Pasture Establishment

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A survey of New Zealand's present pastures and of farmer opinions would, I think, show the following points:—

(1) A very large proportion of our pastures are very poor, and need renewing.

(2) Quite a large proportion of farmers are aware of this, but are not keen to have a go at renewing their pastures, largely because of past failures, and of their doubt as to their ability to produce rapidly pastures much better than they now have. This applies in spite of the Pedigree New Zealand pasture plants available. Consequently, most of what little pasture renewal that is being done, is mainly as part of a cropping cycle.

(3) Not very many appreciate that pasture establishment is a tricky business, and one that calls for much more than the sowing of some empirical seeds mixture and super, followed by a period of waiting, with or without prayer, until the new pasture "comes right."

(4) Very different results are secured from differences in soil, climate, weed populations, sowing dates and methods, and grazing management; yet there are still many people who fail to appreciate this and who endeavour to fit a common treatment and mixture for all conditions, which treatment is in many cases a result of habit rather than of any reasoning around the pasture needs.

(5) Many of the disappointments with new pastures of recent years, especially where H1 ryegrass has been used, follow a similar pattern of good grass growth for the first few months, a poor second year, and then a slow recovery to either a very good pasture, or to one of only moderate performance.

In this short paper I do not propose to deal in detail with any factor, but only to outline briefly some of the results we have been securing at Grasslands over the past few years; mainly to illustrate that the problem is complex and one calling for considerable thought throughout the whole pasture establishment period.

Emphasis on different factors will naturally vary from place to place but in general the problem is one of adjusting the growth of grasses, clovers, and weeds in order to encourage the first two and to prevent or eliminate the last. Naturally feed provision by the new pasture is important from the start, but always a balance has to be struck between present and future growth.

Between the grasses and clovers the balance is all-important. On low fertility soil the difficulty is to hold the grasses until the clovers have started their nitrogen cycle, while on high nitrogen soil the problem is to get the clovers going in competition with the vigorous growing grasses and weeds and against the hazards of stock trampling, grazing, and urination.

It seems logical to me that to obtain rapidly this balance between grass and clover on low fertility soil, the main emphasis must be on the early provision of appropriate soil minerals, soil moisture, and of strains of clovers and their associated root nodule bacteria, and the use of grass strains and species that will hang on during the soil fertility building and early grazing, and then develop with the soil fertility.

At the other extreme, where soil nitrogen is already high (and this obviously implies high total fertility under normal New Zealand conditions) it seems equally logical that care must be taken to prevent too much early competition from the sown grasses and the volunteer weeds, by cutting down the amounts sown of rapidly establishing grasses, by keeping the grasses and weeds defoliated, by using only erect types of any associated cover crops, and by taking nitrogen off

the land before and during this building process. Naturally, consideration will also be given to early autumn or to spring sowing to give a relative advantage to the clovers where the above alternatives are not practicable.

The value of stock grazing on the early grass growth, for feed and for pasture control, must be considered against any damage by poaching, and the toxic effects on young clovers of urine passed by the grazing animal in concentrations. Equally weed control by sprays must be carefully considered against losses of clover seedlings.

Following are a few examples of the pasture establishment trials under way at Grasslands:—

1. Soil Moisture.

I have no experimental data on the damage caused in new pastures by excess moisture, but field examples show very clearly how hopeless it is to try and produce a good pasture on undrained soil. Most farmers are, however, fully alive to the position, as is evidenced by the great and growing pressure on drainage and levelling services.

The dry end of the scale is of course equally difficult, and care must be taken to conserve moisture during cultivations, and also to sow the seed at moisture levels.

To this end Mr. Hyde and I have been working over the past three years with the Lands Department on some of their raw pumice development blocks. We have obtained considerable advantage by the use of a roller-drill made in collaboration with Massey College, which machine gives good crushing and consolidation of the rough pumice, and also gets the seed and phosphate essential on this country, down to moisture and together. With this we have secured a much better strike and early growth than from broadcast seedings. Actually, we feel that much of the benefit claimed from heavy consolidation on this land is in fact due to such placement of seed and fertiliser in the roller and tractor cleat marks.

2. Soil Minerals.

Many people overlook the need by new pastures for adequate soil minerals, and the need to correct for soil deficiencies, which were possibly among the main reasons why their previous pastures failed.

The outstanding results from phosphate on raw pumice are well known. More recently the trials of molybdenum are showing a rather widespread need for this trace element. But let us not forget the others and always keep our eyes open. For example, over the past year I have seen from several small fenced plot enclosures laid down by Dairy Board officers on new pastures through the Manawatu area, that potash is needed far more than is generally appreciated. Indeed on most of these farms it appears that money being spent on super at present is not showing any return, but that potash is essential. Fortunately the soil testing services are being extended, but small plot trials in fenced ungrazed enclosures are to my mind an "almost must" on most farms, for gaining obvious information about what minerals are or are not needed for good pasture growth. The search for fertiliser needs must be a continuing process on each farm, and even on each paddock, and should not be limited at any time by habit, or by inertia.

3. Clover Nodule Bacteria.

An outstanding feature of our recent trials on the raw pumice development blocks, has been the demonstration of the need there for appropriate clover inoculation. This has been especially successful when combined with seed and fertiliser placement at moisture levels. It is of course easy now to appreciate that such virgin country is an obvious place for such inoculation, but one naturally wonders why we do not continue to explore the needs of other areas, especially where present clover growth is poor, and where perhaps appropriate

fertiliser, seeding and management have failed to bring success. After all, lucerne inoculation is accepted as a standard practice; why not follow the same cheap insurance practice with the clovers of our pasture mixtures. I know that many trials have been made in New Zealand, mostly without results, but I feel that it would be a good thing to re-open the question, using good rhizobia strains and good sowing methods.

4. Soil Nitrogen Levels.

Soil nitrogen levels appear to me to be a key factor at the establishment stage. In our trials on the very low nitrogen pumice, added nitrogen at sowing has shown very marked growth responses in both grass and clovers. It is doubtful, however, whether such additions are economic, and we feel that a better approach is to try and nurse the clovers on such soil by appropriate sowing and inoculation and also possibly by reducing the seeding rate of the early competing ryegrass.

At the other extreme it appears that a very high soil nitrogen at the establishment stage can easily lead to poor pasture. Two recent trials at Palmerston North illustrate the position. For the first trial I used an area low in soil nitrogen from cropping and cultivations in wet weather, but high in other nutrients. In a replicated plot layout I imposed the following treatments on autumn sowing of H1 ryegrass, white clover, and red clover:—

(i) Low nitrogen at start—no return of urine.
(ii) High nitrogen at start—no return of urine.
(iii) Low nitrogen at start—return of urine.
(iv) High nitrogen at start—return of urine.

The growth was cut throughout at the 3" stage and urine returned in patches, similar to sheep urinations, on the basis of 80% of the total N yield of each plot at each cut. The nitrogen level of the soil was raised in Treatments (ii) and (iv) by the addition of urea at 3 cwt per acre at sowing. A weakness of the trial is that there was no pure clover plot on the high N soil; the clover strike was good however on all plots, and the internal evidence was that the urea did not directly reduce the seedling clover growth. Results are as follows:—

Treatment (i): Low N—No Return.

Early grass growth was slow and yellowish in appearance but the clovers developed strongly, with very few deaths. At the present time the pasture has a vigorous clover growth with the grass improving in amount and colour. This pasture has produced bloat every time it has been fed to a cow.

Treatment (ii): High N—No Return.

Grass growth was vigorous and dark green for the first few months but clovers developed very slowly. There was a marked slump in grass growth after September and the pasture became very yellowish in colour. After this the clovers slowly developed and at present the growth is not very much behind Treatment (i).

Treatment (iii): Low N—Return of Urine.

This started off similarly to Treatment (i) but the grass became quite strong in the urine patches. Clover deaths were confined to the urine patches but a good balance between grass and clover has resulted.

Treatment (iv): High N—Return of Urine.

For the first few months grass growth was vigorous but the clover deaths were very considerable especially in the urine patches of which there were naturally many more than in the Low N—Return Treatment. A marked slumping in growth took place in this treatment after October and at the present time this pasture is open and yellowish in colour with very weak clovers and with a production of only about 40% that of the Low N—Return Treatment.

I emphasise that these results have been secured on good land and in a season very favourable to clover growth. Also there was some lateral spread of clovers from the vigorous to the poorer treatments before I had adequate plot separations made. I feel, therefore, that the results are conservative.

In another paddock trial I compared in a spring sowing the differences between seeding direct grass to grass against prior forage cropping on high and low nitrogen soil at Grasslands. The data are only from a single season but show clearly that it is much better to sow low nitrogen soil direct to pasture, and not to waste efforts on a crop; on high nitrogen soil the best results were obtained after taking a crop to use the high nitrogen, and then to follow with a pasture mixture.

Actually, the yields of the two spring-sown pastures were similar, but the botanical composition on the low nitrogen soil was 75% clovers, 25% grass, for the first six months, while that on the high nitrogen soil was the opposite. At the present time, however, the pasture sown on the low nitrogen soil is strong in both grass and clover after coming through its clovery phase, while that sown on the high nitrogen soil is weaker—no doubt as a reflex of the poorer clover development in the early stages last spring.

I have no data on the actual soil nitrogen levels at sowing of these trials, but obviously they are somewhat extreme. I quote the results simply to illustrate the principle involved. On the farm there will naturally be a mixture of levels, and this mixture will also be seen within paddocks. For example, high soil nitrogen will be expected on "night" paddocks, good clover paddocks, "camping" areas, gateways, and also where summer cultivation without much rain has been carried out. By contrast low nitrogen will be expected in day paddocks, poor clover areas, cropped areas, and also areas under cultivation and where heavy leaching has occurred.

Seeds Mixtures and Management.

Similar large differences in pasture establishment can result from differences in early grazing control (2) and from seed mixtures (1). From several of our trials and from paddock results the evidence is very convincing that seeds mixtures must be adjusted to the soil conditions, species growth rates, and to grazing control. Essentially the basis must be to so adjust these that all sown species get their chance, and are not choked out in their infant stages.

For example, with a heavy autumn seeding of H1 it is essential to keep the grazing height at the 3" stage—more latitude in grazing height is possible with a lighter seeding, due to the greater light penetration through the less dense mass of grass herbage. The addition of an erect growing cereal to such light seedings will fill up the early growth weakness of such lighter grass seedings and be well out of the way after the first one or two grazings. But care has to be taken if there is any risk of poaching in early grazing on heavy land, and if in doubt it is better to leave out such additions.

Conclusion:

I have purposely kept this paper loose in construction and have dealt only with extremes. My purpose in doing this has only been, however, to emphasise the fact that successful pasture establishment calls for detailed thought throughout, and is not a subject which can be covered by some easy recipe.

On the other hand I feel that thought put into this subject will be repaid not only in better pasture establishment, but also in the development of a better attitude towards pasture growth generally.

References.

(1) Brougham, R. W. (1952)—Proceedings N.Z. Grasslands Assn.
(2) Sears, P. D. (1950)—Proceedings N.Z. Grasslands Assn.

Discussion

MR. SMALLFIELD: Mr. Sears has shown his results of inoculation of sub clovers on pumice development country. What sort of results were secured with white clover?

MR. SEARS: The results were very similar, with outstanding differences in favour of inoculation in new sowings of white clover in those trials. Red clover differences were much less.

DR. WALLACE: In soils of low fertility you recommend grass to grass. Is it wrong to put in a crop on poor country before putting back to pasture?

MR. SEARS: My data refers to crops such as rape or kale. However, I appreciate that for several reasons connected with cultivation and levelling of the ground, it is often desirable to put in a crop. In general, however, I think it is wrong to crop on low nitrogen soil as the crop yields will be low. On the other hand good crop yields will be obtained on high nitrogen soil, which however, can make it difficult for establishment if sown direct to pasture.

MR. SMALLFIELD: I agree in general with Mr. Sears and advise the use of a leguminous crop such as lupins where necessary to crop low nitrogen soil prior to pasture. Has any experimental work been done recently at Grasslands on time of sowing in the autumn?

MR. SEARS: No we have not done any recent trials. All our sowings have been made rather late in March due to unavailability of land, and also to fit in with our normal farm programmes of cropping and single plant work.

MR. BURGESS: To what extent is soil nitrogen reduced by a heavy growth of ryegrass after an autumn sowing? Would you advise the use of nitrogen in the spring after a new pasture has grown very tall and then been cropped off?

MR. SEARS: A very heavy growth would contain nitrogen equivalent to about 6 cwt. of sulphate of ammonia. I would not use nitrogen myself after this has been cropped off as the new clover would be very weak; it would be better to encourage the clovers if the final result desired from this paddock is a balanced grass and clover mixture.

MR. ALLAN: Would you explain the roller drill?

MR. SEARS: Our roller drill is essentially a roller with built-up Cambridge rings to give a more pronounced V profile; seed and manure boxes are mounted behind the roller so that the seed and fertiliser fall on to the rolled surface and roll to the bottom of the V marks before being covered by harrows (photographs are in the Massey College Dairyfarming Annual 1951).

DR. HAMILTON: Is a summer crop worth while on grassland farms? Would farmers in the audience give their opinions and also whether they prefer grass to grass sowings?

COL. DURRANT: I have found it very satisfactory both for feed supply and for pasture establishment, to plough in early spring and sow Chou moellier, Millet, or Kale, and to use this in early autumn and then to sow the area to grass in autumn.

MR. SINCLAIR: At Manutuke Research Station (Gisborne) we have had better pasture establishment after a paddock of Kale than direct after good pasture.

MR. CANDY: I think it well worth while to take summer crops on my dairy farms.

MR. ECKROYD: I am on town supply in the Auckland district and have this year a good summer crop of Kale. My worry however, that I have also plenty of pasture which should be graze. Has Mr. Sears any suggestions?

MR. SEARS: I suggest either making silage of the crops or the extra grass, or else taking the crop into the winter and spring sowing the pasture. The weed problem may be greater in the spring but can be controlled by the mower.

MR. GERRING: Would you give us more definite ideas on rates of seeding? Your suggested lighter seedings may influence farmers to sow more frequently.

MR. SEARS: I cannot give mixtures to cover all conditions. With short rotation ryegrass it is obvious, however, that grass seed rates can come down. Our present mixture for dairy farms is 15lb. short rotation ryegrass, 3lb. white, 6lb. cowgrass, with barley, timothy, cocksfoot, sub clover or perennial ryegrass added to meet local variations.