

## SUBTERRANEAN CLOVER IN THE NORTH ISLAND,

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At the 1936 conference of the New Zealand Grassland Association a group of four papers on subterranean clover was read by field officers of the Department of Agriculture, giving the experience with this clover as a pasture species in North Auckland and South Auckland (excluding the King-country, the pumice lands of the central plateau, and Bay of Plenty), Manawatu and west coast, and Hawke's Bay. During the subsequent discussion of the papers the position in Taranaki, Wairarapa, Poverty Bay, Bay of Plenty, and other parts of the Auckland Province, including the pumice country round Rotorua and Taupo, was indicated. It is the intention in this article to summarize the present position and possibilities of subterranean clover in the North Island as disclosed by the papers and the discussion.

### GENERAL CHARACTERISTICS

Subterranean clover is a strongly growing and very palatable annual clover, which buries its seed in the surface soil, ensuring its permanence when once established in a sward. The seeds germinate with the autumn rains, and the plant grows and develops through the autumn and winter and comes away earlier than most pasture species in the spring, giving its maximum growth in the North Island from August to November. Flowering takes place during the period of maximum growth, and the plant dies off with the approach of hot, dry, summer weather. The seed which is buried as the plant develops lies dormant in the soil until the autumn rains come. An essential condition to free re-establishment is the opening-up of the sward to some extent through the summer, while essential conditions to good early spring production are early autumn establishment, freedom from water-logging in the winter, moisture and warmth in the spring, and, above all, adequate phosphatic manuring. As with all pasture-plants, the more fertile the soil the higher the production, but subterranean clover has a surprisingly wide range in regard to soils, and, with adequate phosphate supplies, will easily outyield all other annual clovers on most second- and third-class land.

### RECENT WIDESPREAD INTEREST IN SUBTERRANEAN CLOVER.

Though subterranean clover has been known in certain districts of the North Island for the past fifty years, particularly as Mangare clover on the volcanic soils near Auckland, and on similar soils in the vicinity of Whangarei, it is only in recent years, following its wider use and extensive propaganda in Australia, that a similar realization of its possibilities in this country has developed. While in the past subterranean clover has been mainly confined to dairy pastures and high-rainfall areas, it is in connection with sheep-farming and in districts of lower rainfall and dry summers that present interest is chiefly centred.

## EXPERIENCE IN VARIOUS DISTRICTS.

## NORTH AUCKLAND(1).

Subterranean clover has long been appreciated as a valuable clover in dairy pastures on free-draining volcanic soils. Its tendency to smother other species under light stocking and the prevalence of bloat in cattle in favourable seasons have been regarded as bad faults, but under good management and utilization it has shown clearly its capacity for high spring production. The fact that rye-grass, white clover, and paspalum can combine well with subterranean clover under good management is now generally recognized, and this clover is accepted as a useful additional species. It is, however, on the older, consolidated, sand-dune country of the west coast too dry in summer to hold white clover, and where its superiority over *Lotus hispidus* and suckling clover, the main legumes of the pasture, is very marked, that its use should be developed. On sandy gum land also there is considerable scope for the extension of subterranean clover. The main requirement in both cases is adequate phosphatic manuring which the introduction of subterranean clover would make profitable on swards at present not capable of giving satisfactory returns for top-dressing.

As in many other districts, it is in connection with fat-lamb production that the use of subterranean clover is likely to prove most profitable in North Auckland. Much of the rolling sandstone and grey-wacke hill country at present carrying dry stock and not worth top-dressing could, with the introduction of subterranean clover and phosphatic manuring, be converted into fat-lamb pastures.

## SOUTH AUCKLAND(2).

The area covered in this paper extends from Auckland south to the Waikato. Subterranean clover has been recognized for many years in the Manakau and Franklin Counties as a valuable clover additional to white clover, particularly on account of its ability to re-establish quickly after occasional dry summers, when white clover may be practically killed out. Because of the usual adequate summer rainfall of South Auckland dairying lands, white-clover establishment is, however, generally the aim on most dairy-farms. Subterranean clover is appreciated on the volcanic lands and lighter pumice soils for its early and heavy feed-production and the excellent silage it makes. As in North Auckland, there is likely to be a considerable extension of the use of subterranean clover for fat-lamb production, particularly on the lighter volcanic, sandstone, and pumice soils, when its value in this direction is more fully appreciated.

## MANAWATU AND WEST COAST(3).

In this area, extending from Parāparaumu to Wānganūi and from the west coast to the mountain ranges, the value and possibilities of subterranean clover on different types of country have been well demonstrated by changes effected in the production of farms since its introduction. The reason for the increase in the quantity of subterranean-clover seed sown in the Manawatu district from a few pounds five years ago to 12 tons in 1936 is quite apparent when the scope for the use of subterranean clover is realized.

On the coastal belt of consolidated sands, with a rainfall of 35 in., the introduction of subterranean clover to certain farms has been the

means of converting poor dry-stock country to dairying and fattening land at a much lower cost and much more rapidly and satisfactorily than was the case where the usual methods of attempting the establishment of rye-grass and white clover have been used. With the ordinary pasture species sown on the best of the consolidated sandy flats, the tendency to reversion to sweet vernal and *Poa pratensis* is very marked. The establishment of subterranean clover, with less than the usual phosphatic top-dressing, has given a rapid increase in production and a steady improvement in the sward. Subterranean clover, sown with the grass-mixture on the richer flats after a root crop or rape, drilled into the existing swards on the poorer flats, and broadcast on the sandy ridges, is paving the way to profitable top-dressing and the successful establishment of such species as perennial rye-grass and white clover. Changes from one dry sheep to three and four ewes per acre or a cow to 2 acres are being made through subterranean clover. It is very apparent that the limit of carrying-capacity on this country has not been reached, since lucerne and paspalum, both of which thrive well, are being gradually exploited to provide additional summer feed to carry on when the subterranean clover goes off. There is also in the district a considerable area of light friable loam characterized by a marked tendency to reversion to brown-top and danthonia. Subterranean clover on this country is also giving remarkable results. Dry-sheep country sown with 2 lb. to 4 lb. of subterranean clover and top-dressed with  $1\frac{1}{2}$  cwt. to 2 cwt. of superphosphate is being changed rapidly so as to be able to carry three to four and more ewes per acre, with the lambs going off fat earlier than is usual on the heavier land. From Palmerston North through Feilding, north to Marton and beyond, there is a wide stretch of heavier, flat, undulating country with bad natural drainage, and a tendency to rushes and brown-top. Individual farmers in this area have demonstrated the value of subterranean clover, either broadcast on the existing sward or sown with a grass-seed mixture, in rapidly increasing the carrying-capacity of this land both drained and undrained.

The light sandy coastal belt, the friable clay loams, including much of the lower foot-hill country along the ranges, and the heavier rolling clay lands of this portion of the Wellington Province represent some 350,000 acres, and it is safe to say that the exploitation of subterranean clover by farmers on this area would mean at least doubling the carrying-capacity.

#### HAWKE'S BAY (4).

It is undoubtedly in Hawke's Bay, with its occasional very dry summers and vast areas of light freely draining soils extending from Woodville through Norsewood, Takapau, Maraekakaho, to Tutira, Putorino, and Mohaka up to the Wairoa flats and beyond, that subterranean clover has especially demonstrated its wonderful potentialities as a valuable pasture species. Right through this belt of country, estimated at upwards of 500,000 acres, the introduction of subterranean clover, whether it be by inclusion in the seed-mixture after ploughing, by surface-sowing with top-dressing after severe harrowing of the existing sward, or by surface-sowing with fertilizer on open danthonia or brown-top turf, has resulted in a very definite increase in carrying-capacity. The response of the subterranean clover to superphosphate has been remarkable, and the ability of this clover to produce feed for lamb-fattening just when required is appreciated. The doubt as

to whether top-dressing pays on much of the rolling to steep hill country has been removed by the introduction of subterranean clover, and in Hawke's Bay, as in Manawatu, Wairarapa, and Poverty Bay districts, some outstanding increases in carrying-capacity have been recorded. Other country suitable to the exploitation of subterranean clover in Hawke's Bay are the Takapau Plains, the lighter soils of the Hawke's Bay flats, much of the limestone country which has shown reversion, and the extensive area of coastal and southern hill country. It is indeed difficult to visualize the result of the full exploitation of subterranean clover in the province. The quantity of seed being sown is rapidly increasing. Last season some 30 tons was used, sufficient at 4 lb. per acre to sow over 15,000 acres.

The fact that when fully utilized it gives its greatest returns, that set-stocking with ewes and lambs is a relatively simple matter when once the carrying-capacity is gauged, and, further, that subterranean clover well utilized is helping to bring back rye-grass and white clover, are points which are likely to bring about a rapid extension of the area sown to this clover. On some of the lightest pumice country in the district increases from one dry sheep to the acre to five and six ewes with all lambs away fat are recorded.

#### WAIRARAPA AND POVERTY BAY.

In both these districts large quantities of subterranean-clover seed are being sown, the quantity increasing rapidly each year. In the Wairarapa, subterranean clover is being used with excellent results on the lighter shingly soils of the plains, and is having a very marked effect on the carrying-capacity both for dairying and sheep-farming. Recorded experience has shown that much of the rolling hill country, especially the coastal belt, could be rapidly and profitably improved by subterranean clover, which allows so definitely for the profitable use of top-dressing on swards that probably do not pay for manure. In the same way in Poverty Bay, subterranean clover is destined to play an important part in the regeneration of much of the hill country. Many farmers are now exploiting subterranean clover, and it is evident that this clover is likely to overcome the difficulty of the relatively high cost of top-dressing in this district.

#### INFORMATION FROM DISCUSSION OF PAPERS.

It appears from the discussion at the conference of the New Zealand Grassland Association that in the North Island on all the lighter soil types subject to drying out in the summer, subterranean clover can be used to advantage. Its ability to give rapid and effective response to phosphatic manuring and the subsequent improvement in the conditions for rye-grass and white clover through heavier stocking are the main contributing factors to its success. The Bay of Plenty, with its extensive areas of light soils and dry summers, should find in subterranean clover a valuable pasture species likely to outyield the suckling clover and *Lotus hispidus* prevalent on much of this country.

In the King-country, the Waikato, Rotorua, and Taranaki the satisfactory reseeding of subterranean clover may be hindered from time to time by the closeness of the sward in January and February in seasons of good summer rainfall. In the Waikato and the coastal areas

of Taranaki, however, subterranean clover is proving a valuable additional clover, and on the poorer soils in these districts, if fully exploited, is capable of improving the fertility up to rye-grass and white-clover requirements.

A discussion of the altitude range of subterranean clover showed that it was being successfully grown at an altitude up to 2,000 ft. in the Kaetihi and Poverty Ray districts, and it is evident that the possibilities in the central tableland to the south of Taupo are well worth investigation. While considerable detail was available at the conference as to methods of establishment and utilization under widely varying conditions, such information is best obtained from the officers of the Department of Agriculture in the districts covered by this review.

#### POSITION OF SUBTERRANEAN CLOVER IN NORTH ISLAND REVIEWED.

Reviewing the position in regard to subterranean clover in the North Island in the light of the papers read at the conference and the discussion on them the main points can be summarized as follows:—

(1) In the Wairarapa, Manawatu, Wanganui, Hawke's Bay... and Poverty Ray districts an area estimated at, upwards of 1,500,000 acres of grassland could be converted rapidly and economically from dry-stock to fattening land by the use of subterranean clover and phosphatic manuring. In the Auckland, Taranaki, and Bay of Plenty districts, while the value of subterranean clover in fat-lamb production has not been tried out to the same extent as in the southern half of the Island, and the soil and rainfall conditions generally are not so well suited to subterranean clover, there are indications that this clover could well replace inferior annuals such as suckling and *Lotus hispidus* on considerable areas of second- and third-class country, particularly where the returns from top-dressing are doubtful.

(2) The seasonal production from subterranean clover coincides exceptionally well with the seasonal requirements of the ewe and lamb, and set-stocking in the spring, to the limit of what the paddocks will carry is the best method of utilization. The clover re-establishes well, when once thick enough to form a sward, under heavy stocking.

(3) Phosphatic manuring is essential to subterranean clover on poor soils. Lime is not nearly so important as it is with white clover; and can be used as a forerunner to good rye-grass and white clover. Subterranean clover, therefore, responds well to superphosphate, and lime is required only in exceptional circumstances.

(4) Subterranean clover fully utilized is a valuable soil-improver; establishment, with which it combines, well when adequately stocked.

#### REFERENCES.

- (1) Paper read by E. B. Glanville at 1936 Grassland Conference.
  - (2) Paper read by J. Bell at 1936 Grassland Conference.
  - (3) Paper read by A. J. Galpin at 1936 Grassland Conference.
  - (4) Paper read by J. W. Palmer at 1936 Grassland Conference.
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#### DISCUSSION.

(Follows next paper.)