

GRASSING OF MANUKA SCRUB LAND IN THE
AUCKLAND PROVINCE.

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GREEN MANURING AND TEMPORARY PASTURES.

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One settler may turn a wilderness of manuka scrub into a green sward of ryegrass and white clover and make a prosperous farm an apparently barren land, another may fail and leave one of those rather tragic landmarks - an abandoned farm - on the countryside; for the development of poor land is full of pitfalls and the balance between success and failure is very slight.

We read of the 18th and early 19th Century English "Improvers" who chalked, clayed and dunged poor heath land to bring it to a fertility level suitable for annual cropping, and in this country the original ideas in the development of poor land for grass were along the lines of raising the soil fertility - generally by green manuring - before permanent grass was sown. We now pin our faith on the theory of surface fertility - let the clover and grass make its own soil; cultivate carefully, sow perennial strains of ryegrass and white clover, liberally topdress with phosphates, and lime where necessary; and the pasture will build up the soil.

Perhaps we have moved too fast - the liberal use of phosphates costs money which may be wasted if the initial strike of grass and clover is poor, even the vestiges of a crop turned in prior to sowing may greatly improve grass and clover establishment, and the correct balance between the factors time and money may be extremely important to a settler with limited finance. There is probably no "best way" of grassing manuka scrub land and it may be of interest to discuss all phases of the work. The broad statement that certain land will grow first-class ryegrass and white clover pastures, if properly treated, may be correct, but let us be certain that when we pass to giving details of treatment (and to a settler details are important) we do not pass to error - for error in treatment may mean wasted effort, loss of capital, and eventually an abandoned farm.

SCRUB LAND.

The manuka thicket occupies numerous soils and situations in the Auckland Province; it is found on the gumland soils of North Auckland, the pumice plains of the Central Plateau, reverted hill country, drained peat swam coastal areas of consolidated sand - in short, it is found where the soils are poor, sour or dry, or wet in the winter and dry in the summer.

In this paper I propose to deal with the grassing of manuka thickets on gumland, pumice land, and coastal areas of consolidated sand. All these areas are of considerable importance in the future farming development of the Auckland Province - they contain large areas of easily ploughable land and may, with proper treatment, be turned into highly productive dairying or fattening farms. They have in common low initial soil fertility and without fertiliser treatment will only support a poor sward of danthonia and browntop.

The gumland soils of North Auckland are clays and grey silts - podsoils, acid soils of low fertility that have been formed under conditions of prolonged soil leaching. Both types are characterised by an almost entire lack of humus in the surface soil, are consequently difficult to cultivate, and respond to lime and phosphate treatment. The manuka scrub covering varies considerably, depending on the incidence of fires and soil drainage -- where fires have repeatedly swept the areas the scrub covering is sparse and stunted, and on the silts drainage is often bad and rushes form a considerable part of the natural vegetation.

The pumice soils of the central plateau are sandy and have been formed by volcanic ash showers and water sorted pumice. Again the scrub covering varies in density and height, depending a good deal on the incidence of fires. The soils are easy to cultivate and respond remarkably to phosphates.

The areas of consolidated sand situated on the west coast of North Auckland are light soils of two types - on the older areas the iron podsol type of soil has developed, and more recent areas which have not been affected by prolonged leaching. On the older areas drainage is bad owing to iron pans which occur at varying depths below the surface; the soils are wet in the winter and dry in the summer, and are below the margin of cultivation: the newer areas can be grassed satisfactorily, responding readily to phosphates and showing a slight but appreciable response to lime.

RAISING SOIL FERTILITY.

The low initial fertility of manuka scrub land is due to lack of humus in the soil, lack of phosphates, and on some areas lack of lime. Ploughed, cultivated, and sown with a standard grass mixture for good land, the grasses and clovers are slow in getting away and it usually requires about half a ton of phosphates (3 cwt. at sowing, 3 cwt. within four months, and a further 3 cwt. within twelve months of sowing) to bring the pasture up to the standard where it will produce 100 lb. of butterfat per acre. Get a good "strike" the phosphates promote a strong white clover growth, the clover encourages the ryegrass and within a year a complete turf is formed; subsequently the standard of production depends on regular yearly topdressing and stocking. But if the preparation of the seed bed has not been perfect and the strike of white clover is poor, then the cost of grassing may be almost a complete loss.

Lack of humus is a factor that adds greatly to the difficulty of obtaining a satisfactory strike of grasses and clovers; it makes cultivation difficult, heavy soils cake and light soils dry out quickly. Hence the obvious need for green manuring; but this costs money and takes time. For a crop of blue lupins the land must be ploughed and cultivated, there is the cost of seed and fertiliser, the crop has to be ploughed in, time allowed for it to rot and a further ploughing is necessary to bring up the rotten material and mix it with the soil. It costs so much that it is hardly ever done.

Any green crop that is used to improve the soil fertility must be a cheap one and temporary pastures of clovers present a fairly certain way of improving the soil's fertility prior to its being sown in permanent grass. Red clover and white clover can be used on pumice land and Lotus hispidus on gumland and consolidated sand.

But the factors, time and money, again come in - a settler with limited capital (or limited ability to borrow) cannot wait three years before receiving a return. A combination of direct sowing and heavy manuring, and temporary clover pastures appears to be the most economical method of treatment. In developing a dairy farm the normal plan will be to sow twenty or thirty acres in permanent grass, enough for ten or fifteen cows, make a thorough job of cultivation, sow early in the autumn and be liberal with fertilisers; at the same time prepare for future permanent sowings by surface sowing temporary clover pastures.

CULTIVATION.

Before developing land it is most important to estimate the probable cost. The cost of seed, fertilisers, lime, fencing and buildings are not difficult to determine but cultivation costs are harder to assess - so much depends on the class of land, the size and kind of power unit, the climate, and the area dealt with. For large scale operations tractors are quite satisfactory but in everyday farming horses are generally used. The cost of cultivation is the cost of feeding horses, repair and depreciation on team and equipment, and wages or living expenses of the settler: the cost per acre will depend on the area dealt with by the team. I have found on land development work that the cost of cultivating light land for grass has varied from 25/- per acre for perfectly flat land to £2 per acre for undulating to hilly land: heavy land costs more - generally from £2.10.0 to £3.0.0 per acre. The total cost of cultivation is roughly divided as follows:- a third is horse feed, a third wages, and a third depreciation and repair of implements, horses and equipment. The starting point in estimating the cost of cultivation is the cost of feeding and this is roughly 4d. to 4½d. per horse working hour (see attached table). Further than this it is impossible to go in the general estimation of cultivation costs; every job has its own particular conditions - the soil, climate, area and team unit - that have to be gone into before an estimate of the probable cost of cultivation can be arrived at.

GRASSING AND MANAGEMENT.

Of the three classes of manuka scrub land dealt with in this paper, the pumice country, provided the soil has a good moisture holding capacity, is the easiest to grass. The scrub is first cleared, the land ploughed, rolled on the furrow, double disced, harrowed, rolled, and grass and clover seed sown with 3 cwt. superphosphate; and after a further 6 cwt. of super has been applied, the pasture land, provided it is annually topdressed with 3 cwt. super, has a butterfat production of 100 to 150 lb. per acre. The usual grass mixture consists of perennial rye 25 lb., cocksfoot 10 lb., red clover 2 lb., and white clover 2 lb.; for the first three years the dominant pasture constituent is red clover, which, if properly controlled, rapidly builds up the surface fertility and allows of the establishment of high class ryegrass - cocksfoot - white clover pastures. Grassing appears an easy matter; but there are certain pitfalls, and red clover instead of building up the pasture may destroy it - a luxuriant red clover growth, uncontrolled, will completely smother out ryegrass and white clover. To

the settler the control of a large area of red clover is not an easy matter; he is usually engaged in dairy farming and milking cows do not thrive on rank red clover - it rapidly becomes unpalatable and has to be mown and wilted before milking cows do well on it; he has difficulty in harvesting the surplus growth for the whole of the requirements of winter supplementary feeding - he has not sufficient labour for harvesting a large area and often makes bad ensilage and worse hay from red clover through attempting too large a harvest programme. The normal alternative would be to turn to temporary pastures - and this was the old idea - of Italian ryegrass and red clover before sowing to permanent grass; but it costs almost as much to sow Italian rye and red clover pastures as it does permanent ones, and to utilise the produce from these pastures he is still forced to make the whole of the winter feed provision with hay and silage. Fortunately, the pumice country grows good swedes and by combining the sowing of red clover with the swede crop, it can be used to build up soil fertility without doing any harm. The best routine for a settler breaking-in pumice land to follow is first to sow a limited area in permanent grass, containing 2 lb. of red clover and in the same year sow an area of swedes, and after the swedes are drilled, roll, sow 5 lb. of red clover, 5 lb. cocksfoot, and 1 lb. of white clover with 1 cwt. super, harrow to cover and roll again. The division of areas will be somewhat as follows:- allow $1\frac{1}{4}$ acres of permanent grass for grazing by each milking cow, $\frac{1}{2}$ acre for hay or silage per cow, and 1 acre of swedes for every 5 cows. A cow to 14 acres will keep the pastures fairly well controlled although the mower will have to be used occasionally for trimming and a settler can usually manage the harvesting of $\frac{1}{2}$ acre per cow, and the hay and silage saved, together with the swedes, will be sufficient for winter feeding. The temporary pasture sown with the swedes is particularly useful - the red and white and cocksfoot do not interfere with the growth of swedes as ryegrass does - in the next year after the swedes are eaten off, the red clover and cocksfoot plants grow luxuriantly and the produce can be made into ensilage. Delayed cutting does no harm, or the autumn growth can be kept over for rack feed to be grazed along with the next season's swede crop. After being down in temporary grass for two or three years the land can be ploughed and sown in permanent grass, or ploughed and sown in swedes and after the swedes are eaten off, disced and sown in permanent grass in the spring,

Gumland is harder to grass than pumice land, for it is more difficult to get a good initial establishment. Working on the plan of letting the pasture build up its own fertility, the programme of grassing is as follows: - clear and burn the manuka scrub, fill holes, plough in the autumn and early winter, leave the furrow slices exposed to the weather over the winter, harrow in the spring, re-plough, and keep worked over the summer and sow grass in February. The two ploughings give a moist and firm seed bed and February sowing allows the grasses and clovers to become well established before the winter. Before sowing, $\frac{1}{2}$ to 1 ton of ground limestone is applied and the grass mixture is sown with 3 cwt. of super or slag; and after a further 6 cwt. of phosphates have been applied, the grassland will have a butterfat production of 100 to 120 lb. per acre. The usual grass mixture consists of 25 lb. of perennial ryegrass, 5 lb. of 8 lb. of paspalum, 2 lb. crested dogtail, 2 lb. red clover (which does not do very well), 2 lb. white clover, and 1 lb. Lotus major. The aim is a ryegrass - paspalum - white clover pasture and the whole success of this method of sowing is dependent on a good white clover establishment; if everything goes right this is obtained, but unfavourable weather, late sowing or surface caking of the soil often spoil the white clover establishment - and without white clover the ryegrass will not grow. If there is some humus in the soil, grassing

is rendered easier - the seed bed is better, grass and clover plants get away quicker, and the surface soil is less liable to cake. Humus can be put into the soil by first establishing temporary pastures of Lotus hispidus - but establishment must be cheap. If the original manuka scrub is heavy enough to leave a thin ash covering, sowing in the ashes of the burn gives the best results - if the scrub is very thin the surface requires discing. Sow 5 lb. Italian rye, 5 lb. Lotus hispidus along with 1 cwt. of basic slag. Lotus hispidus grows well on gumland but it must be allowed to grow during the summer and not kept grazed or the manuka will come back very thickly and little good will have been done - look on the Lotus hispidus purely as a green manuring crop. The gumland clays are not very suitable for annual crops and the development of a dairy farm is slower than on pumice land.

The coastal areas of consolidated sand may be grassed in a similar way to pumice land, i.e. clear, plough, roll on the furrow, double disc, roll and sow the grass with 5 cwt. super. The grass mixture used is similar to that used for gumland, with usually the addition of 1 lb. of subterranean clover. Here again successful establishment depends on a good white clover strike: early sowing is essential, but at the first ploughing these soils do not hold moisture well and unless the weather is favourable, sowing may have to be delayed until good autumn rains fall - this may cause late sowing and if cold westerly winds occur early in the winter the young white clover plants may die. The general development of these light sandy soils has been to cut and burn the manuka, surface sow, aiming at a danthonia - paspalum pasture for sheep grazing, and later to plough these rough pastures for permanent dairying or fattening pastures. Here again in farm development, surface sown Lotus hispidus pastures are a useful and cheap preparation for permanent grass.

SUMMARY.

The manuka scrub country on the gumland, pumice land and coastal sand areas can be turned into first class dairying grassland after one ploughing, provided the land is carefully cultivated, permanent strains of grass and clover sown, the land adequately phosphated and limed, and the pastures well managed. The success of this method of treatment depends on thorough cultivation to give a good white clover establishment. Failure in the white clover strike is very serious to a settler of limited means and the chances of failure are lessened if a temporary clover pasture has first been grown on the land to raise the fertility. If temporary clover pastures are used they must be established cheaply, otherwise they may prove more costly than the failure of permanent grass. The paper also outlines the usual development methods for scrub country, shows the place that temporary red clover pastures may play in the development of pumice land and Lotus hispidus pastures on gumland and consolidated sand; it also contains notes on cultivation costs, so that, with the general information given regarding grassing and development, the cost of grassing any particular area of land may be worked out with a fair degree of accuracy.

HORSE FEEDING.

Table showing the number of horse days (divided into working and idle days) and food consumption for a stable of horses engaged in pumice land development work, Ngakuru Blocks, Rotorua, for the 1932/33 season.

MONTH:	HORSE DAYS			FOOD				
	Total Days	Work- ing Days	Idle Days	Oaten Chaff lb.	Oats lb.	Bran lb.	Hay lb.	Lis- t lb.
1932								
April	1,050	628	422	14,640	3,480	1,800	5,250	20
May	961	552	409	16,380	3,680	1,440	6,750	20
June	862	619	243	17,640	3,520	1,200	4,800	20
July	949	804	145	22,620	3,720	1,300	1,600	25
August	777	668	109	18,890	3,280	850		
September	536	438	98	12,600	2,320	650		
October	591	425½	165½	12,300	2,760	450		
November	780	613	167	19,710	3,840	000		
December	1,094	780½	313½	17,280	4,080	300		
1933								
January	866	643½	222½	11,700	3,360	400		
February	716	554½	161½	9,720	2,960	600		
March	544	419½	124½	7,830	2,400	500		
TOTAL :	9,726	7,145½	2,580½	181,310	39,400	9,690	18,400	85

The average daily ration was 25½ lb. (costing 25.15 pence) but if all food had been eaten only on working days the consumption would have been 34½ lb. per day (costing 35 pence) and the cost per working hour for food was 4½ pence.

The number of horses fluctuated - the highest number in the stable was 36 and the lowest 14: idle days are Sundays, Statutory holidays, wet days, and incapacity: horses had access to moderate grazing when not working.
