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The Making of New Grassland

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The Making of New Grassland During the Last Five Years

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The fields for grain, silage, roots and Italian ryegrass hay are worked intensively and are all near the farm buildings.

This is to economize labour, and the bulk of the farmyard manure is distributed on these fields, most of them being treated with this twice in three years.

As all the produce, including hay, is consumed on the farms there is a large quantity of farmyard manure to distribute annually.

The real value of pasture lies in the stock it will carry and the live weight it will produce.

I have on occasion got 3 cwt. live weight per acre during the grazing season and my aim is to get this increase on all my pastures.

Particulars of Stock

The farm is worked from one centre by seven horses and a tractor, the latter being used for threshing and bare-fallowing only.

The stock carried in summer is larger than during the winter. At 28th May 1930 it consisted of 283 cattle, including calves, and on 10th February 1931 of 215—a reduction of 68; and 893 sheep, including lambs, and on 10th February 1931 of 524—a reduction of 369.

The sheep will be reduced by another 40 before 1st March by the sale of fat sheep, and the numbers will be brought up to about 900 again before May by lambs dropped. The cattle will be brought up to about 290 at the same time by calves dropped and purchased for suckling.

Nearly all the stock sold go off the grass fat during the summer, very little winter fattening of cattle being done. About 250 male lambs are fattened in autumn and early winter, the female lambs being kept and sold for breeding in September following year of birth, having meantime reared a number of lambs.

THE MAKING OF NEW GRASSLAND DURING THE LAST FIVE YEARS

BY W. M. FINDLAY, N.D.A.

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Experiments at Craibstone

IN the north of Scotland, where 80 to 90 per cent. of the soil is what may be called a light medium loam about a plough-furrow deep, a large proportion of the arable land is worked on the six-course rotation with three grasses, which may be either one year's hay and two years' pasture or three years' pasture. In a few cases there is a five-course rotation with two grasses, while in some other cases the pasture may be lengthened

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to four, five or more years. In one or two districts there is a more intensive rotation with only one year's hay.

The general method is to apply dung to the root crop, and artificials either wholly to the root crop or partly to it and partly to the nurse crop. Very little artificials are applied directly to the grass. After the wonderful results obtained by the application of slag to permanent pasture, several farmers applied it to their temporary grassland, but as there were apparently sufficient phosphates already in the soil it had little effect.

There is very little permanent pasture, what there is being mostly round mansion-houses. A large part of what is classified in the agricultural returns as permanent pasture is unfit for ploughing and would be more correctly called rough grazing.

It is now fully twenty-five years since Sir Robert Greig started experiments with different grass-seed mixtures. Before that time the mixtures contained large quantities (often up to 2 bushels) of perennial ryegrass and clovers, only in a very few cases were small quantities of cocksfoot and timothy or other grasses included.

Those trials showed (1) that many other factors besides the seed mixture affected the result; (2) that perennial ryegrass could be considerably reduced without reducing the hay crop, and the addition of cocksfoot and timothy improved the pastures by making them earlier for use in spring, more lasting in summer, and prevented to a large extent the entrance of such weeds as Yorkshire fog; (3) that there is a considerable interaction between the different ingredients of mixtures, such as the effect of perennial ryegrass on cocksfoot, timothy, meadow-fescue and Italian ryegrass; Italian ryegrass on perennial ryegrass; Italian ryegrass, and to a less extent other grasses, on clovers; red clover and white clover on grasses, and so on: this interaction is modified by the weather conditions and methods of treatment and manuring; (4) that the improved pastures are due, so far as the seed mixtures are concerned, in equal proportion to the reduced perennial ryegrass and increased cocksfoot and timothy on the one hand, and to the inclusion of wild white clover on the other.

Since those early days the subject has been further complicated by the introduction of several distinct strains of grasses and clovers, each of which again exercises its own peculiar reactions on the others.

Fully ten years ago a commencement was made with trials of the more late-flowering types of grasses, especially perennial ryegrass and cocksfoot. At first, a study was made of the relative proportions of leaf and stalk in individual plants, and it was generally concluded that these late types, owing to their ability to produce much more leaf, would evidently be better suited for pasture than ordinary commercial samples. Several of the best plants were broken up and multiplied.

One important point observed in connection with ordinary commercial perennial ryegrasses, which are almost invariably seeded from

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first year's grass, is that its longevity and value have undoubtedly increased since the introduction of wild white clover. Apparently the nitrogen provided by the wild white to the growing perennial ryegrass encouraged the more perennial of the ryegrass plants present, so that they have stocked out and filled a much larger proportion of the soil surface. This is especially true where the pasture has been kept comparatively well eaten down and not allowed to form ears until the white clover got established.

During the past five years several trials have been carried out where the different types were sown in small plots alone and were also included in turn in the same seed mixture. The mixture used was generally 13 lb. perennial ryegrass, 8 lb. cocksfoot, 4 lb. timothy, 2 lb. broad-leaved red clover (English), $1\frac{1}{2}$ lb. late-flowering red, 1 lb. alsike and $\frac{1}{2}$ lb. wild white clover per acre. The same mixture was used in the trials with cocksfoot and red and white clovers.

Most of the commercial perennial ryegrass used comes from Ayrshire, although a fairly large proportion, especially in some districts of Aberdeenshire, is home-grown. The late-flowering samples used in addition to the home selection have been mainly what is called Evergreen, or wild or indigenous—in most cases likely sifted out of wild white clover—Cornish Eaver and a Swedish selection called Victoria. When made into hay the differences between the plots were very marked, the stalks of the commercial samples of perennial ryegrass being much earlier and more numerous than in the late-flowering. On the other hand, the amount of cocksfoot, timothy and red clovers was generally much greater where the latter type was sown. The comparative weights of hay have varied in different seasons. In some seasons the commercial plot was distinctly heavier, while in other seasons the late-flowering was the heavier, and this variation is likely to happen in all trials of this kind so long as we have different soils and different seasons. In pasture, the relative appearance necessarily varied according to how the field was grazed. In a typical example the difference was quite marked, the commercial tending to go into ear early and thereafter consequently somewhat neglected by stock. The late-flowering on the other hand was much thicker with leaf blades and was usually better eaten, so that it had not the same chance to form ears. Some of the samples, for example Cornish Eaver, appeared to be intermediate.

The trials with the late-flowering strains of cocksfoot included, in addition to the home selection, Akaroa, Swedish and several English selections. Danish was usually the commercial kind used. In the hay crop the ears of Danish were quite prominent, while there were comparatively few in any of the late-flowering samples, although there was a considerable quantity of green blades present, and the latter also showed much thicker in the aftermath. In pasture the Danish came away very much earlier in spring, and was preferred, and well eaten down

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by the cattle. However, it soon went into ear, after which the produce was much less. This early tendency of the Danish is, however, of considerable importance in the north-east of Scotland, where early grazing is much required. Further, if there is too large a proportion of succulent material in a pasture the tendency to scouring is increased, especially in a wet season, and the presence of some of the grasses in ear helps to counteract this. The late-flowering stocked out and produced a considerable amount of blades, which were generally well eaten.

These results are so far favourable to the late-flowering types, but there is just a danger that we may expect too much from them, as has been the case in too many instances in the past. The comparison is not between early- and late-flowering types but between grass-seed mixtures containing these types, and we must not forget the effect of the interaction between the different ingredients of the mixtures. The final test is: how much beef or how much milk will mixtures with the late-flowering types of grasses produce compared with the early-flowering types.

Two other considerations that must be taken into account are (1) that the seed of the late-flowering strains of grasses is often of inferior quality, and (2) that there may be some difficulty in getting genuine samples. For example, we have compared a good many samples of "Evergreen" perennial ryegrass during the last year or two, and a fairly large proportion have been little better than ordinary commercial samples.

Turning now to the mixtures for one year's hay, these consist mainly of Italian ryegrass and red clovers; the hay is mainly Italian ryegrass, the amount of clover being usually small. A difficulty in making up mixtures for one year's hay is that there are several methods of dealing with the produce. The mixture that may be best for one purpose may not be best for another. If winter and early spring grazing are wanted then the inclusion of Italian ryegrass is essential, but trials show that the subsequent hay crop is less; on the other hand, if the grass is not to be eaten down previously, mixtures with perennial ryegrass substituted for the Italian will produce heavier hay crops with more red clover. Possibly the most notable feature in these trials for one year's hay has been the value of including 5 or 6 lb. of timothy. This not only increases the weight of hay but also helps the crop to stand better.

The chief feature of red clovers in the north-east of Scotland is their susceptibility to be affected by different conditions of soil, management and weather. In one trial where little or no dung had been given to the turnip crop there was very little red clover in the hay, whereas where a good dressing was given, and especially along with a good application of artificials, there was abundance.

The previous crop has often had a marked effect on the amount of

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red clover. For example, on several occasions there has been much more red clover after a potato crop than after a turnip crop. This was due to the fact that the grain crop, both oats and barley, was much lighter after potatoes and so enabled the red clover to get better established. Further, a comparatively thin grain crop, cut early, favoured not only the red clover but also the grasses, whereas a thicker grain crop, especially when late in being cut, reduced both the amount and vigour.

The weather conditions have affected the red clover in at least two different ways. First, in spring at the time of sowing the seeds, when the soil was dry, and dry conditions continued, there was very little, whereas in another part of the field where the seeds had been sown earlier there was quite a good stand. Secondly, in the following spring, red clover was slow in starting to grow when there was a dry spell, and especially when the temperature was low there was very little in the hay, although there was plenty in the aftermath. This happened last year, and it is interesting to note the effect on the different types and nationalities. Generally, the late-flowering was superior to broad-leaved, and among the former some English samples were best, the later Montgomery, Cornish Marl and Swedish were next, and about the same, while American Mammoth and Russian were very poor. In other seasons Montgomery and Cornish Marl were best, while in still others all the late-flowerings were very poor and the broad-leaved good and vigorous. In the case of the broad-leaved, English samples were most reliable. It is only in an occasional season that any foreign seed gives good results.

Keeping these results in mind, then, our conclusions are that we require both broad-leaved and late-flowering in a mixture, and it is well to include several different samples of each. One other point in connection with red clover is that we look to English farmers to sow acclimatized English seed and not to sow weakly foreign stuff, seed it and sell it as English. We have had experience of this.

White clovers have occupied our attention during the last five years, and we have tested samples from different parts of England, from New Zealand and America, and with ordinary white. About 90 per cent. of the English samples were genuine, but the other 10 per cent. gave a poor result and were evidently from cultivated grassland.

Chemical tests were made of all the samples, and those that did poorly gave weak reactions, the big seeds being generally weaker than the small seeds. Two samples from Oxford and York respectively were of special interest. While they produced lasting plants, the leaves were much larger and the stalks much thicker than ordinary English wild white.

In the trials with New Zealand wild white when sown in rows many samples showed considerable vigour, but they showed much less prominently in the field. In no case where the same amount of seed

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had been sown was the New Zealand so vigorous or so well spread as good English. All American samples lacked vigour. As some farmers still sow ordinary white in addition to wild white, mixtures were sown with different quantities, but even where 5 lb. of ordinary white were included there was hardly a plant to be seen in the pasture.

We like to get a good vigorous mixture of grasses and white clover as soon as possible in our pastures, and in this connection the effect of the previous treatment has been observed on several occasions. In part of a field the hay was cut early while the remainder was cut late. The result was very marked during the three years the field was in pasture, the first part having a fine uniform "sole," while in the latter part the white clover was very patchy. In another case where part of the aftermath was late in being used the result was similar.

After the white clover is well established we find it is an advantage not to eat it too bare, otherwise if dry weather sets in the pasture is practically finished for the season.

During the last few years a considerable amount of attention has been paid to what is called rotational grazing, along with intense manuring. We have had several small trials on both points. There is no doubt but that our commercial friends spoiled a good case by making far too extravagant statements, and it is gratifying that they have considerably toned down.

Taking the manuring first, there must necessarily be a considerable difference in their needs between poor permanent pastures and temporary grasses growing on land in good heart. There are fields of the latter that are growing all the grass they possibly could except at the beginning of the season, when an application of a nitrogenous manure would provide earlier grazing.

When applied to young pasture, nitrogenous manures, even with abundance of lime, phosphates and potash, encourage the grasses, including annual meadow-grass, to such an extent that they act adversely on the young plants of white clover, which, after all, is the cheapest source of nitrogen we have.

Our conclusion is that on arable pastures little or no nitrogen should be applied until the white clover is well established, then some may be applied at discretion, especially at the beginning of the season.

Several small trials have been carried out on the rotational method of grazing, but these have not shown it to be of any advantage, as quite as much live-weight increase was obtained where the cattle were not shifted as where they were.

What the trials do show, however, is that the success depends on the management. Where the pasture was eaten comparatively bare until the white clover was established, then where there was a good mixture of grasses and white clover, and when the pasture was not eaten too bare early in the season, it was not affected so much during dry spells as where it was eaten barer. Also, where a field was sufficiently

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stocked so that the pasture was evenly eaten down the grasses did not go readily into ear and there was a good supply of pasture of the best quality.

One point of importance is that if there are different types of soil in a field which produce different kinds of pasture these should, if practicable, be sown with mixtures suitable for the different types of soil, or be fenced and grazed separately.

But, the best-laid schemes "gang aft agley." Weather conditions often upset plans.

MAKING OF NEW GRASSLAND

BY A. McARTHUR

Buntingford, Herts

I HAVE been asked to read a paper, or rather to relate to you my experience in laying down arable land to permanent pasture.

About fifteen years ago I put several acres of land down to grass in Cambridgeshire, on land that was absolutely unfit to grow corn and which is now a fine pasture; there has been no deterioration at any time since being put down, which often does happen.

I succeeded in getting an excellent plant the first year, and never at any period in the summer months was it closely grazed, and to this I attribute the successful result. At no time during the first ten years was any of the pasture cut for hay. I strongly believe that to cut your pasture for hay goes a long long way towards ruining it. Graze it, and feed it, either by fattening stock with cake, or by applying artificial manure.

In 1922 I purchased a farm of 580 acres, near Buntingford, 80 acres of which was old pasture, the remainder arable; the most of it two-horse land in dry weather, and three horses when wet. One would call it a medium heavy soil, all mole-drained, the subsoil being suitable for this treatment. I started putting one field down to grass and then another, until I now have 300 acres in pasture out of a total of 580 acres, and it has gone down splendidly, with the exception of one field, from which I cut hay. That field has lost a large percentage of the clover, the clover plant having been choked with the vigorous growth of varieties of grass plants, which always grow quicker and more robust than the clovers. When I put down mixtures for cutting on arable land, sainfoin or clover, I have found in the case of Italian ryegrass and sainfoin the best mixture is four bushels of sainfoin and one-eighth of a bushel of Italian ryegrass, which is quite sufficient grass. Now why such a small quantity as one-eighth of a bushel? Because if you put more it spreads out so much it will smother the sainfoin or clover, and you never see them any more. The same thing applies to new permanent