FARMING PROBLEMS OF SOUTHLAND AND PROGRESS IN RECENT YEARS

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In 1863 a surveyor, a Mr A. Tuckett, was sent south in search of a settlement for the Church of Scotland. He came as far as what is now Bluff, sailed into the Oreti estuary, and apparently looked with disfavour at the land on which Invercargill now stands. He reported that it was a mere bog totally unfit for human habitation.

Admittedly, first impressions are not *always* right, but one would naturally suppose that any country or block of land which prompted such a comment would have at least a few problems before it could be converted into high producing farm land.

Problems there have been, and of course mistakes have been made.

Southland Province today occupies a proud position in the agriculture of the country. The total occupied area is over three million acres, of which 1⅓ million acres are in sown pastures; the balance is in tussock, fern, bush, scrub, and some barren tops.

The carrying capacity of this occupied area is better than five million sheep, of which approximately four million are breeding ewes. Incidentally, the breeding ewe population has increased by between 80,000 and 100,000 per year for the past 20 years.

Southland farming today is centred around sheep farming, with fat lambs and wool as the major sources of farm income. The wool clip is over 50 million lb per year (the income from the Invercargill sales last season was over £9½ million) and over 3,400,000 lambs were put through the four freezing works. Before last season three works were in operation, but a new works began at the end of March.

Southland is not particularly interested in dairy farming, but there are over 153,000 cattle, of which 46,000 are dairy cattle.

Despite the lengthening of the grass growing period, about 180,000 acres are ploughed each year; 150,000 is for supplementary feed and 30,000 acres for grain growing.

Land Drainage

Land drainage has always been a problem of Southland farming.

To cope with this drainage problem, many localised schemes were introduced.

Of more recent years this work has been undertaken by the Southland Catchment Board formed in 1945.

As a result, large areas of land which were previously too wet and swampy have been either made available for farming, or the work done in providing outfall and in the deepening and cleaning of watercourses has permitted more efficient internal farm drainage being undertaken. It is estimated that about 67,000 acres has benefited by this drainage work.

The effective drainage of peat is still a problem of Southland, where the rainfall is in the vicinity of 48 inches and fairly evenly distributed throughout the year. But the outfall drainage provided by the Catchment Board has also facilitated the development of some of the *peat lands*. A feature of the Southland peat bogs is their comparative shallowness and the incidence of heavy timber. This timber severely interferes with the installation of subsidiary drains and has an influence on the methods of cultivation used.

The use of the rotary hoe and burning off of the fluffy top followed by rolling have given a sufficient secdbed for pasture establishment, and recent topdressing trial observations indicate that topdrcssings of phosphate up to 8 cwt per acre in the first year of the pasture are necessary for vigorous growth.

Responses have also been obtained from the addition of potassic fertiliser on some of the peat in the Waituna district and copper has been found necessary for animal thrift.

Lime

Liming and farming are almost synonymous in Southland., Liming and adequate drainage laid the foundation of the farming prosperity of this province and have assisted tremendously in land development. There are at present twelve lime works here and until recently they were producing a total of about 300,000 tons a year, most of which was used in this province.

All Southland soils respond to lime and it has been applied at rates of 2, 3, and 4 tons per acre during the breaking in of new land until it is sown down in pasture.

Quite spectacular results have been obtained, and as a result it became the practice to *topdress* with lime, usually 1 ton every second year. Heavier quantities were sometimes put on until some farms had applied 10, 12, and even up to 15 tons of lime per acre in a few years.

Soil Analysis

Soil analyses have shown in a number of instances that the quantity of lime applied over a period of years has raised the pH

concentration to around about the 7 mark, and associated with this is a very high calcium status. These results have generally been found on the higher fertility lands of the province; that is, the flats and terrace lands and on the easier rolling country which has been built up to high fertility by heavy stocking and top-dressing.

As a result of the analysis, many farmers have been advised amongst other recommendations to withhold lime applications, particularly for topdressing, and to put the lime on only at sowing down. Soil analyses are generally asked for in connection with lamb thrift, and improvements in the lambs have been reported, ostensibly as a result of these recommendations.

Withholding of lime must not, however, be carried to the stage where the available calcium becomes too low for stock health.

Soil analyses, linked with experimental results, have indicated *potash* responses on the alluvial lands and terraces, and it seems that this fertiliser is likely to play a more important role in the maintenance of a balanced manurial status of Southland's grasslands, particularly on the high stock concentration country, which has been liberally treated with lime and phosphate in the past.

Trace Elements

Cobalt: Problems associated with trace element deficiency are not new to Southland. As far back as the late 1920's investigation became necessary when sheep were starving in the midst of plenty. It was eventually ascertained that lack of cobalt was the cause of this ill-thrift.

With the increased interest in fat lamb farming and the resultant concentration of sheep per acre, the use of cobalt has extended far beyond the area for which it was first found to be necessary. Cobalt is applied either as a component of the topdressing fertiliser or sprayed on to the pastures on a very large number of sheep farms throughout the province. However, this subject will be dealt with in a later paper (see p. 75).

Boron: Boron has been found necessary for the control of brown heart in swedes on practically all Southland soils, particularly where heavy liming has been practiscd. There is also some evidence of boron deficiency in lucerne crops; responses in renewed vigour have resulted from applications of 15 lb of boron per acre on alluvial soils and on the lighter lands in the northern part of the province.

Molybdenum: During recent years a considerable number of trials have been conducted on various soil types to assess the role of molybdenum in Southland agriculture. Responses have been

recorded, usually on land which has not previously been limed or where lime has been applied only in limited quantity.

Responses have been seen on the soils in northern Southland; that is, around Te Anau and Mossburn; on the yellow brown earths between the Longwoods and the south coast between Colac and the Waiau River; on the podzolised yellow brown earths around Tokonui and Chaslands; and on the more inland soils classified as intermediate between yellow grey and yellow brown earths. In general the responses have been noticed in improved vigour of clover growth and colour on areas which have received a basal phosphate and sometimes potash topdressing. These molybdenum responses must not, however, be taken as a complete *substitute* for lime, because the calcium content of soils is generally low.

Sulphur: A large number of trials (generally observational trials) have been put down to determine the areas responsive to sulphur. It seems that most soils require *phosphate,* but there are indications that extra sulphur gives responses on the more recent soils in the northern part of the province; that is, around Mossburn and Nokomai. However, the phosphate requirement of this land is such that the sulphur required may be adequately catered for in the necessary applications of superphosphate. One response to sulphur has been recorded on the alluvial soil around Benmore. Sulphur investigations are, however, still being carried on, particularly on the tussock lands.

Depleted Tussock Laud

Very early in investigational work it was shown that all other work undertaken was completely useless until the rabbit was successfully controlled. This point must *never* be overlooked when considering tussock land rehabilitation, even though there are still many problems to be dealt with before this very *extensive* area can be regarded as having regained its place in our farming economy. This phase of Southland's farming problems will be dealt with in a later paper. (See p. 84 and 96).

Land Development

Land development has always been a feature of Southland farming and in the more northern and inland parts of the province there are extensive areas of tussock, fern, and scrub being developed by the State and by private enterprise. The potential of this land development is being dealt with in a later paper. (See p. 37).

In line with the present trend toward rapid conversion, much of this land is being sown straight to pasture from the original scrub, fern, and tussock. The only preliminary *working* being bog discing and working down with heavy chain harrows. This is light

land low in natural fertility, and a considerable amount of experimental work is being undertaken to investigate the benefits from clover inoculation. The soil here is almost devoid of rhizobia bacteria, and this and the system of cultivation which has to be adopted limit vigorous pasture establishment.

Under suitable conditions sod seeding has been undertaken successfully in this area, but trials with chemical ploughing have not been satisfactory.

The older method of land development in this province for breaking in tussock, scrub, and browntop country was to plough in the rough with a semi-swamp plough and, after working, to put in a crop of ridged turnips. The crop was not generally heavy but it provided some winter feed. Grazing off of the crop assisted in preparing the land for pasture; not only could it be regarded as a period of semi-fallowing, but the pulverising action of the animals during the grazing off in winter and the return of dung and urine built up fertility.

It was not unusual to put in a second crop of turnips and in the third year the pasture was sown, frequently under a crop of rape.

Porina and Grass Grub

Damage by these pests *is* very considerable and the problem is not yet solved, at least as far as porina is concerned. On badly infested farms the caterpillars may be found at varying stages of development almost throughout the year, and in at least one case they were still plentiful even after repeated applications of D.D.T. and lindane preparations, both wet and dry. Damage by these pests is cyclic; after a season of vigorous grass growth the infestation is usually more severe and the damage during the autumn and winter is noticeably greater.

Weeds

By far the most troublesome weed of Southland farm lands is Californian thistle. Much money has been spent on spraying, but up to the present no weedicide or hormone weed killer has been found that will *destroy* this weed and not affect the pasture species.

Turnips and swedes are still important crops for winter feed and despite the fact that hormones have been used with some success in the control of spurrey and other weeds, the control of wild turnip in swedes and chou moellier is still beyond any hormone weedkiller or weedicide without damage to the crop,

Cultivation, Crop Rotation, and Pastures

Crop rotation in Southland entails broadly, the ploughing of lea (8, 10, or 12 years old) for swedes, followed by grain, then rape and grass. Alternatively, the swedes may be followed by

chou moellier, then grain, then pasture. With the supplementary feed crops being grazed and only one grain crop being included in the rotation, there is little likelihood of any loss in fertility; on the contrary, fertility is built up. This build up, the use of improved strains of pasture plants, and topdressing have not only extended the pasture growing period, but have permitted a change in the cultivation programme. In the past early ploughing was recognised as the best time to break up lea land if a good swede crop was to be grown. Nowadays the trend is to reduce cultivation to the minimum, and the ploughing of lea paddocks intended for swedes may be left until after the lambing. As a result, extra grass is available for the ewes from these paddocks and there is no loss in the resultant swede crop.

Early ploughing was a necessity when the turf had to have time to mellow, and any turf which comes into this category ***still*** requires early ploughing, ***but*** on the higher fertility paddocks today the turf is generally clovery and requires very little working.

Pasture Mixtures

Before the introduction of seed certification Southland produced a very considerable quantity of ryegrass seed (some used to be sold to Hawke's Bay). The seed crop in the first year paid for the seeding. With this seed crop in mind, the usual sowing rate was anything up to two bushels of ryegrass seed per acre in a general seeds mixture.

The practice of making perennial ryegrass the heaviest component of the mixture has persisted despite the change in the type of ryegrass being used. A mixture containing 1 bushel of ryegrass, 6 lb of cocksfoot, 4 lb of timothy, 2 lb of red clover, 3 lb of white clover (total of 35 lb per acre) provides approximately ***14 million seeds per acre*** or 330 seeds per square foot, of which approximately one-third are perennial ryegrass seeds.

Of the three ***grasses*** in the mixture, perennial ryegrass is the most vigorous in establishing and most aggressive in growth, and consequently overshadows all others. The control of perennial ryegrass, particularly during December and January, when this grass is making its most vigorous growth, presents a considerable problem, particularly on high fertility land where sheep (ewes and lambs) arc the only form of grazing animals.

To obtain some local information on pasture species and sowing rates, investigations have been carried out in four small paddocks at the Winton Experimental Farm over six years. This trial was prompted by the fact that the lambs in the paddock which was broken up did not thrive, despite the fact that it was a good, vigorous ryegrass-white clover pasture, so the five acre paddock was ploughed and put through the usual rotation. It was

then decided to divide it into four small paddocks and to begin this investigation to obtain some idea of the production and the fattening capabilities of cocksfoot, timothy, and short rotation ryegrass; in other words, what are the capabilities of the component grasses other than perennial ryegrass in a grass seed mixture if these other grasses are given a chance to establish.

The paddocks are 1¼ acres each and the grass mixtures sown in each with a standard base of 3 lb of white clover and 3 lb of Montgomery red clover were:

A. Timothy 7 lb (total 13 lb per acre).

B. Cocksfoot I2 lb (total 18 lb per acre).

C. Timothy 4 lb, cocksfoot 8 lb (total 18 lb per acre).

D. Timothy 3 lb, cocksfoot 6 lb, short-rotation ryegrass 10 lb (total 25 lb per acre).

These paddocks have been stocked up each year with ewes and lambs at estimated capacity in September. Slight adjustments have been made in numbers during some seasons, but these have always been kept to a minimum.

The four paddocks have been compared with a 1¼ acre paddock of perennial ryegrass, white clover, and red clover used as a basis for grassland production on the farm from 1953 to 1959.

The results are shown in the tables.

One or two other rather important points must be taken into consideration in the results of this trial. One is that the results are linked with the grazing animal rather than the appearance or dry matter production of the pasture, although this has been recorded; another is that there has been a noticeable increase in the cocksfoot in those paddocks where it was sown as a component. In all paddocks there is a very noticeable increase in other grasses generally regarded as undesirable, particularly ***Poa annua,*** Yorkshire fog, and browntop.

It is not suggested that these pastures are ideal, that perennial ryegrass should be excluded from grass seed mixtures, or that the mixture used in this trial should be advocated for sowing down all paddocks on all farms in Southland. But it does indicate that there is scope in our grassland investigation work for a grass which will be more suitable for fat lamb farming than is perennial ryegrass.

The question to be answered is: If not perennial ryegrass, what have we to take its place? Short-rotation ryegrass is much more suitable than is perennial, but it will not stand up to heavy stocking; long-rotation may meet the requirements, particularly if it is late flowering. It has been noticed that the sheep seem to concentrate on the "late flowering" ryegrass types in a paddock where a ryegrass strains trial including these is being conducted at the farm.

In any investigation involving pastures, be it into varieties,

DRY MATTER PRODUCTION PER ACRE (lb)

	1954–55	1955–56	1956–57	1957-58	1958–59	1959–60
Paddock A	9,970	8.720	12.660	II.350	7,000	14.970
Paddock B	9,430	8.010	13.030	IO.530	8.800	12.210
Paddock C	8,340	8.390	12.520	12.790	9,630	12,540
Paddock D	6.400	7,140	1 1,090	12.240	9.060	12.320

The particulars of lambs fattened (milk lambs) are as follows:—

	PADDOCK A					PADDOCK B				PADDOCK C				PADDOCK D			
Year	No.	%	Av. Wt. lb	Tot. Wt. lb	No.	%	Av. Wt. lb	Tot. Wt. lb	No.	%	Av. Wt. lb	Tot. Wt. lb	No.	%	Av. Wt. lb	Tot. Wt. lb	
1959–60	9	90	33.3	300	5	62.5	32.8	164	8	100	33.3	266	9	100	31.1	280	
1958–59	2	2.5	30.0	60	0	—	—	—	3	35	$0.0	9 1	6	75	34.3	206	
1957–58	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
1956-57	I ()	83	32.3	323	3	23	31.0	93	5	38.5	33.7	167	9	100	36	324	
1955–56	8	72	34.9	279	5	31.3	31.4	157	5	41.7	38.3	190	5	45.5	38.6	193	
1954–55	9	100	39.0	351	10	100	37.6	376	8	100	41.5	332	6	100	41.5	248	
	38	74%	34.6	1,313	23	54%	34.3	790	29	62%	36.1	1.046	35	84%	35.8	1 ,25	I

Compared with results above, those of a 1¼ acre paddock of perennial ryegrass, white clover, and red clover used as a basis for grassland production on the farm from 1953 to 1959 were:-

DRY MATTER PRODUCTION PER ACRE (lb)

1953–54	1954-5s	1955–56	1956–57	1957–58	1958–59
7.430	I.470	8.800	13.030	10,660	IO.060

Particulars of lambs fattened (milk lambs) are as follows:-

Year	No. Lambs	Draft	%	Av. Wt. lb	Total WI lb
1953–54	10	9	90	33.3	300
1954–55	13	4	31	29.5	118
1955–56	13	4	31	32.0	128
1956–57	13	6	46	32.3	194
1957–58	13	—	—	—	—
1958–59	12	5	42	30.4	152
	74	28	48	32.0	892

strains, or mixtures, the final deciding factor must be how the stock "do". Not many years ago a pasture was awarded first prize in a pasture competition, but ewes and lambs "starved" on it, while the unploughed surround, which was a mixture of brown-top, fog, and flat weeds, was grazed bare.

This problem of pasture control and palatability does not loom so large on farms where cattle are used in association with sheep. Sheep will always tend to keep to the short bite and the cattle clean up the roughage, thereby permitting the sheep to graze those parts of the pasture which would otherwise be neglected by them.

The concentration of sheep on heavily stocked sheep farms increases the many problems of fat lamb farming. These problems are all linked and could possibly be covered by one word "management". There is something, or a *number* of things, we are doing wrongly; it may be WC are using wrongly balanced pastures, with too much clover, too much grass, or these in wrong ratio; too much topdressing; or the topdressing programme may be causing an imbalance in the many other minerals of our soils. In addition, the set stocking system with sheep and their automatic selective grazing habits could be accentuating these problems.

DISCUSSION

Q. (N. A. Cullen): What is the place of lucerne in Southland and how did the timothy do when sown with short rotation ryegrass?

A. Except in the drier areas of Southland lucerne is used for hay only. Lucerne is increasing in all districts despite difficulties with harvesting. The timothy has weakened when sown with short-rotation ryegrass but the trials concerned have not had much fertiliser applied.

Q. (A. J. Harris): How were the paddocks stocked in September?

A. Ewes and lambs grazed the areas, and after weaning, paddocks come into normal pasture management.

Q. (J. 0. H. Tripp): Was there any great variation in rainfall during trial life and what has been its effect on timothy?

A. In years of evenly distributed rainfall timothy does better.

Q. (T. L. Symons): What is the life of a timothy dominant pasture?

A. Probably ten years provided management is adjusted to suit timothy. If grazed bare, life of timothy is shortened.

Q. (Dr L. Corkill): Timothy, cocksfoot and white clover were sown together in the pasture; what were the percentages of the components in the first year'?

A. During the first year timothy was very thin and the pasture was dominated by red shank which was later cut. In the second year timothy 75 per cent and the rest white clover.

Q. How much phosphate and calcium was used, and what are the soil test potash levels before you get potash responses?

A. The soil test initially gave pH 6.4 with phosphate, potash and calcium all high. Onlv one ton of lime has been applied in six years. First topdressing of pasture in 2nd year-2f cwt K super. Second topdressing of pasture two years later-2 cwt super. A soil test figure of 3 for potash on the Edendale plain would indicate a response to potash.

Q. (W. Jacques): There were four grasses used in trial, was the management of the plots different to suit each grass?

A. Management was suited to grass to some extent but all plots were stocked to capacity all the time. Perhaps cocksfoot did not do so well because of hard grazing during the spring.

Q. Are these trials for the heavier rainfall areas only?

A. Yes.

Q. (A.C. Burgess): What use is prairie grass in Southland?

A. No information available. An earlier experiment at Gore in 1930 used prairie grass but grass grazed too hard.

Q. With a pH of 5.3, 2½ tons of lime are necessaray to raise to pH 6. Is it better to apply this dressing in small lots or in one application?

A. Heavy initial dressings are better than a number of smaller dressings over the initial development stage.

Comment (Dr J. K. Dixon): Results of a single application of lime compared with a number of applications are the same. The single dose gives quicker results but the leaching loss is greater.