

PASTURE ESTABLISHMENT

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Each year New Zealand farmers renew some 630,000 acres of pasture either directly or after crop. In addition an area of about 120,000 acres is broken in from virgin ground, giving a total pasture sowing of three-quarter million acres. Seventy-five per cent of the renewal of pastures is in the South Island, but only 25 per cent of the new sowings.

On pastures not suitable for cultivation improvement is attempted over a wide area by surface introduction of improved strains, using the aeroplane, or other methods. Of the 18 million acres of sown pasture perhaps seven per cent, or one and a quarter million acres is renewed or surface sown each year. This is a costly item of farm expense ranging from less than £1 per acre for restricted over sowing to as much as £20 or more for virgin land development.

Pasture establishment and over sowing thus costs the farming industry over £6 million per year. Canterbury farmers renew 250,000 acres of pasture each year so that, perhaps justly, much of the expense is borne by the province producing most of the pasture seeds. For regions where cropping is only a minor feature of the farming system much of the expense of pasture establishment can be recovered by devoting more money to it to ensure the development of swards with a long useful life. The rapid deterioration of many pastures is due to poor establishment techniques. The choice of techniques for any particular area is governed by local conditions;

variations in climate, soil and farm equipment are important factors. A major factor is whether the pasture is being sown on cultivated land or is being surface introduced on an existing sward with or without prior cultivation.

Whatever techniques are used, they must conform to certain well defined principles. These are:

- (1) Destruction of the previous vegetation.
- (2) The preparation of a seed bed suitable for the rapid establishment of the sown species.
- (3) The provision of adequate nutrients.
- (4) The choice of seed sown.
- (5) Time and method of sowing.
- (6) Early management.

Destruction of the previous vegetation:

The aim here is the obvious one of removal of competition for light, water and nutrients. An extreme case is found in the felling and burning of climax forests such as precedes the sowing of some 12 million acres of our grasslands. In virgin land development today the destruction of scrub and bracken involves crushing and burning as a preliminary to cultivation of surface sowing. In cultivated land more complete destruction can be achieved. The elimination of twitches and other creeping weeds such as CAT-formian thistle is a desired result. One important source of competition is the hidden sowing of buried weed seeds. This may be considerably greater than the actual sowing of pasture seeds.

and any practices involving a destruction of such seeds in the upper layers are desirable.

In surface sowing of existing swards complete destruction of the previous vegetation is usually not desired, but some destruction is necessary to reduce the competition between established plants and the developing seedlings. In aerial sowing this is limited to heavy grazing prior to seeding. In over-drilling with a sod-seeder the use of a wide shoe tends to reduce competition. If the seed can be covered without filling in the drill again, competition is reduced. In over-drilling erodible hillside slopes of *Poa pratensis*, American workers use chemical weed killers: 4lb. Dalapon and 1½lb. Amino triazol applied in mid-January gives a good kill of the grass. By late February the land can be over-drilled with a sod-seeder with or without two or three discings. On the flat, competition may be reduced by the use of pitchpole harrows, narrow tine grubber, or other means. In any over sowing technique some destruction or weakening of the existing vegetation is essential. Many farmers are familiar with the failure of grass over sowing and success of clover over sowing in grassy swards. The important element of competition in this case is nitrogen. Two stages of over sowing are necessary, first clovers to raise the nitrogen status and then grasses to take advantage of the raised fertility.

The preparation of the seed bed:

The aim is to produce a well-drained, weed-free, fine, firm, moist, level seed bed. The seeds to be sown are small and, especially in the case of clovers, are incapable of germination from any considerable depth, hence the need for fineness. Our sown species prefer a firm-root-run. Likewise the young seedling is vulnerable to any drying out. To cater for vagaries of weather there must be an adequate supply of moisture from below. This is provided by a seed bed consolidated from the bottom of the furrow. Time is an important factor in the development of such a seed bed as it is in the development of suitable chemical and biological conditions for plant growth.

The degree of perfection desired depends on fertility and soil moisture. Where both are adequate, good results can be obtained from short-cut methods; where either or both are inadequate, short-cuts should be avoided. Under mixed farming in Canterbury the farmer usually has to contend with conditions of low fertility, inadequate moisture and the presence of weeds, particularly twitches. Depending on the severity of these factors the farmer has the choice of three methods:

(1) Spring sown with the last crop.

This may be:

(a) cereal,

or (b) Rape or turnips.

(2) Autumn sown after the last crop.

This is usually:

(a) cereal

or (b) Rape.

(3) Direct seeding following a fallow.

Spring sown with the last crop:

Fifty per cent of the pastures are sown by the first method, mainly with rape or turnips. The advantages of the method are cheapness, saving of labour and the reduced time the land is out of production. None of these advantages has any weight if the resulting pasture is poor. With a cereal, summer moisture is critical and the shading effect of the crop has a severe effect on grass development.

Another difficulty is that the new pasture cannot be grazed until the cereal crop is removed. This method can be used for the straight sowing of legumes but has little to command it for pastures.

With rape or turnips, moisture competition is usually less serious but shading can be more severe. With reduced seedings of the fodder crop a fair pasture can be obtained.

The so-called nurse crops do not justify their name in that the pasture is sown and grazed at a time to suit the crop. Being slower in establishment, the pasture is the first to suffer from any deficiency of moisture or nutrients. Because of the difficulty of grazing at the most suitable times there is little opportunity for the control of pasture succession.

Autumn sown after the last crop:

In the case of a cereal, moisture is usually at a low ebb as is fertility, and

the stubble, if ploughed in, causes undue drying of the soil and lowering of available nitrogen. Burning of the stubble immediately after harvest, followed by ploughing and daily rolling of the freshly ploughed land, will retain the existing moisture and permit the development of a suitable seed bed by late autumn. A new crop, vining peas, suffers few of these disadvantages as the crop is removed by December or January while the soil is still moist and while there is still adequate time for cultivation. After rape, the position is better as the land is usually available for working earlier in the autumn and surface fertility is high due to stock residues. Shallow working preserves this fertility and gives a fair chance of success if autumn rain is adequate.

Direct seeding after a fallow:

At the College on stiffish loam, the stubble of the last crop is roughly worked and sown to winter greenfeed. In late September this is ploughed and the rough furrow left for a month to dry out. It is then rolled down, harrowed to level it and grubbed at fortnightly intervals until mid-January. At first, grubbing is from the bottom of the furrow gradually coming to the surface. Up to this point the fallow is kept fairly dry to kill twitches. Harrows are then brought in, heavy at first, until mid-February. Alternate rolling and harrowings complete the preparation of the ideal seed bed by the first of March.

This method is expensive, it makes heavy demands on labour and plant, and involves the loss of a season's growth. However, it is justified by its success under adverse conditions. On light loams the same end result is achieved with fewer cultivations, and in seasons of heavy rainfall consolidation is effected by rain.

Where surface renovation of existing pasture is attempted this is usually done in early autumn. The field is quickly worked to retain existing moisture and is left firmly consolidated. Preparatory cultivation for aerial over-sowing can be achieved to a limited extent by heavy stocking, particularly with cattle, hoof and skid marks providing a form of seed bed.

The provision of adequate nutrients:

In former years we recognised zones of soil fertility and adjusted grass sowings to that end. We made sowings of *Danthonia* and brown top on land of low fertility and were satisfied with cloverless sward. With the advent of aerial topdressing the aim now is the establishment of high-producing swards under all soil conditions. The basis of the sward is a vigorous legume and nutrients are adjusted to ensure its growth. Superphosphate and to a lesser extent, lime, potash and molybdenum, are used as required. Nitrogen is contributed by the legume and promotes a strong grass growth. Where legumes have not been used before, as in raw pumice, it may be necessary to inoculate clover seed as is done with lucerne. In arable soils of low fertility, preparatory forage crops may be used to raise fertility to a reasonable status. At the opposite extreme, very fertile soils with high levels of nitrogen are inimical to legume development and require cropping with exhaustive crops to permit good growth of clovers.

The choice of seed sown:

The species chosen must be suitable for the environment and for the intended utilisation. For some years we have been dominated by ryegrass and white clover. Good as these are in suitable environments, there are many conditions where other species are preferable. In compounding the seeds mixture it is important to bear in mind competition within the sward and to endeavour to sow species that are compatible with one another. Quickly-establishing grasses provide serious competition with clovers not only in the establishment year but annually in the early spring. Timothy, phalaris, and meadow fescue find ryegrass competition very severe in the initial stages. Lucerne can be killed in the establishment year by winter growing grasses and is given its best chance by spring sowing. Annual plants such as subterranean clover demand low density or grass to permit autumn germination. A recent trend in New Zealand is for a reduction of seeding rates, especially of the ryegrasses. Seed quality is important. A high standard of purity is desirable. A

recent germination test should be seen and the seed should be of a desirable strain as shown by certification.

Time and Method of sowing:

Time of sowing is dependent on local climatic conditions. Autumn is normal for areas not subject to early severe frosts. The success of spring sowing depends on summer rainfall but in general this period is more favourable for perennial legumes. There are two basic methods of sowing pasture—broadcasting and drilling. Broadcasting gives a more even distribution and drilling a quicker, more even establishment.

Broadcasting is carried out on a surface prepared by the Cambridge roller and an attempt is made to gather fertiliser and seed into the grooves by light harrowing. With the ideal seed bed, good results are achieved but where the surface is subject to alternate wetting and drying on a poorly prepared seed bed, slow uneven germination occurs. An improvement of this method is the use of a roller-drill with larger rungs and with the seed and fertiliser directed into the deepened grooves.

Drilling in seven inch rows gives an intimate contact of seed and fertiliser and places the seed in the soil at a depth suitable for germination. In an adverse environment or with a

poorly prepared seed bed, drilling is preferable. Coulter attachments are available to permit drilling at three and a half inches in order to obtain a better cover. Such attachments are more difficult to operate and require additional fertiliser, but can achieve the desired result.

Early management:

A young pasture passes through several stages before it achieves any degree of stability of composition. Grasses dominate from autumn to early spring and then weaken as nitrogen supplies give out. In the first summer, clovers become prominent provided that they have not been weakened by the earlier dominance of grass. As nitrogen is built up, grass returns and a balance is finally achieved. Weeds can become serious in this changing succession of dominance. A light early grazing encourages tillering and favours the slower establishing species. A high concentration of stock for a short period means that the field is eaten evenly including weed growth. The making of hay or silage in the clover dominant phase further weakens grasses by removal of nitrogen, whereas grazing encourages grass by the return of animal residues. The general story of early management is the subordination of stock requirements to the requirements of the pasture.

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