

moisture-retentive subsoil; the original cover was red tussock.

In the early days this land was held in extensive blocks and was used for the grazing of black poll cattle. After the land had been subdivided the tussock was ploughed and sown in turnips, and this crop was followed by ryegrass for seed. Ryegrass usually did exceedingly well, yields of seed were heavy (50 bushels per acre was not uncommon), and the seed harvested was generally very clean; it sold at about 2s. 6d. to 3s. per bushel ex mill. As there was no clover bottom, the ryegrass quickly "went out" and was replaced by a vigorous growth of browntop, seed from which then became a source of income.

Farmers found that with application of lime white clover growth was greatly stimulated and consequently pastures lasted longer, which permitted an increase in the sheep-carrying capacity of the farms. More lime was applied, topdressing with artificial fertiliser and more lime followed, and carrying capacity was steadily built up until much of this land which was clothed in red tussock only a comparatively few years ago is now carrying between 2 and 3 ewes per acre.

A 400-acre farm in this district, where more than 3000 tons of lime were used in about 14 years, may be quoted as an example of the progress made. The lime was applied at the rate of  $4\frac{1}{2}$  tons per acre during the first 3 years ( $2\frac{1}{2}$  tons per acre on the first furrow and a further 1 ton per acre in each of the following two seasons). Pasture was sown down during the final year and thereafter it was topdressed with 1 bag of superphosphate and 5cwt. of lime per acre each year.

The farm, which was taken over in 1935, was carrying about 350 sheep and was dominantly browntop and red tussock. At present the 400 acres and the original homestead block, also of 400 acres, are carrying more than 2500 ewes, approximately 700 ewe hoggets, and about 80 head of cattle. All lambs other than ewe lambs kept for flock replacements are fattened, usually about 3000 per year.



Lime is essential in establishing high-producing pastures.



The rolling country was brought in out of red tussock.

#### Development in Wendonside District

Another example where lime has played an important part in development is a farm in the Wendonside district. The soil on this farm, in contrast to that of the Waimumu farm quoted, is light, shingly terrace land. The farm of 960 acres was taken over in 1928 in a badly run-out condition; 300 acres had been extensively cropped and sown out in chewings fescue and the remainder was tussock.

In the first year 200 ewes were purchased, but as the farm would not carry them, they were sold. A bare living was made from chewings fescue seed and the sale of summer grazing. In 1936 a plan of improvement was put into effect. Blocks were ploughed and fallowed for 1 year. One ton of carbonate of lime was then applied

before sowing swedes and a further ton per acre before sowing grain the next season. The next year pasture was sown out and another ton of lime per acre applied; the pasture land has since been topdressed every second year with 8cwt. of lime and 2cwt. of superphosphate per acre. At present the farm is carrying 1500 ewes and 600 dry sheep and is producing good crops of white clover seed.

The two farms quoted are examples only of Southland farm practice. Similar though perhaps less spectacular results have been achieved by most Southland farmers from the use of lime.

The lime requirement of the alluvial soils is not generally as high as is that of the downs country, and applications of 1 to  $1\frac{1}{2}$  tons of lime on the first

furrow, followed by a further ton at sowing down, is usually sufficient for the terrace land and the river flats.

#### Over-liming

The question of over-liming, particularly on farms situated within certain areas of the Southland Plain and on farms where the sheep concentration is between 4 and 5 ewes per acre, has been raised recently. The build-up in carrying capacity has been brought about by application of lime, plus improvement in pastures and topdressing, linked with a system of pasture management based on set stocking of paddocks from lambing time to weaning. Soil samples from some of these farms have been analysed and analyses have in many instances shown that, though the soils have not been over-limed, further application of lime is not necessary at present and the build-up in lime status may be affecting the balance of other minerals in relation to the lime present. Recent experimental work at Invermay Agricultural Research Station (Taieri) and at South Hillend indicate that applications of  $2\frac{1}{2}$ oz. of sodium molybdate give responses in line with those which have been obtained from heavy dressings of lime, and further work is being undertaken to investigate the relationship of heavy liming and molybdenum deficiency.

#### Arable Land

The breaking up of lea land for swedes for winter feed is necessary, as club root is one of the problems of Southland. To minimise the likelihood or severity of club root attack lea is ploughed and a dressing of 1 ton of carbonate of lime per acre (or on some farms 1 ton of burnt lime per acre if this can be procured) is applied, usually just before the final discing. Some farmers make the lime application early in the cultivation, thereby giving the lime more time to take effect before ridging of the swedes. Others contend that if lime is applied early, it is worked down into the soil and the benefit from it is lost; but