MODERN TRENDS IN GRASSLAND FARMING

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In viewing the problem set me by the executive of this Society—to provide a talk on modern trends in grassland farming-I found myself faced with formidable difficulties. The canvas is so huge, the picture so complex, and my knowledge so limited that I do not feel able to do justice to a subject which could be adequately covered only by contributions from a large number of specialists. All that I can hope to do in the course of the 20 minutes available to me is to give a very personal view of the present situation of grassland farming and of the new factors, knowledge, and techniques that must be given proper consideration if it is to continue to develop satisfactorily.

At the outset it will be useful to examine briefly the present position of the pastoral industry in New Zealand and compare it with the' state of affairs some 10 years ago, for after all it is often possible to obtain a guide to the future by studying what has happened in the past.

The total area of New Zealand is a little more than 66 million acres, but a great deal of this is extremely rugged country, with skeletal soils unsuited to farming. In 1959-60 the total area in grass was approximately 31 million acres, with another million acres under crops, giving a total of slightly over 32 million acres of what may be described as effective farm land; that is, about half the total area. Of the grazing land there were about 18 million acres of sown pasture and 13 million acres of natural grassland. A point which should be particularly noted is that the major proportion of the dairy produce and meat exported by New Zealand is produced on some 10 million acres of easy contoured land that has been cultivated.

This, then, is briefly the overall position at present. How does it compare with the situation 10 years ago? The statistics show that since 1950 there has been only a slight increase in the area occupied for farming and no very marked increase in the acreage in sown grasses. We all know that each year some new land is. being developed, but some is also reverting to scrub and bush, and it is fairly generally agreed that most of the land that can be farmed economically has already been brought into production and that the total area of potentially useful land awaiting development is probably less than 2 million acres.

Although the farmed area has increased but little in the last 10 years, there has been a very considerable increase in the numbers of livestock carried, particularly of sheep and beef cattle. In 1950 there were 21.9 million breeding ewes and 2.1 million beef cattle; in 1960 there were 32.6 million breeding ewes and just over 3 million beef cattle. Over this period the number of dairy cows and heifers has not shown the same decided increase; the number has in fact been fairly stationary, varying slightly just below the 2 million mark, but there has at least been an upward trend in the level of production per cow. This has amounted to approximately 20-25 lb of butterfat over the lo-year period. The general trend over the last decade has been, then, not one of any great expansion in the total area farmed, but rather of a steady increase in production obtained from land already in use. It seems fairly clear that in the future, too; by far the greatest part of production increases must likewise come from more intensive farming. Despite our present difficulties in finding remunerative markets for our dairy produce and fat lamb, there seems no doubt that, taking the long-term view, we must still further increase our production if we are to avoid a fall in the standard of living of our rapidly increasing population.

What are the methods which have brought about these past increases in production per acre? Are the methods which we have employed in the past the only ones upon which we shall have to rely? Or are there new methods and techniques becoming available which we should be willing to consider?

Certainly the basic problem today is essentially the same as in the past. More feed, and high quality feed, will have to be grown from each acre of land, and all steps taken to ensure that this is efficiently utilised. And if efficient utilisation is to be obtained, three conditions must be met: First, the seasonal spread of pasture production must approximate as closely as possible to the seasonal variation in animal requirements; second, grazing management procedures must be employed which ensure that a high proportion of the feed grown is actually consumed; third, the food eaten must be efficiently converted by the animal. This means that animals capable of a high level of production must be used.

The main methods whereby the productivity of our pastures can be increased are all well known. Firstly, there is the problem of selecting from the species of grasses and clovers available those best suited to the climatic environment. Next, steps have to be taken to discover whether the soil concerned is deficient in any essential nutrients which would limit the growth of these desirable species. For years past the introduction of English species such as

ryegrass and white clover combined with the use of phosphatic fertilisers has resulted in spectacular increases in pasture productivity. But the fact that many of our soils are definitely in need of potash is only now becoming generally recognised, while the discovery that molybdenum applied to some groups of soils stimulates clover growth tremendously is an excellent example of the fact that we must continually be on the look-out for minor element deficiencies.

Nor, of course, can we afford to be content with the strains of grasses and clover at present available. While we have every reason to be profoundly grateful for the seed certification scheme and to the plant breeders who have provided us with pasture plants such as the improved perennial and short-rotation ryegrasses and white clover, these are still far from being completely satisfactory in all districts. Perennial ryegrass tends to be unpalatable and of low nutritive value and gives insufficient winter production. This is also true of white clover, while short-rotation ryegrass tends to lack persistency. I understand that the new hybrid long-rotation ryegrass produced by hybridising short-rotation and perennial ryegrasses is likely to prove more productive than perennial and more persistent than short-rotation, although not as good a winter producer as the latter. One of our greatest needs at present is to improve further the winter production of pastures. It is comforting to know that this line is being pursued and that workers at Grasslands are busy investigating the value of strong winter growing introductions from Spain and Portugal.

In the past most of the increases in carrying capacity have been obtained from the relatively small acreage of ploughable land, mainly by the application of artificial fertilisers (particularly phosphate) and lime, the use of improved strains of grasses and clovers, and by better pasture management. We can expect still further increases by these means, for the productivity of many pastures on this easy country is still much lower than it should be. I would like to think that we will see an accelerated plough-up and resow policy rather than the present slow and gradual renovation and renewal of present old, low-producing pastures. During the decade 1950-60 the number of agricultural wheel tractors in New Zealand more than doubled (30,933 in 1950 as compared with 65,166 in 1960) while the number of crawler type tractors showed almost a four-fold increase (from 3,750 in 1950 to 13,249 in 1960). Today we have the machinery to undertake pasture renewal not only on flat land, but also on country that a few years ago was considered too steep to be cultivated.

Reference has already been made to the spectacular increase in sheep and beef cattle numbers that occurred during the last 10 years. Paralleling this increase and without doubt largely responsible for it has been the tremendous expansion of the agricultural aviation industry. In 1950 the total area topdressed (with artificial fertiliser, lime, or both) was 5.7 million acres; by 1960 the area covered was 8.9 million acres, and on almost half this area (about 4 million acres) the fertiliser was dropped from the air. In 1950 only about 5,000 tons was spread from planes; in 1960 475,000 tons was applied in this way. It is to be hoped that during the next decade the financial climate within the country and economic conditions abroad will permit the continued rapid growth of aerial topdressing. Although the recent expansion of the use of fertilisers has been impressive, the fact remains that at present the total area being topdressed represents only about half of the total area in sown grasses and less than a third of the total grassland acreage.

However, as previously mentioned, growing more feed of higher quality and with a better spread of production throughout the year is only part of our problem. As soon as pasture. productivity is raised we must give more thought to ensuring that the feed is efficiently utilised. On hill country sheep and cattle farms the importance of adequate subdivision with attention to contours has long been recognised as essential if the advantages of mob-stocking are to be secured and the stock used effectively as pasture improvers. But there are also certain modern developments of great potential value. For instance, the electric fence is proving its worth on many hill properties.

Increasing numbers of farmers are seeing the advantages of early weaning of lambs, particularly on country where bracken is a problem, for this enables the ewes to be mob grazed during the critical months of December and January. More, too, are tending to use breeding cows to replace steers on some of the less well developed hill country and it is increasingly becoming the practice to limit the mating season of breeding cows, to have them diagnosed for pregnancy during the early autumn so that dry cows can be culled to be fattened or disposed of, and also to wean calves early so that they can be given preferential treatment and the cows used to best advantage for pasture improvement.

Other fairly recent developments are the use of strain 19 vaccine to ensure abortion-free beef herds and the use of the brucella vaccine to control epididymitis in rams.

There is also a growing appreciation of the way in which management practices at mating time can influence lambing percentages, particularly of two-tooth ewes. The value of shearing

two-tooths shortly before mating has been thoroughly established, and there is considerable evidence that on many properties the practice of mobbing up two-tooths for a short period each day will give improved lambing percentages.

Similarly there is a growing body of knowledge which, if applied, should lead to the more efficient utilisation of the feed grown on fat lamb farms. Trials conducted at Ruakura and elsewhere have shown quite conclusively that outputs per acre are greatly influenced by the stocking rate, and there seems little doubt that in general it pays to sacrifice something in the way of lamb and fleece weights to achieve the benefits of high carrying capacity. Information is available as to the methods of grazing management that can best be employed at different rates of stocking. At low and medium stocking rates (4-6 ewes per acre) at Ruakura we have obtained best results by set stocking ewes and lambs from lambing time onwards, but at really high stocking rates (8 ewes and lambs per acre), when the amount of feed available becomes a limiting factor, better results have been obtained by rotationally grazing on a daily basis. Trials are in progress to see whether under really intensive conditions (with 10 ewes and lambs to the acre) there is any substantial benefit to be derived from adopting the forward creep grazing system which appears to have given quite remarkable results in some English trials.

Financial returns on fat lamb farms depend greatly on the lambing percentage, and it is reasonable to expect that as we know more about the managerial factors influencing this, improved percentages will be obtained. The importance of flushing ewes before and during the first few weeks of the mating period has long been appreciated, but the importance of having two-tooths really well grown and all ewes in really good condition at the start of mating has not been so well recognised.

In practice, lambing percentages are considerably influenced by the extent of ewe and lamb mortality. The level of nutrition during the month before lambing is very important in this connection, and there is plenty of evidence that very high and very low levels of feeding should both be avoided. Much can nowadays be done to minimise stock losses - both ewes and lambs-by intelligent use of the modern vaccines available. Blackleg or blood poisoning, malignant oedema (the cause of a common form of navel infection in lambs), pulpy kidney, and scabby mouth can all be brought under control in this way.

A piece of apparatus which has recently become available is of very great potential value to fat lamb farmers, particularly those who farm a "flying" flock of aged ewes. This is the ram tupping harness, use of which enables tupping dates to be recorded and

the ewes divided into groups according to probable date of lambing. Even more important, this equipment makes it possible for most late lambing and dry ewes to be identified, so that these can be culled and sold during the late autumn and early winter. If rather more ewes than it is desired to winter are mated, it is possible to ensure that virtually all animals carried through to lambing are in lamb, and also that they are animals which will lamb reasonably early in the season.

There is at present a most desirable trend on the better fat lamb farms towards increased conservation of hay and perhaps also silage. While in the South Island it has long been customary to feed hay to sheep in winter, the value of having sheep accustomed to hay feeding is only slowly being appreciated in the north. Frequently one sees on fat lamb farms in the summer large quantities of rank surplus feed which could with great advantage be conserved as hay for winter use by both sheep and cattle. Last winter at Ruakura no real difficulty was experienced in carrying ewes stocked at the rate of 10 per acre through the winter on peat pastures that contained a fair proportion of Yorkshire fog, *Poa trivialis,* and browntop pasture which certainly could not, by any stretch of the imagination, be described as really high producing. This was made possible simply because the ewes in question had been trained to eat hay and readily ate ½ lb per head per day as a supplement over the period when pasture was in short supply.

There is no question that in the future, as deficiencies are corrected and soil fertility is built up, leading to higher levels of pasture production, the trend will be to carry more and more stock per acre. As the density of stocking increases we can certainly expect the problem of parasitic diseases to increase. Where animals are thin on the ground usually very little trouble is experienced. But under really intensive grassland farming the problem may well assume major proportions. Fortunately the field of parasite control is one in which very rapid advances are being made, and there is every indication that within the next year or two new materials will be commercially available in New Zealand which will control worm infestations very much more effectively than any that have been available in the past. Some of these new materials are at present under test at Ruakura.

One very marked and quite recent trend in the sheep industry has been the growth of the practice of multiple shearing. Whereas a few years ago it was unusual to shear more than once annually, now, particularly in the Auckland Province, a very large number of producers are shearing either three times every two years or twice every year. The practice has many advantages from the

farm management angle, it being claimed that the increasing wages that have to be paid for shearing are more than offset by improved wool condition, by reduced sheep losses, by shepherding and labour economies, by better lambings, and by improved sheep thrift. The future of the practice will undoubtedly depend on whether the highly favourable prices which have been paid over the last few years for second and early shear wools continue to hold. They are more likely to hold if the wool staple can be maintained at a reasonable length.

Let us turn now to consider trends in grassland and general management procedures on dairy farms. The improved strains of grasses and clovers bred at Grasslands Division have probably had a bigger impact in the dairy than in the other pastoral industries and many farmers are finding their wintering problem considerably less acute since the introduction of short-rotation ryegrass. As far as methods of grazing management are concerned, one can only say that many different methods are being employed and there *is* no general agreement as to which of the numerous systems practised has most to offer. At one extreme is the set stocking system with the animals allowed to graze continuously over the whole of the pasture area. Over recent years, however, the general trend has been toward increased subdivision (with particular emphasis on contour fencing on the more broken farms), which permits various forms of rotational grazing to be practised. One sees some extreme examples of very intensive rotational grazing systems in which throughout the year the cattle are offered a fresh area. of pasture either once or twice every day, just sufficient to meet their immediate requirements. Certainly with modern methods of electric fencing it is possible to obtain a considerable degree of subdivision for a moderate financial outlay.

In grazing trials it is extremely difficult to measure the amount of feed actually grown. Therefore, although quite a large number of trials have been conducted with dairy cows to compare the continuous, rotational, and break grazing systems, results have usually been expressed in terms of the effects on animal production and on the amount of feed utilised. However, most investigators have claimed that the more intensive grazing systems have resulted in more efficient feed utilisation, but have found that over the main growing season the method of grazing used has little influence on per cow yields. No experimental work has yet been carried out in New Zealand to compare directly the effect of the continuous and rotational grazing systems on dairy production over the flush period of pasture growth. Dr McMeekan has carried out a long-term experiment with dairy cattle on two uniformly stocked, self-contained farm units on which "controlled" and "uncontrolled" grazing systems were practised throughout the

entire year. Over a lo-year period the control grazed cows out-produced their set-stocked mates by approximately 40 lb of butterfat per cow. However, the quite large production differences obtained in this experiment should not be regarded as evidence that the two systems would result in production differences when applied only over the main growing period. Tndeed the bulk of the available evidence suggests that when grass is in abundant supply the method by which it is utilised has comparatively little influence on the level of milk production. The main advantage usually claimed for rotational grazing is that it results in greater yields of herbage and allows each paddock to be grazed off at the optimum stage of growth while the nutritive value of the herbage is still high. In practice it seems very doubtful indeed if this feed is of higher quality than that eaten by set-stocked animals which have greater opportunity to graze selectively. It is equally doubtful whether more feed is grown by the rotational method. On New Zealand dairy farms set stocked over the early summer the pasture is usually dense and several inches long. The leaf area index is high and there are in fact no good grounds for believing that any less feed will be grown under lenient set stocking than under a rotational or break grazing system.

This does not necessarily mean that some form of controlled or rotational grazing is not to be preferred. Even though the more elaborate grazing systems may not result in any immediate increase in either pasture or animal production, they do allow feed genuinely surplus to current requirements to be seen, recognised as surplus, and cut and conserved either as hay or silage. In my opinion one of the major disadvantages of the set stocking system is that a decision has to be made as to what proportion is to be closed for silage and hay and what kept under grazing. If a fairly intensive system of grazing is followed, no difficult decisions have to be made as to when or how many paddocks should be closed. Those that get beyond the desirable grazing stage are automatically shut up for hay or silage.

The present trend is undoubtedly toward higher rates of stocking and the importance of this factor in securing efficient utilisation of the feed grown and high outputs of milk and butterfat per acre can hardly be too strongly stressed. It is splendidly illustrated by the results obtained by Dr McMeekan at Ruakura's No. 2 Dairy over the last four years where he has been studying the effect of two different methods of grazing management-controlled and uncontrolled grazing-at two different rates of stocking. At both stocking levels the controlled grazing system has given best results -on average approximately 20 lb more fat per cow at the low level of stocking and 56 lb more fat per cow at the high rate of

stocking. Under both methods of grazing management per acre outputs have been greatest from the more heavily stocked farms, despite some reduction in per cow production. The results obtained serve to emphasise that the method of grazing management, and particularly the method of winter management, becomes increasingly important as the rate of stocking increases, and this is in accord with a great deal of other evidence obtained at Ruakura over the years which clearly shows the importance of good wintering procedures. There is no doubt that as stocking rates are raised the normal periods of feed shortage become more acute and it becomes increasingly important to devise a sound wintering system in which autumn-saved pasture, silage, and hay all have their part to play.

Much of the silage made at present is of very poor quality. A few years ago silage making methods were completely changed by 'the advent of the buckrake. Now flail type harvesters are becoming extremely popular and it is to be hoped that as a result of this development we will see an improvement in the quality of the silage being made. Certainly recent research results suggest that rapid ensiling, rapid consolidation, and low ensiling temperatures should be the aim if good silage is to be secured.

The shortage of labour on dairy farms is forcing the adoption of a number of other labour-saving practices. Here one may cite the interest in self feeding of silage, the wide adoption of the herringbone type milking shed, and of simplified calf rearing methods, such as once-a-day feeding and early weaning. With difficult economic conditions ahead no dairy farmer can afford not to streamline his operations to the fullest possible extent.

Many dairy men are much concerned by the incidence of metabolic diseases, and I fear that as productivity is stepped up these troubles may tend to become even more prevalent. But some progress is being made. For instance, although bloat can be extremely troublesome, methods that are completely effective are now available whereby it may be controlled. I refer, of course, to the method of spraying pastures with oils that has been developed by workers at the Plant Chemistry Division of the Department of Scientific and Industrial Research at Palmerston North.

In the time at my disposal I have been able to cover a very wide field in only a very superficial way. It is difficult to forecast the future, but one thing I believe we can be certain of. Methods and techniques will not stay as they are. There may even be changes in the form of our animal production. Whatever happens, I believe that science and technology will play an increasingly important part in our agriculture and it behoves all farmers and research and extension workers to try to keep abreast of modern developments.

DISCUSSION

Q.. Dr Wallace mentioned creep feeding. Has he tried the method with lambs on pasture?

A. Dr Wallace said he was at present trying out the method. Other centres found there was difficulty in saving pasture in the early stages and controlling growth later with lambs only.

Q. (Granger):

(1) What is the optimum stage of growth for feeding off autumn and winter saved pasture?

(2) Is there much trouble with stock with the new strains of grasses and clovers, and is there any liaison with Grasslands regarding the new types of grasses as to palatibility, etc.

A. (1) Previously it was the custom in the Waikato to shut up a limited portion of the farm in the late autumn, carry this through the winter and to feed off in the spring. However, it is far better to shut a larger area later in the autumn, and to start feeding this off at a younger growth stage before deterioration occurs in the bottom growth. The 6 in. stage of growth would appear to be ideal for feeding off and with no damage by smothering of the all important clovers.

(2) There is no reason to believe that the new strains of grasses and clovers are any less effective in picking up nutrients from the soil than the older strains. The new strains are just as effective and palatable.

Comment (P. D. Sears): Grasslands Division is very watchful of the situation with complete liaison between us and the Plant Chemistry people. There is no reason to believe that the new species of grasses and clovers are any less effective than the older strains. We are working progressively with the Plant Chemistry people all the time.

Q. Dr Wallace obtained highest production with controlled grazing. Would not set stocking be better in the control of metabolic diseases due to the stock eating more fibrous material.

A. Not in agreement entirely with the view that stock will balance their diet completely, since stock will select against fibre if given a choice. New Zealand pastures are high in fibre content of low value after spring growth but short rotational rye is less fibrous for a longer period than perennial rye. Agreed however there is less metabolic troubles with poor pastures and low producing animals but the problem of metabolic diseases must be met by other methods than poor pasture production.

Comment (J. Gerring): At Ruakura over the last nine years the following metabolic cases have been experienced:

35 cases of milk fever under controlled grazing.

15 cases of milk fever under uncontrolled grazing and one case of grass staggers under controlled grazing.

Q. Is it a fact that on sheep farms lambs do far better on pastures matured by sunshine than *in* periods of prolonged wet weather?

A. The point is that 'in periods of good weather there is a considerable increase in soluble carbohydrates. It is the increasing proportion of clover in lamb fattening pastures that is the important factor.

Q. (F. Thompson): With pasture renewal is enough use being made of undersowing and if so, is the Farm Advisory Division advocating that sufficiently?

A. The method appears to be a very valuable one, and appears to be neglected in this country. Undersowing depended largely on the particular conditions.

Comment: The Chairman concluded discussion by remarking that a whole paper could be given on the subject of pasture renewal alone.