

VALUE OF PASTURE SPECIES IN OTAGO AND SOUTHLAND

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We learn from the Agricultural and Pastoral Statistics for 1949-50 that though the total number of cattle per 100 sheep shorn in North and South Auckland combined was 57, in Otago and Southland land districts combined there were 4. Pastures in this area, then, are more likely to be grazed by sheep than by cattle.

All our trials at Gore assess the herbage production of pedigree strains of pasture species as superior to that of any others. Species of pasture plants have characteristic seasonal growth patterns, apart from any question of strain, but pedigree strains have reduced the difference between species. Pedigree timothy, for example, is capable of about twice the winter growth of uncertified timothy. In discussing the species, pedigree strains are compared, where these are available, rather than uncertified strains.

PERENNIAL RYEGRASS

(*Lolium perenne*)

This is the major grass species of Otago and Southland, due to its ability to grow and persist under a wide range of soil and management conditions. It is a grass which can be utilised in the fertility building programme from the crested dogstail and browntop stage, since its production and palatability improve with increasing fertility. At low levels of fertility it is a tough and unpalatable grass, and unless fertility is raised its value is lost. Its palatability decreases quickly as the leaf matures and, under the prevalent sheep grazing system, the practice is to keep it in a short state to retain palatability. Perennial ryegrass tolerates continuous close grazing, though its vigour is reduced, while browntop, *Poa annua*, and flat weeds invade, more or less in proportion to the severity of grazing. At the same time species such as cocksfoot, timothy, short-rotation rye-

grass., and red clover may be eliminated or reduced to minor constituents of the sward. Though white clover persists under continuous grazing, it is often more palatable than the perennial ryegrass and a grass-dominant pasture may develop. As grazing management becomes more lenient, other valuable species share the production of the sward.

The growing season of perennial ryegrass is long, being from August to June under favourable conditions, but shorter than this as conditions become less favourable. Only such grasses as Italian or short-rotation ryegrass surpass it in seedling vigour, and slower establishing species may be suppressed, particularly at high rates of ryegrass seeding.

SHORT-ROTATION RYEGRASS

(*Lolium perenne* x *L. multiflorum*)

This grass is less versatile than perennial ryegrass. It is just as capable of taking advantage of increasing fertility, but its use as a pioneer grass in the fertility building programme is of doubtful value, except on soils where quick fertility building is possible. Under these conditions its value really begins when the medium fertility level is reached, and its greatest value is on high fertility soils with good moisture supply. It is more severely checked by dry conditions and grass-grub attack than is perennial ryegrass. However, except on soils of low fertility, its initial quick growth makes its inclusion worthwhile, even where conditions will not allow it to remain as a permanent part of the sward. Palatability is high, and this leads to hard grazing unless some form of control is practised. In the absence of conclusive evidence, that rotational grazing is satisfactory for lamb production, the seasonal set stocking system -set stocking from lambing to weaning-as practised by some sheep farmers is the best compromise. Under this system the grass adopts a finer leaved, more prostrate growth form which apparently is less susceptible to grazing damage than the erect form. A quick rotation may therefore be more punishing than this form of set stocking. Continued hard grazing will eliminate it in a short time.

It grows considerably more than perennial ryegrass in winter and will grow as well in the rest of the year if soil and management conditions are suitable. If the summer is dry, its growth falls off more

rapidly than that of the perennial, which consequently may outyield it in autumn. Observation suggests that crowding of ewes after weaning on to a thinning short-rotation ryegrass sward improves it, while allowing it to reseed weakens it. Hard grazing at this stage, together with oversowing, is suggested. Haying does no harm, particularly if the hay is not too mature and dry weather does not follow. The palatability of short-rotation ryegrass is retained in the hay.

COCKSFOOT
(*Dactylis glomerata*)

Cocksfoot also is less versatile than perennial ryegrass, though its use is widespread. Its value is best seen in the drier but not the driest situations, and here it may excel. It makes most growth under good soil fertility and moisture, but does not flourish on permanently damp soils. Under good conditions its growth period 'is as long as that of perennial ryegrass, but its speed of growth at either end of the season is slower. Its main growth period is in January to May, and in a mixed pasture during a dry summer or autumn it may surpass perennial ryegrass. Where soil fertility is low it is probably more palatable than perennial ryegrass and may produce better. Coupled with its better growth under fairly dry conditions, it is a valuable pioneer in the fertility building scheme and even where further fertility building is impossible.

Its palatability varies ; mature herbage may be unpalatable, even where growth is small. On soils of low fertility we may expect perennial ryegrass to be equally unpalatable. Under good conditions it is eaten readily. The condition of "winter burn" is often seen, but this is greatly reduced if nitrogen supplies are adequate.

It is difficult to eliminate, but easy to reduce it to a minor and unproductive role in the sward by hard and continuous grazing. Thus its continued production demands a more lenient management. Its dominance in a mixed sward is induced by such factors as under-grazing, declining fertility, or too much haying. To these factors may be added grass-grub attack, since cocksfoot is particularly resistant.

TIMOTHY
(*Phleum pratense*)

Timothy is less versatile than cocksfoot and its value is limited to soils where moisture supply is

fairly good. Its growing season is as long as 'that of perennial ryegrass, but again its speed of growth is slower at each end of the season. Its spring growth is faster than that of cocksfoot, if moisture supply is satisfactory, while its main growth period is in November and December. Under conditions of low fertility it has little vigour, and is not regarded as a useful pioneer in the fertility building cycle, except where quick progress may be expected. Dry conditions check its growth severely, as does grass-grub attack, though the latter rarely kills the plants.

Its palatability is high in relation to perennial ryegrass, and it can be reduced to a minor constituent by selective grazing, but, as with cocksfoot, it is not readily eliminated by such grazing,

CRESTED DOGSTAIL

(*Cynosurus cristatus*)

This grass has had considerable popularity and is still included in many seed mixtures. Observation and experiment indicate that where soil conditions are favourable to growth of a good ryegrass pasture, the inclusion of dogstail is not warranted. When conditions will not allow a good ryegrass pasture its use is entirely justified. It begins growth early in spring and thus plays a valuable part at a critical time. Under dry conditions it persists, but except for that early growth it does not produce much bulk of feed.

BROWNTOP

(*Agrostis tenuis*)

This is a widespread species which grows in almost all situations, but it is of value only where better species cannot be grown. It commonly invades sown pastures and in many cases becomes dominant. In every case this is an indication that conditions have not suited the sown species. These may be conditions of hard grazing or soil fertility. Browntop persists under hard, continuous grazing where even perennial ryegrass weakens.

WHITE CLOVER

(*Trifolium repens*)

The characteristics of white clover are well known. On its presence, in good supply, and vigour,

depends pasture production from the major portion of Otago and Southland, as in most of New Zealand. It is even more versatile than perennial ryegrass and is sown in almost every seed mixture. Though it does not disappear under close and continuous grazing, grazing management affects its growth. Under continuous hard grazing it adopts a small leaved and prostrate form very different from the large-leaved form of more lenient conditions. Except under adverse grazing or seasonal conditions, it begins growth as early as the end of August and in a mild season may grow into June. It is often more palatable than perennial ryegrass, but short-rotation ryegrass is usually more palatable than the clover.

RED CLOVER

(*Trifolium pratense*)

This species is usually included in a seeds mixture, though its popularity is falling in the higher rainfall areas. Two types are available, the broad or early type and the Montgomery or late type. Its main growth period is in summer, the broad type being earlier than the Montgomery type, though later than white clover. The broad type, which appears to be as persistent, under a moderate grazing system, as the Montgomery type, also grows further into the autumn than the latter, which, however, may outyield broad red in mid-summer. Red clover grows under a variety of conditions, and on drier soils it can be better than white clover. In this it resembles cocksfoot, but unlike cocksfoot, it is readily eliminated from the sward by hard grazing, when it may persist for little more than a year. It persists much better when a major constituent of the sward. Its value in the higher rainfall areas is questioned, certainly where fertility is good and where hard grazing is practised. In temporary mixtures it is valuable, since its seedling vigour is good, but even here its use may be limited if high rates of grass seeding are used. As a constituent of the permanent pasture mixture where soil fertility is medium it appears to have a place, if only for its contribution in the first season. On soils where summer drying is usual its use is justified. On low fertility soils it cannot replace white clover as a fertility building legume. There is some evidence that its nitrogen fixing ability is somewhat lower than that of white clover.

Suckling clover (*Trifolium dubium*) is widespread

on the drier country, but where white clover will grow it has no place. On the principle that any clover is better than none, suckling clover can be of considerable value.

Subterranean clover (*Trifolium subterraneum*) is not of much value in this area. Its use appears limited by the shortness of the gap between re-establishment and winter.

EXPERIMENTAL EVIDENCE

A grazing trial was sown in November 1951 to compare simple mixtures of grasses and clovers. Five pedigree grasses were sown, each one with red clover at 4lb. and white clover at 3lb. per acre. The grasses and the rates of seeding per acre were: Perennial ryegrass, short-rotation ryegrass, and meadow fescue (S.215, the hay strain of the Welsh Plant Breeding Station) 30lb., timothy 7lb., and cocksfoot 15lb. The cocksfoot was the Grasslands Division's new strain not yet on the commercial market. Except for low growth periods of the year, the sheep remain within the trial, and each mob remains on its own species; for example, the sheep on timothy rotate round the timothy paddocks only.

From previous experience it was obvious that a continuous grazing management would eliminate most of the species. A rotational management was adopted in which the pasture was to grow to 3 or 4in. in height between grazings. In practice there was some fluctuation above and below this height.

After 3 years all the species are surviving, though considerable differences in yield of sown grasses have been measured.

The first spring and summer were wet and rapid establishment of both sown and volunteer species resulted. Grazing began in early January 1952, and considerable differences in establishment vigour were evident, as shown in Figure 1. The "other species" were mainly shepherd's purse (*Capsella bursa-pastoris*) and spurrey (*Spergula arvensis*). These, together with clovers, produced most where meadow fescue was sown and least with short-rotation ryegrass. By the end of the first winter the annual weeds had disappeared and "other species" were mainly browntop and *Poa annua*.

Fig. 2 shows the seasonal growth in the succeeding year. Of the sown grasses the ryegrasses were

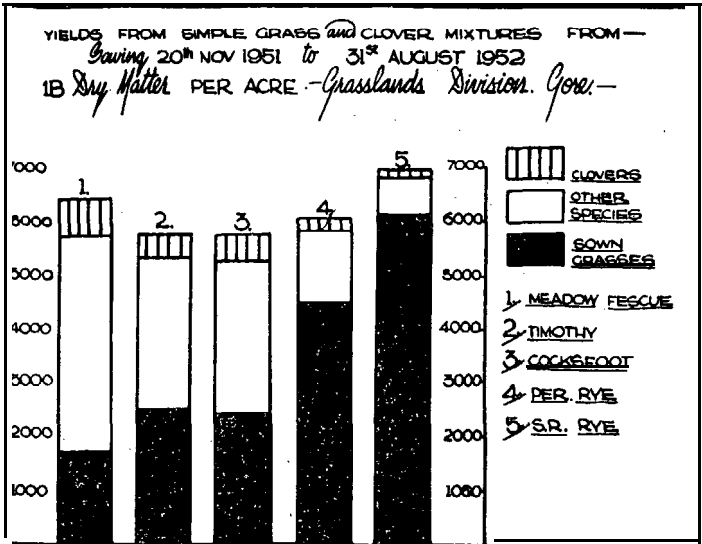


Fig. 1

considerably better in spring than the others, and all with the exception of perennial ryegrass improved during the summer, cocksfoot and short-rotation ryegrass being the highest producers. In autumn tim-

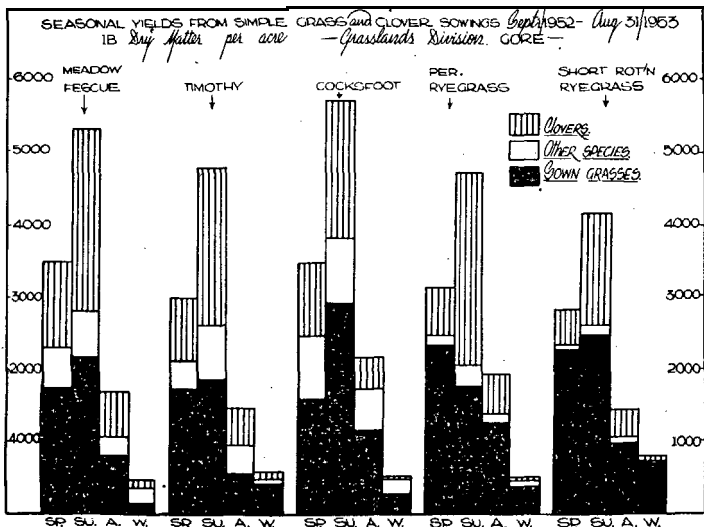


Fig. 2

othy, produced least and cocksfoot and perennial ryegrass most. In winter short-rotation ryegrass was easily the highest and meadow fescue easily the lowest. However, production of clover and volunteer grasses was in inverse order to that of sown grasses, and differences in total productions are not so marked except in winter. Over the whole year the order of sown grass production was short-rotation ryegrass, cocksfoot, perennial ryegrass, meadow fescue, and timothy, the last being lowest. In total production there was remarkably little difference. The short-rotation ryegrass mixture yielded considerably less clover than any other mixture and, as with perennial ryegrass, considerably less volunteer grass.

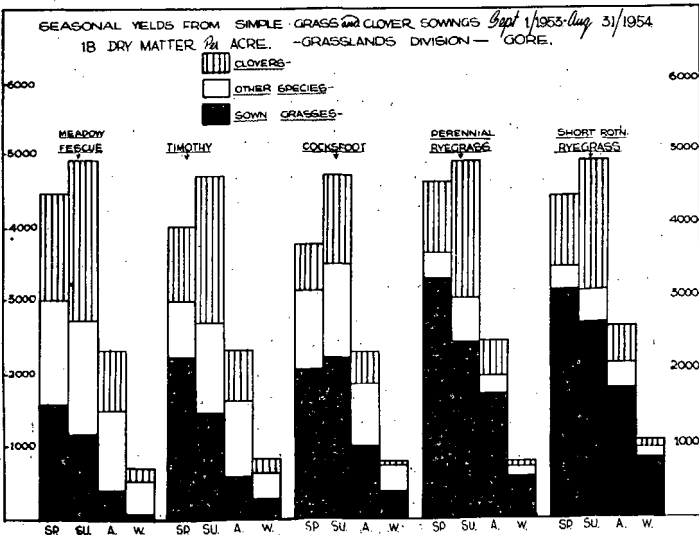


Fig. 3

Fig. 3 shows the production during the year up to the end of winter 1954. Of the sown grasses: in the spring the ryegrasses again out-yielded any others and meadow fescue was now lowest. In summer only one grass, cocksfoot, improved on its spring production, though the ryegrasses were still higher, yielding than any. In autumn the ryegrasses still led, followed by cocksfoot, with timothy and meadow fescue well behind. In winter short-rotation ryegrass was well ahead, with perennial ryegrass next. Meadow fescue production was almost negligible. Clovers and volunteer species again compensated for differences in, sown

grass production, and, except for the winter, seasonal and annual total yields are similar.

It is not known how long this compensating growth of clover and other species will continue to even up total yields, but it should be remembered that the ryegrass pastures developed an initial clover shortage. This trial helped to persuade us to adopt a seed mixture containing not more than 20lb. of ryegrass per acre.

These were simple mixtures to study species characteristics, and little more can be said at this stage except that meadow fescue has not shown, any character which would warrant its replacing any of the other four or even its inclusion in a general mixture.

CONCLUSION

There is little doubt under existing general grazing management that perennial ryegrass and white clover play the dominant part in pasture production. There is little doubt either that even under good soil conditions much of the potential values of short-rotation ryegrass, cocksfoot, arid timothy is wasted to varying degrees.

Differences in management and soil fertility should influence us in prescribing a seed mixture.- At one end of the soil and management ladder, for instance, short-rotation ryegrass may form the biggest part of the seed mixture, but at some lower point perennial ryegrass will replace it completely. At the bottom of the ladder we may even be in doubt as to the wisdom of attempting to replace crested dogstail and browntop.

DISCUSSION

- Q. The speaker is not in favour of allowing short-rotation ryegrass to reseed as a means of re-establishment. This has been recommended in Manawatu.
- A. I have been discussing Otago and Southland and at present entirely from observation. It appears in a thinning pasture that rather than allow short-rotation to reseed it is best to keep it grazed down and oversow.
A Speaker: In Manawatu the most successful short-rotation pastures have been allowed to reseed and some farmers have even gone to the extent of harrowing to encourage the re-establishment of the shed seed.
- Q. Would the speaker qualify the limits that could be expected to be set by temperature and lack of moisture?
- A. Moisture is one of the most important factors. You can have too much or too little. Either sow something that will persist in the conditions or put moisture on.

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- Q. Would the relative values of species yields be appreciably altered under optimum conditions of temperature and moisture?
- A. The soil is a light alluvial one on the banks of the Mataura River and in a dry summer there is a definite moisture deficiency. The conditions are marginal for cocksfoot and timothy. In a wet season timothy outyields cocksfoot but in a dry season cocksfoot outyields timothy.
- Q. How would perennial ryegrass compare with short-rotation* under hard frosts ?
- A. The advantage is definitely with short-rotation, as it does not burn, off as perennial does.
- Q. Otago and Southland conditions must approximate those in England, where much reliance is placed on meadow fescue in the back end of the season, and it would be interesting to know of any experience with it here.
- Q. That is the reason for the inclusion of meadow fescue in the trials. but I have had no experience of it outside. It has not shown any characteristics that would warrant its inclusion in mixtures.
- Cullen: In a trial that has been down for two years at Invermay with fescue and timothy, meadow fescue is not promising and combined yields of meadow fescue and timothy were much lower (2000lb. d.m. in a season) than that of ryegrass (6000lb. d.m.). Meadow fescue provides a Christmas cut when ryegrass tends to shoot to seed. It is much more palatable than ryegrass and sheep prefer it even to short-rotation.