3lb per week can be regarded as normal on rape or lupins, those on quite good permanent pasture are only about 1lb per week.

It is common knowledge that lambs do much better in a dry summer than in a wet one. This last spring and summer in Canterbury have been the driest for a very long time and feed has been in very short supply and yet the daily liveweight gains up until weaning have been the highest in the six years over which we have comparable records. We can only guess at the reason for this—is it a matter of dry matter content and intake; does the longer growing, more succulent pasture of a wet season contain lower amounts of trace elements, or higher amounts of some unknown toxic substance, or is it purely a matter of sunshine and temperature?

Unthriftiness in lambs and hoggets can continue right through until the spring when with shearing and the onset of warmer weather hoggets usually make a remarkable recovery. Parasitism is not the cause since drenching has generally not been very effective except in odd years, though in the years when positive responses are obtained the response often pays the cost of several years of drenching. On light land it is our practice not to drench at all, except in a wet year. On the light land we can winter hoggets satisfactorily and can keep them going with only a 3-4 per cent loss in spite of a very slow live weight gain. There might be something in the use of hay for if you can get the hoggets eating $\frac{1}{2}$ lb or more of hay per head per day there seems to be no particular trouble in rearing them even though the pastures are bare and the amount of greenfeed available is limited. On the other hand there are many hill properties where negligible hogget losses are experienced on permanent pasture alone, and others where losses are high. At least in the South Island a good proportion of the loss of hoggets in the winter is due to poor feeding and requires no speculation.

It is to be hoped that some positive results may emanate from the work recently commenced at Ruakura and Wallaceville on lamb and hogget unthrift, for the causes in the two islands are probably basically the same. This unthriftiness in young stock starting before weaning and continuing until the following spring is indeed one of the major problems in the industry.

Special mention should be made of one known cause of unthrift—the deficiency of one or more trace elements. To-day, nearly 20 years after the discovery of cobalt as a factor in sheep health, deficiency or marginal deficiency is being found over an ever increasing region. Deficiency has recently been diagnosed on quite a number of Canterbury Plains farms. How widespread is marginal cobalt deficiency—a cobalt status satisfactory in some years and sub-optimal in others? Again, this year for the first time we examined every lamb that died on the Ashley Dene farm. Twenty were dead or died at birth from goitre and these out of ewes which had had no brassicas during the winter. It is very doubtful whether goitre in these particular lambs would have been identified by the shepherds in the normal course of events. It makes one wonder how frequently such a condition occurs. We want more knowledge on these matters and this can best be effected through an increase in the diagnostic facilities and the number of mineral analyses conducted by Wallaceville. It is to be hoped therefore that a chemical laboratory will be attached to one of the proposed diagnostic centres to be established in the South Island with this specific purpose of trace element investigation. Sending samples to Wallaceville and getting a piece of paper back with the analysis several months later is not the same as having the laboratory close at hand. Further, the delay in receiving the analyses is nearly two months in the case of copper and four months in the case of cobalt. By then the sheep are either dead or have recovered and the particular circumstances have faded from the farmer's mind, or have been replaced by some other urgent matter.

In the South Island, too, we have most, though not all, of the sheep diseases of the North, and in general the position here is not

very different from that up there. There are no diseases of great consequence specific to the South Island requiring special mention. Most of the ewe mortality is directly related to pregnancy and parturition. The provision of diagnostic centres in the South Island is in hand and it is hoped will do much to encourage greater use of diagnostic facilities by South Island farmers, reduce the delays in transport and diagnosis and ultimately benefit the farmer. I would not encourage the farmer to expect too much, especially the sheepfarmer, for once a sheep becomes sick it is usually going to die in spite of all efforts to save it. However, by research and critical observation the veterinarian and his diagnostic centre, provided the latter is something more than just a diagnostic centre, will in the course of time materially assist first in determining what the diseases are and then in solving the problems which even the non-veterinarian must admit are very difficult indeed.

I want to switch now to mention very briefly a few management problems.

HEAVY LAND

On the heavy wet land of the South Island, typified by the district of Southland, we have sheep farming systems of very high efficiency. Carrying capacities of 5 ewes per acre, together with a good lambing percentage, are not uncommon. This is no mean achievement, considering the long winters experienced there. However, the fortunate Southlander has this problem half solved by the excellence of his swede crops. This comes perhaps a little too easily for him, for over reliance on roots tends to cause neglect of the other refinements of wintering pregnant ewes—the provision of hay or silage, greenfeed, and autumn-saved pasture—but this will no doubt be rectified in time. The high carrying capacities achieved are not without their troubles for it is said that there comes a state with increasing stocking rate at somewhere about 4-5 ewes per acre where illthrift in the lamb seems to appear and where cattle must be brought in to eat the extra grass produced. Our knowledge on the causes of lamb thrift on high producing pastures is meagre and just what there is in this cattle-sheep combination on country where sheep alone can control the pasture remains to be discovered. Until the hill country can turn off substantial numbers of store cattle for summer fattening on the flats, the problem remains.

There are many things of which the Southlander may feel proud and one of them is the high lambing percentage. The mean for the district shows a consistent advantage over any other district of comparable size in New Zealand and some farmers obtain excellent percentages. I should like to see this advantage carried further by farmers mating their ewe lambs. In this country we have always been conservative about this and I feel that in all districts of New Zealand where good two-tooths can be reared 50-60 per cent and higher could be got out of the ewe lambs without appreciable detriment to their subsequent growth and production.

DRY LAND

By way of contrast the East Coast of the South Island is characterised by a dry climate. Low rainfall, high evaporation and light stony soils together form an unfortunate combination which characterises several million acres of flat ploughable country. Canterbury has its full share, and of this country I would pass some comment. Moisture is undoubtedly the limiting factor in this type of country. In its unimproved state of browntop and sweet vernal it carries about a sheep to the acre and does not fatten much if any stock. By pasture improvement the carrying capacity on some farms has been increased to over two ewe equivalents per acre with fat lamb production. With-

out irrigation we believe that the potential of this land within the next 10-20 years is upwards of 3 ewe equivalents per acre. The main method of improvement during the last 20 years has been through subterranean clover, liming and topdressing with some use of lucerne. The next phase will be the exploitation of lucerne. The Canterbury plains farmer is always conscious of drought and he tends to stock accordingly. In the good seasons he is grossly understocked and will not or cannot buy cattle for summer fattening to consume the excess pasture. In the particularly dry seasons he is somewhat overstocked. Extensive use of lucerne would remove much of the drought hazard and permit a policy of full stocking without undue risk. Marlborough lucerne provides especially the hay for winter feed, but can also be used usefully for early spring greenfeed and autumn greenfeed. The creeping or grazing lucernes have a most important place for these can be grazed without fear of damage, remain green and leafy several weeks after ryegrass and subterranean clover pastures have run to seed or died, and if sown with lucerne-compatible grasses such as *Phalaris tuberosa* or cocksfoot plus subterranean clover, give a balanced permanent pasture.

In most years the ewes cannot be flushed unless lucerne is available. In view of the quite positive effects of flushing demonstrated at Ruakura I have to admit that we here have been much less successful. Records at Ashley Dene over the last 17 years have shown practically no correlation between autumn flush and lambing percentage of the whole flock. Only when the drought has been very severe has lambing percentage been significantly reduced. It could of course be that we don't flush properly or that we are dealing with less responsive breeds than the Romney, or that the effect is masked by other more important environmental factors.

There is a fairly long winter in the area but in spite of this, early lambing is essential to get the lambs away fat before the land dries up in early summer, and this early lambing requires substantial provision of special greenfeed. It is not possible to carry lambs to heavy weight unless forage crops are grown, so that early light weight lamb is the most suitable type of production. Provided it is dry the stock remain fairly healthy in this area but in a wet year stock health and lamb thrift suffer and heavy losses can occur.

The foreseeable potential for this 2 million acres of light land is about 3 ewes per acre and correspondingly higher on the medium-light soils. With irrigation carrying capacity can be doubled. Trials at the Winchmore Irrigation farm have shown that seven ewes per acre can be carried all the year, though it is probable that this would have to be reduced to 5 or 6 per acre if conducted on a full farm scale under practical conditions. But even this is a very substantial increase on the best that dry-land farming can do. It is estimated that there are $\frac{1}{2}$ million acres of this irrigable land in Canterbury so there is a potential for an increase of 3 million sheep over the present carrying capacity. It is likely, however, that the land would be used for cropping, dairying and cattle fattening in addition to sheep raising. Personally I would regard it as an essential supplement to the large areas of tussockland at the back of the Plains, providing lucerne or other hay to the high country for wintering, and receiving in return store lambs and cattle for summer fattening. Such a situation would indeed be a great boon to the hill farmer.

BEEF CATTLE

Some reference must be made to beef cattle. South Island farmers are not cattle-minded; we never have been and as far as I can see, are unlikely to become so in the near future. This is due largely to the climate, for with a longer winter and drier summer than in the North there is only a short time in the year when cattle can be useful. In some of the better hill country such as Bank's Peninsula, cattle

are in fact run in proportions comparable with the North Island. On the foothill country and downsland where the rainfall is over 30 inches, with a good deal of it in summer, there is, I think, a place for more cattle to control rough growth and to keep country open for sheep. On most of the tussockland, except the wet shady faces, sheep, and especially wethers, are capable of controlling the growth and they are more profitable. The plains farmer is too conscious of drought to consider cattle seriously and here I must agree with him. At the rates of stocking we have here, sheep health is not seriously affected by absence of cattle. With the past and present prices of beef in comparison with wool and lamb it is just not profitable to allow cattle to eat grass that sheep are capable of handling. Cattle can be useful to clean up poor hay, unpalatable to sheep, and very useful indeed in the wet seasons but in the dry seasons they are a liability. None of us questions that cattle plus sheep are better for the land, the pasture and the sheep. We don't question that cattle are badly needed in the not infrequent wet years, but the fact remains that cattle are not as profitable as sheep. The plains farmer wants to be able to buy store cattle in the spring, and in the spring of only the wet years. Such an unreliable market is not much encouragement to the hill farmer to breed cattle for sale as stores.

DAIRY CATTLE

As far as dairy cattle are concerned we have both butter and cheese production on the pattern of the North Island systems and also an important town milk supply. In the former the problems are much the same as in the North except that the less favourable climate here forces us into the use of forage crops in addition to hay and silage. Probably a better all-round level of husbandry exists in the South for despite a shorter lactation, the average tested cow out-produces its North Island counterpart by 20lb. butterfat, though production per acre would no doubt be higher in the North. In town herds too the level of production compares very favourably with the North in spite of the more severe climatic conditions under which milking cows are called upon to produce. This apparently satisfactory position does not mean that there is no scope for further important advances. Most of these I believe lie in the field of nutrition.

The South Island dairy farmers have to contend in their feeding programme with two difficulties of considerable magnitude—the long winter and the dry summer-autumn periods. The former imposes a period of five months in the winter and early spring when supplementary feeding is necessary, especially in town milk supply herds. In order to maintain a high level of nutrient intake over such a long period the following points may have to be given more attention:

- (i) improved techniques of fodder conservation to provide a material of higher palatability and digestibility;
- (ii) the use of winter growing grasses such as short rotation ryegrasses, *Phalaris tuberosa*, prairie grass, and possibly other species;
- (iii) the profitability or otherwise of using limited quantities of concentrate feeds in special circumstances.

Related to the above is the perennial problem of low solids-not-fat of milk in late winter and early spring. This situation is no doubt complex from both nutritional and climatic effects aggravated by the use of low-testing Friesian cattle in town supply herds.

The summer-autumn period in the South Island is usually dry and lack of moisture can limit pasture growth, and hence milk production, at any time from October to April. There seems to be a wider

field here for investigation into the techniques and economics of irrigation since irrigation in some form must be the answer. The border-dyke system employed by the Winchmore Irrigation Station, controlled flooding, used successfully by some Christchurch dairy farmers and spray irrigation used at Lincoln College are all attempts to satisfy conditions for sustained pasture growth.

In calf feeding further research is desirable to solve the difficulty on town milk supply farms of rearing the calves on restricted supplies of whole milk in an environment where the Ruakura early weaning system has limited application due to the onset of winter or the dry summer. Lastly, in artificial breeding there would appear to be considerable use in the South Island for deep-freeze semen on account of the widespread distribution of our dairy herds.

In conclusion, there is a potential in the South Island as indeed there is in the whole of New Zealand for considerable increases in livestock production. Land development and pasture improvement are going ahead continuously. Animal husbandry is, I fear, progressing rather less rapidly partly, though not entirely, because its problems are more difficult to solve. In this address I have pointed out only some of these problems and I hope that I have made it clear that their solution could bring about vast improvements.