TOP- DRESSING OF PASTURES.

MANURIAL PRACTICE IN OTAGO AND SOUTHLAND.

J. M. Smith. Department of Agriculture, Dunedin.

A REVIEW OF THE PAST FEW YEARS.

The degree of grass consciousness that is so evident in many districts in the North, has not been developed to nearly the same extent in Otago and Southland and visitors to our Southern Provinces are often amazed that in this area, which represents a Quarter of New Zealand, and where the type of farming is in the main pastoral, so little topdressing of pastures is carried out, The total occupied area of Otago is 7,963,000 acres, and of this area only a shade over 1% was top-dressed during the 1935/36 season, Even if we take only that area whioh has been under cultivation and is subsequently 8own down with grass which is 1,122,000 acres, we find that only 82,300 acres, or 6.5% is topdressed, and of this 16,000 acres had only lime. What a contrast this is to say Taranaki, where, with an area of 956,367 acres of sown grass, 325,775 acres or 34% is top-dressed annually, while some of this is topdressed twice and practically the whole of it receives a heavier dressing than does the top-dressed land of Otago, The position, as far as Southland is concerned, however, makes better reading, for with a sown down to grass area of 1,056,152 acres we find that 220,969 acres, or 20% was topdressed in 1935/36, although of this area 31,700 acres had lime only.

What is the reason for this apparent apathy on the part of the farmers of Otago and Southland towards topdressing? It has been stated that the farmers of the South are conservative in their outlook and practice, and while there may be a certain amount of truth in this there are other reasons why so little grassland is topdressed in these provinces. It is a recognised fact that there is close correlation between rainfall and the successful use of fertilizers, and the rainfall of Otago and also to a lesser extent of Southland, is very variable, The following table gives the average rainfall for the various official. meteorological stations in Otago and Southland:-

Oamaru (North Otago)	22.01	inches.
Queenstown (Central Otago)	30.46	"
Clyde (Central Otago)	15.22	"
Dunedin (Otago)	36.77	"
Wendon (Pastern Southland)	29.96	"
Gore (Eastern Southland)	34.34	"
Invercargill (Western Southland)	45.75	"
Puysegur Point (Western Southland).	85.26	"

These figures would indicate' that the rainfall varies 'from about 40 to 50 inches on the coastal belt to 10 to 15 inches in the Central areas. It is estimated that over half of the area in sown grass in Otago is in districts with a rainfall of below 25 inches, while the area in districts with over 35 inches is comparatively small. In Southland the area that could be described as arid is not large, but there is a fairly extensive inland district with a rainfall well below 30 inches per annum. In these districts of comparatively low rainfall the "dividend" from fertilizer applied as a topdressing is not *large,* even where there is one, and naturally this does not tend to bring about the more extensive practice of topdressing.

Although Otago and Southland are extensive provinces they contain huge areas of high tussook land, the grassing of which at the present time constitutes a problem. It is unlikely that these areas will ever be clothed with a high productive sward, as the best that could be hoped of them would be to see them back in good tussock, or clothed with comparatively low producing, though drought and frost resistant species. These huge areas of unimproved pasture land, representing as they do 80% of the occupied area. of Otago and 60% of the occupied area of Southland constitute one of the reasons for what would appear to be indifference to topdressing- in these Provinces,

These then, are the two main reasons why such a small percentage of the pasture lands of Otago and Southland is top-dressed. It cannot be claimed that the standard of fertility of our soils of the South is such that they do not require fertilizers to maintain a high state of production, There do exist small isolated areas such as are to be found at Inch-Clutha and on the Taieri where the standard of fertility cannot beequalled anywhere else in New Zealand, but taking the average soils of these two provinces it will be found that nature did not heavily endow them with plant food. Not only that, but the system of farming that was practiced over much of the arable country in the early days, where many successive cereal crops were' grown without any fertilizer, sadly depleted the natural fertility of the soil, and today we *have* many soils that should be, and are,' very receptive, as far as fertilizers are concerned. The soils of the low rainfall arena, composed as they are in the main of mica sohiat, are comparatively high in fertility, and it is really lack of moisture that reduoea production from such soils, Nevertheless, as will be shown later, even where the lack of moisture is corrected by the introduction of irrigation, the use of fertilizers as tap-dressing has proved that the fertility is not sufficiently high to enable the maximum production to be secured without manures*

One sometimes hears it said that there is such a short growing season in the South that farmers cannot get much out of top-dressing, but the mere fact that there is such a short growing period makes it imperative that production from the pasture lands must be forced along during this period and top-dressing with fertilizers must form an important part of farming practice if this is to be done.

The so called conservative nature of our Southern farmers *cannot* be diomissed altogether, but it is very evident that the practice of top-dressing pasture lands in Otago and Southland is slowly but surely developing. The following table showing the increase'in output and consumption-of fertilizers in these Pro*vinces* bears out this statement.

PHOSPHATIC FERTILIZERS, EXCLUSIVE OF SLAG', ETC., BOR THE PAST FIVE YEARS, (TO MARCH): -

	32/33. tons.	1933/34. tons.	1934/35. tons.	1935/36. tons.	1936/37. tons.
Southland	12153	20384	23368	25765	25785
Otago	6165	12592	15173	17509	19625
North Otago.	1546	3504	4034	4203	5495
TOTALS	19864	36480	42575	47477	50905
Annual Inoreases		16616	6095	49 02	3426

Total Increase over five years - 31,041 tons.

During the same period there has been a falling away in the area under annual crop while the area in sown grass has increased as the following table shows: --
(The latest available return' is the 1935/36season.)

		OTAGO. (Acres)	SOUTHLAND. (Acres)	TOTAL. (Acres)
Sown grass area	1930/31 -	1,236,277	1,155,795	2,392,072
" " "	1935/36	1,267,851	1,126,430	2,394,281
	Increase			2,209 ac.
Annual Crops, (Grain, roots & Fodder),				
	1930/31 -	254,499	198,953	444,452
	1935/36 -	234,065	198,374	432,439
	Decrease			12,013 ac.

This increase in the use of fertilizers together with the decrease in the area in annual crop would indicate that an ever increasing quantity of manure is being applied to the pasture lands in the form of top-dressing.

As further and more direct evidence that topdressing is definitely on the inorease might be cited the following figures which indicate the areas topdressed with fertilizers, such areas being exclusive of those where lime alone was applied.

	OTAGO. (Acres)	SOUTHLAND. (Acres)	TOTAL, (Acres).
1930/31	62.702	128,304	191,006
1935/36	66,520	189,265	255,785
INCREASE			64,779

These figures definitely prove that the farmers 'of the South are alive to the importance of top-dressing, andwhile progress is not as rapid as some of us would like it to be, progress is certainly being made and we are hastening slowly.

THE DEPARTMENT OF AGRICULTURE 'S EXPERIMENTAL WORK:

Before dealing with the general top-dressing practice in Otago and Southland it might. be as well to review the results of top-dressing experiments that have been conducted in these two provinces by the Department. of Agriculture during recent years. These have been, in the main, small observational trials carried out co-operatively with various farmers throughout the district, and as such are not as complete or satisfactory as trials that have been carried out inmany districts further North, where definite experimental farms and experimental areas 'are available for experimentalwork. On' the other hand they have the advantage of covering the various soil types met with throughout a district and arc subject to the same type of management. and grazing that the farmers pastures are subject to. Thia later may, or may not be an advantage, dependent upon the farmers farming ability as far as pasture management is concerned. For instance if a small fopdressing trial is placed in the middle of a paddock, the remainder of which is not topdressed, or is only lightly topdressed, we get the stock over'-grazing and unduly punishing the experiments3 plots with the result that it is difficult to interpret the responses to the dhfferent manures. On the other hand if the farmer grazes very lightly the topdressed plots are inclined to get away rough during the period when the stock are out of the paddock and again there is difficulty in interpreting the results.

The number of topdressing trials carried out runs into several hundred so that it will not be possible to give any detailed results but the results will be summarized in a general way.

During the seasons 1927, 1928 and 1929 a series of trials were put down in different districts,. Thirty eight haying trials were carried out and the manures used were superphosphate and slag, both with and without carbonate of lime, In these trials only hay weights were recorded' and no consideration was given to early growth or to aftermath growth so that the results as given are not complete, The manures were applied at the rate of 3 cwt. per acre and the lime at 1 ton per acre, the dressing, being carried out during the July/August period. The pastures were divided into four classes as follows:-

TYPE A. Young pasture of a high productive nature, dominantly rye and clover.

TYPE B. Dominantly rye clover pasture, but not so vigorous as A.

TYPE C. Dominantly cocksfoot, dogstail and grasses other than rye, with little clover.

TYPE D, Dominantly brown-top with minimum of clover and good grasses.

Dealing first with Type A, Super and Lime gave the best results in North Otago and on the Taieri, but Slag gave the highest hay yield at Awamangu (South Otago). The addition of the lime to the slag in this instance did not give any appreciable increase. The Type B. trials resulted in the super lime plots giving the highest average yield in all plots, but the whole of these plots were situated in districts of comparatively low annual rainfall. The difference between the lime, super and slag plots in some of the trials was not significant, however. With the Type C. pastures the super lime plots gave the best results in nine instances, with Slag slightly ahead in two cases (at Herbert and Greenfield.) The Type D pastures gave little response as far as hay is concerned to any of the treatments actually the slag, plus lime applications giving the best average yield, the comparactive figures being no manure 100, super 111, slag 114, lime 104, super-and lime 114, and slag and lime 118. The summary of these trials states that super and lime give the best hay yields, this' combination being better than either super or slag alone, or slag and lime,

During the 1927/28 season a number of trials were put down in Central Otago, some of these being on irrigated pastures and some on non-irrigated pastures.' These were all in districts with a rainfall below 20 ins. per annum, The manures used were the same as those in the trial already reviewed and the hay weights were again recorded. On the Galloway Flat under irrigation super gave the greatest hay yield with super and lime next and then slag, these three treatments being the only'ones to show any profit. A further trial under irrigation but on higher country on the Raggedy Ridge gave *no* response to any of the treatments. A third trial under irrigation at Springvale on the western slopes of the Manuherikia Valley gave a marked response to super and super and lime and a lesser though still profitable response to slag, slag and lime and straight lime. On non-irrigated country at Wedderburn super was the only treatment showing a. profitable response and this was so small that is was not significant, At Kyeburn Super was the only plot to show a profit and this. was very marked.

Much the same result was recorded at other trials throughout this district of low rainfall where the pastures were not irrigated.

During the same season similar plots were put down in South Otago. At Te Houka super, was the only manure to shon a marked profit , although slag came out the right side of the ledger. Trials at Hillend, Greenfield and Kelso also shoned increases from both super , and slag but the results were not significant, The summary of this series states that of the 31 plots 23 showed significant super responses,8 Cave significant slag responses, while 8 showed no benefits from-any of the treatments..

In: the spring of 1929 forty observational top-dressing trials more put down in Otago and Southland and a further thirty five were put down the following year. These trials were not hayed and weighed but were reported on at regular interv ls and *so* kept under fairly constant observation, The manures used were Super 30% Potash, Sulphate. of Ammonia and Lime, while in certain localities, particularly in Southland, slag was also brought under trial. Lime was applied at the rate of 1 ton per acre in the first year only, nith dressings of 5 cwt. per acre in subsequent years; super was applied at the rate of 3 cwt. per annum, 30% potash at the rate of 2 cwt.. per annum and sulphate of ammonia at the rate of lcwt. per annum. The results of these 75 trials were summarised in 1934 (1) as follows:-
In Central Otago the best results have followed from the use of super. 'and also from the additional spring application of sulphata of ammonia- Where the results were ppor it was due to the poor type of sward. In South Otago the best results have been obtained from the application of lime plus super. closely followed by applications of Super, alone. A spring application of Sulphate of Ammonia has been found beneficial. Very poor responses were obtained on the Tnieri. Exceptionally poor results have been-obtained in Rorth Otago, but exceptionally droughty conditions are largely responsible, The best results in Eastern Southland have been obtained from Lime and Super, both alone and in combination, The number of. .-experiment s which indicated a potash response is high. Springapplications of sulphate of ammonia also gave beneficial results. In Western Southland basic slag responses were practically *on* a par with those obtained from lime and super. Very good results were obtained from the application of potash,

Since the date of this report (1934) a further 45 trials have been put down, these all being observational trials. The results of these experiments, with slight variations confirm those of the previous trials summarised in 1934. Super/lime and straight super, have given the beat results generally speaking, with slag giving results practically equal to those plots in the wetter portions of South Otago and Western Southland. Potash also showed up prominently in many parts' of Southland, but in Otago there were very few potash responses and these were only alight , Dressings of lime gave a fairly general response with the exception of the drier districts of Central Otago.

Generally speaking, then, the results of the Department's experimental work have shown a good general response to super ./lime, and a slightly lesser response to straight super, In the drier portions of the district the responses have been smaller except under irrigation where the results have been good. Slag has given results equal to super in many trials in the wetter portions of the district, while potash has given quite good results in parts of Southland, Sulphate of Ammonia has resulted in a good early spring boost to pastures,

PRESENT TOP-DRESSING PRACTICES:

General top-dressing practice in Otago and Southland can in the main be correlated with the results of the Department's trials in these districts. The practice and' experimental results are almost identical as far as districts giving profitable results, and the type of fertilizers being used, are concerned. With regard to the time'of application, and rate of application, however, there appears to be ample room for further investigation, but this will need to be of a very detailed nature and it will require an experimental area to carry out this work satisfactorily,

MANURES USED.

(a) PHOSPHATES.

Dealing firstly with the manures used by farmers of Otago and Southland, an analysis of the position will reveal that in the main phosphatic fertilizers are being used. This is in accord with top-dressing practice right throughout New Zealand. There is a definite phosphate deficiency in most of our soils and this, as far as fertility is concerned, is largely the limiting factor. Just what form this phoephatic fertilizer should take is a debatable question in some districts but taking the provinces as a whole there is little doubt that the answer is superphosphate. As previously pointed out Otago and Southland do not generally speaking enjoy a heavy rainfall. and this makes the use of our only water soluble phosphate a wise one. It is only in those districts that do enjoy a medium to heavy rainfall that discussions take place with regard to the type of phosphatic manure that should be used, and it is in these districts where Basic Slag and Seychelles Guano are being used fairly extensively Which brings us to the old argument super versus slag, which argument as far as Southland is concerned ranks second only to the certified versus uncertified ryegrass. As already indicated on the Department's trials in Western Southland slag gave results equal to super as far as the eye could judge, If this is to be an accepted fact then the only point to consider is cost and taking this over a number of seasons super would prove the most economical manure to use. Yet we find farmers who are prepared to pay, and who do pay, £2 to £3 a ton more for slag than they would require to pay for Super. What is their reason for this? IS it a case of good salesmanship on the part of the slag agent; is it a case of giving preference to certain firms who handle slag, or do these farmers consider that slag gives so much better results as atop-dressing that it is worth the extra money. Figures shorn that in the year ending March, 1936, 2150 tone of slag came in by way of Bluff, while for the following year (March, 1937) 4260 tons came through the same port, This would indicate a growing demand for slag in Southland. There is a something about slag that seems to claim its use and this claim is by no means peculiar to Southland. In a recent publication (2) Taylor states"That 'trace' elements play an important role in animal health and production is now a well recognised fact, but to what extent they control these vital conditions and the manner in which they function in the metabolic processes of the animal body is yet largely a matter of conjecture. " This same writer then goes on to point out that the trifling quantity of 1 mgm. daily has kept sheep in a thriving condition in the bush sick country of the North. He then goes on to say "But is this the only type of soil likely to be deficient in 'trace' elements? It seems harly feasible to suppose so as all the world over there are, and have been for years, baffling diseases and conditions of plant and animal life that

have so far defied all investigation. *In* view of the scientists' already broadening knowledge of the "trace" element and their functions, it occurs to me that one would not need to stretch one's imagination too far to suggest that sooner or later a satisfactory explanation of many of our present day problems will be forthcoming and when this does arrive it will be found that after all the "little things' do count. " When one considers this statement and compares the analysis of slag with super. there would appear to be food for thought in the matter, According to Ingle (3). the analysis of slag is somewhat as follows: -

	PER CENT.
Lime	45.04
Magnesia	6.42
Alumina	1.50
Ferrous oxide	2.10
Ferric oxide	15.42
Manganous oxide	3.50
Vanadious oxide	1.35
Silica	5.80
Sulphur	0.32
Calcium	0.40
Phosphorus pentoxide	18.10

To the layman it is quite feasible that one or more of the trace elements that are missing in certain soils are being supplied by dressings of slag. In connection with this point Bruce (4) states "There appear to be many points concerning the remarkable efficacy of slag on certain classes of soils which are **not** yet understood. Perhaps the time is not far off nhen fertilizer practice will give full recognition to the importance of such mineral **elements** as iron, manganese and magnesia. The combinations carrying these elements in slag, although possibly not in the best form for assimilation by **plants,** cannot be entirely regarded as worthless matter." Here we will leave the matter, but it is obvious that the field is open for some very **intensive experimental work in connection** with slag as a top-dressing fertilizer,

In some districts of Southland there has been from time to time quite a quantity of rock phosphate used, but no outstanding results have **been** achieved with this type of fertilizer on pasture lands, and it is generally felt that more satisfactory results would follow the use of quicker acting phosphatic manures* However) as a paper *on* insoluble phosphatic manures is to'follow this one, there is no need to further discuss this point here.

(b) POTASH.

The use of potassic manures opens up a new era in top-dressing in Southland, and some very striking responses to this type. of fertilizer have been reported. The manure, usually applied to grass land is 30%potash salt and in this sound practice, is being adopted, Generally speaking the use of potash strengthens up the clovers in the' sward, a very necessary factor **in** a high production pasture. Not that super or slag do not build up the clovers, but cases have been observed where phosphatio manures have failed to bring the clovers away satisfactorily and where potash has had the desired result, Another bearing that potash is claimed to have on pastures in Southland is in connection with that very elusive quantity - palatability. It is stated that some farmers have had rather disappointing results as far as the "grazability" of the pasture, is concerned and that the application of 1 cat. of 30% Potash has made all the difference with regard to stock relishing the pasture growth,

which 'difference has been reflected in production in general, and in the percentage of lambs off their mothers in particular, Here again there is much room for extensive experimental work,

(c) NITROGEN.

Nitrogenous manures are not used to any extent **in** Otago and Southland, although the seasonal **responaes'** to applications of this class of manure have been quite good. Sulphate of Ammonia is the nitrogenous manure, usually applied, and its application is usually reserved for those paddocks that are to be closed for hay or silage, The only other time that sulphate of ammonia is used is to invigorate early growth and in this it **has been** quite successful, With a season like the present one where there is likely to be a serious feed shortage in the early spring, it would appear to be a worth while practice to spell **one** or two grass paddocks about the end of August and **give** them a dressing of say 1 cwt. of sulphate of ammonia or 3 cwt. of Ammoniated Super to get an early bite of feed that should prove very valuable.

(d) LIME.

Lime, while not a fertilizer is used very extensively throughout Otago and Southland, with very beneficial results. While the practice of applying lime. **only,** cannot **be** considered to be good general practice it is interesting to record that Southland uses more lime than any other land district, The class of lime, i.e. carbonate or burnt, would appear to be of little moment and the usual practice is to apply up to 1 ton of carbonate per acre at intervals of 3 to 5 years, Phosphatic manure preferably super., should, however, be applied annually. where lime is being used in this manner; In districts of low rainfall, and particularly in Central Otago, there seems little advantage in the extensive use of lime.

RATE OF TOP-DRESSING, The rate of dressing of fertilizers in **Otago** and Southland is on the low side, and most farmers are **very** satisfied if they apply 2 cwt. per acre. In the North, where production is high, dressings of less than 3 cwt. per acre are seldom made, and at times up ***to*** 5 and 6 cwt. are applied annually. There would appear to be no logical reason why such dressings, if sound in the North should not be just as sound in the South. As previously stated there are 2,394,281 acres **of** sown grass ***in*** Otago and Southland while the total phosphatic manure used in this area in the 1935/36 **season** was as follows:-

Super and Super mixtures	47,477	tons.
Basic slag.	2,280	"
Other Phosphatic Fertilizers	7.485	"
TOTAL	57,242	"

If the whole of this was applied to sown grass lands as top-dressing it would represent less than ½ cwt. per acre. If the whole tonnage were applied to our known top-dressed area (exclusive of the area where lime alone is used) it would represent a dressing of. 4½ cwt. per acre. We have in Otago and Southland 432,439 acres of annual crop, the bulk of which is oomparatively heavily manured, and if we even apportion the total phosphate used between the known area topdressed and the annual crop according to acreage we find that 36,026 tons are uaed with the crops and 21,216 tons' as topdressing, which represents 1¾ cwt. per acre. These figures would indicate that

we bave a long way yet to go to reach our optimum topdressing figure .

TIME FOR APPLICATION.

With regard to the time of application of phosphatic fertilizers to pasture lands in the South it would appear from an analysis of 'the present practice that the bulk of the manure is applied during the late winter and early spring months. The following table gives the distribution of fertilizers in tons during the various months of the 1935/36 season:-

	APRIL.	MAY.	JUNE.	JULY.	AUGUST.	SEPT.
Southland	1632	1186	708	2336	3874	3730
Otago	1044	630	299	1210	2450	2414
North Otago	363	527	272	353	435	346
TOTALS.	3039	2343	1279	3899	6759	6490

	OCT.	NOV.	DEC.	JAN.	FEB.	MARCH
Southland.	3924	3925	1087	301	592	2465
Otago	2399	3558	1631	212	196	1463
North Otago	425	646	342	44	93	352
TOTALS .....,	6748	8129	3060	557	881	'4280

From this table it willbe aeen that the'greatest monthly quantity of manure goes out in November; and probably the bulk of this is for the turnip crops. August, September. and October show about the same quantities and while some of this will be for turnips and spring sown cereals it is assumed that the greatest quantity of these months output is used on grassland. Next in order come March, July and April, and practically the whole of this would be used as top-dressing. I f these assumptions are correct then approximately equal quantities of manure are used on grassland in March/April and -July/August. The tendency today is to topdress the pasture lands in the autumn, and this is particularly an advantage in districts of low to medium rainfall, Even in districts of fairly high rainfall autumn dressings are becoming the rule, as it is now known that there is practically no loss of fertilizers with the winter rains. The disadvantage of the early spring dressing, which was largely practiced in the past is in controlling the abnormal growth that often follows such a dressing. It, is admitted that in the South this period of abnoral growth is not as early as it is in the North, but possibly when it comes it is, more acute and the application of manure in the spring intensifies this. An autumn application ensures a sufficiency of plant food as soon as conditions congenial to plant growth are experienced in the spring,. Thia ensures as early as possible pasture growth in the spring with an evening out of such growth and the avoidance of an acute rush period, when pastures are inclined to get past both stock and man..

Potassic manures 'can be applied with equal advantage in the autumn. On all of the experimental plots where potash gave a response the manure was applied in the late autumn.

With sulphate of ammonia, however, it is a different question. We read with longing hearts of winter grass in the North

where the autumn application of nitrogenous manure gives growing grass through the winter months, a veritable dairy farmers paradise, Winter grass in Otago and Southland is out of the question, This i8 a blunt statement of fact, With our long intensely cold winter it is futile to endeavour to grow winter grass, We can perhaps encourage the pasture3 to produce later in the autumn and perhaps get them away a little earlier in, the spring, and so shorten the winter period a little, but there is a perhaps even in this. Sulphate of Ammonia is a manure that should be applied in the spring month3 at about the time when normal growth is expected,

WHAT PASTURES SHOULD BE TOPDRESSED. Finally we borne to the point-as to what grassland should be topdressed. We can immediately rule out our tussock-lands in their present state, which lands form the bulk of the grazing area of the South, The next belt of country that gives one concern is the brown top area, which area rises into. some thousand3 of acres, It is known that a considerable area of browntop country is top-dressed, and where this is done and management is good, the pastures carry up to 3 ewes per acre, quite a creditable performance for pure brown top. The bulk of this country, however, is comparatively low in production and it would appear that the best way of dealing with much of this country would be to break it up, crop. it and sow it down with a suitable pasture mixture with a view to topdressing the resultant pasture, The good financial returns. received for brown top seed harvested from this unimproved browntop country is a factor that has to be reckoned with. With a minimum of outlay and trouble good returns. are at present being received from this country in its unimproved state, Next, we have the sown grasses where the sward is in a fair to good condition! One has no heaitation in saying that these pastures should be topdressed to bring them up to a high production standard and to maintain them at that standard. Lastly we have the poor to fair type of pasture, which is frequently top-dressed in an endeavour to make it a good pasture, but which *in* most cases does not contain sufficient good species to make top-dressing worth while. It is false economy to endeavour to bring back an utterly run out, or worn out pasture by top-dressing. It can frequently be done, and has been done, but when brought to its maximum production capacity it compares poorly with a pasture that has been sown down with a -suitable mixture of grasses and clovers and then top-dressed, The time taken to bring about suoh an improvement is also, a factor that must be considered, whereas by breaking up the run out sward and resowing, a highly productive pasture results after a few months.

SUMMARY.

Summarizing this paper then, we find that up till the present the position as far as pasture top-dressing in Otcgo and Southland is concerned has not been very favourable, but the farmers of the South are now-aware of the potentialities of top-dressing and this phase of pasture work is being developed along sound lines. In districts of medium to high rainfall lime is a necessity to be followed with superphosphate, In the, districts of exceptionally high rainfall basic slag gives results practically equal to super, but there is room for further experimental. work in this connection, In drier districts superphosphate alone appears to be sufficient at the present time. Potash in South land appears to be fast becoming a necessity, while Sulphate of Ammonia gives good results in the production of early grass. Manurial dressings could be profitably increased in quantities, while the autumn applications, generally appear advantageous.

In conclusion the grassland farmer of Otago and Southland can look forward to an era of greater prosperity as far as production from his grasslands are concerned, Only the fringe

of production has yet been touched in this connection and with no very great outlay he should be able to bring about an improvement that should be reflected in his general well being and in the prasperity of the South.

REFERENCES:-

(1) R. B. Tennent and A. Stuart, Journal of Agriculture, February, 1934.
(2) C. R. Taylor, "Field Practice and Research."
(3) Herbert Ingle, "Manual of Agricultural Chemistry."
(4) J. A. Bruce, Journal of Agriculture, May, 1931.