

INCREASING PRODUCTION FROM NORTHLAND HILL COUNTRY

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The subject of this paper is the large area of non-cultivable hill country now in production in the land area mostly north of Auckland City, the North Auckland Land District. It has been broken in, for the most part from standing bush, and to a less extent scrub and fern, and carries the greater part of the sheep population of this area, which is approximately 1,400,000 plus a high percentage of the beef cattle, some 230,000.

If we assume that it carries 75 per cent of both these classes of stock, its present carrying capacity is 1,050,000 sheep and 172,500 run cattle. It thus makes a contribution to our national output of no mean order.

So much public interest has been focused on the potential production to be expected from our unimproved areas of cultivable scrubland, of which there are not less than 250,000 acres available, that the possibilities in this hill country, already equipped with the necessary buildings, fencing, roading, and plant, have not attracted the attention---they-deserve: -- --- --

NEW FACTORS

There has been a big forward move by the men farming these areas in the last two or three years, due to some new factors in the situation, which are:—

A. For the first time for very many years the farmers concerned have had adequate funds at their disposal, due to good prices for their production, in particular wool.

B. The development and putting into use of new techniques in topdressing, accompanied by oversowing with clover, notably by aerial topdressing and the use of New Zealand-invented blowers.

As a practical farmer using such methods, I propose to discuss experience of them to date, their possibilities and limitations, improvements in equipment and materials that are needed, with an attempt

to indicate the extent of the increase in production that is possible:

SOIL CLASSIFICATION

The soil types concerned in this hill country are classified by the soil survey as under:—

Class 4: Hilly or sheep land that will maintain pasture without topdressing with little to moderate erosion, 81,280 acres.

Class 5: Hilly or sheep land that will maintain pastures if topdressed and carefully managed with slight to moderate erosion, 798,080 acres.

Class 6A: Hilly or sheep land that has severe limitations; 376,320 acres, some of this being non-farmable.

The total acreage of farmable hill country in the 9 northern counties is officially estimated to be 1,127,000 acres. Of this approximately 600,000 acres is in production,

The Soil Survey note to class 5, the largest acreage? says:—"Includes soils on hilly land that will maintain pasture if topdressed. Almost all the soils in this class in North Auckland are deficient in lime and phosphate, and require a dressing of **basic phosphate** . . . along with the fertilising there is need for the sowing of a legume."

NEW TECHNIQUES

~~The mechanical aids which have revolutionised~~ the possibilities of hill country are the blower, the aeroplane, and the bulldozer. AERIAL TOPDRESSING shows an increased acreage covered each year and makes possible the topdressing of steep but potentially fertile land that could not be dealt with otherwise. The record of the companies and individuals concerned in this is a creditable one, and they should be given every encouragement to further development. This service has been developed and based almost entirely on war surplus Tiger Moth aircraft, bought at comparatively low cost, and able to lift about 500lb. as a payload. Some Beaver aircraft with a payload of 1500lb. are being used, but are very costly to put into operation. Replacement aircraft, at much higher cost than the original aircraft, will shortly become an urgent problem likely to overstrain the finances of those concerned, who would

seem to merit assistance from national sources in re-equipping themselves for so important a job.

From the farmer's point of view topdressing by this means is fairly costly, both as to the actual cost of spreading, the making of airstrips, assembling large dumps of fertiliser, and time lost in waiting for suitable weather conditions.

Much of the time so lost could be avoided were fertiliser available in granulated or pelleted form as it is extensively used overseas. The provision of manure in granulated or pelleted form is an urgent need to which local companies might well give more attention.

Nearly all phosphate used for aerial topdressing has been superphosphate or serpentine super, its coarse texture making it easier to place from the air than finely ground phosphates, which drift too much in air currents and have proved unsatisfactory.

This brings me to comment on a particular circumstance which is having a severely restrictive effect on the spread of aerial topdressing in Northland. We have a heavy rainfall in this area, and the majority of our hill country consists of soil types which are phosphate retentive. The effect of applying water-soluble phosphate to such land is that the phosphate is immediately fixed by the iron and alumina in the soil, forming insoluble compounds, so that the phosphate is lost to the pasture plants it was intended to benefit.

It will have been noted that the Soil Survey recommendation to Class 5 soils, the largest acreage concerned, is "these require a dressing of basic phosphate." In practice this means, as we have found by costly trial and error, basic slag, North African phosphate, guano, or mixed superphosphate and lime. As the economic cost of phosphatic topdressing must centre round the cost per lb. or per ton of P_2O_5 (phosphoric acid), the superphosphate and lime mixture with a low P_2O_5 content is hardly an economic proposition with present costs of spreading from the air.

Although serpentine superphosphate can be expected to give a better result than straight superphosphate, its effect cannot be compared on most of these soils with that to be obtained from slag, North African phosphate, or guano. The ideal fertiliser for spreading from the air over our northern hills would be granulated slag, which could be relied on to give good results on all our varied soil types. I am reliably

informed that slag can be granulated, and that one of the largest British fertiliser concerns is now carrying out, trials with it to ensure that it is effective before putting it on the market. I understand it is likely to be available in about 2 years. It seems likely that the newer types of phosphates made by the fusion process would suit our needs, and extensive trials of these are required.

BLOWER TOPDRESSING

The blower, developed in New Zealand and of which there are several makes, has proved a valuable help, particularly on the easier types of hill country. It is economical in operation, two men being able to do everything required to handle a substantial tonnage daily. To get the fullest use from a blower the country requires to be roaded with bulldozer roads which will give access to tops of spurs and generally permit either a tractor or 4-wheel drive truck to give a good coverage to the area concerned. These roads are best made to at least 12ft. width, to give a margin of safety, and should be finished level so that when they settle the road has a slight outward grade. This allows water to run off instead of down the road. Grades should be made as easy as possible to check erosion, and concrete culvert pipes used where necessary. Roads should be sown and topdressed soon after formation, the ultimate objective being a grassed shelf sloping slightly outward except where a lead in to a culvert is required.

The blower itself is mounted on either a tractor trailer or a 4-wheel drive truck able to carry 1 to 3 tons of fertiliser.

The most economical practice is to take the fertiliser on to the block to be done in the road trucks which deliver it, and to make dumps of 10 to 15 tons which can be covered by tarpaulins.

The vehicle carrying the blower has then the minimum distance to travel to fill up with a fresh load.

As with every other new tool, one has to learn how to use it, and make full use of *air currents*. Best results are usually obtained with a light, variable breeze rather than strong winds.

Fineness of grinding of the material used is the biggest single factor in success with a blower, North African phosphate being almost ideal.

From the farmer's point of view the fact that he and one man can operate the whole box of tricks as

and when it suits him is one reason for the popularity of this appliance.

The blower has its limitations and can seldom cover 100 per cent of the area, but surely it is better to do say 80 per cent of an area by this means than perhaps not do it at all. As stock return a high percentage of what they ingest to the soil as excreta, they must over a period raise the phosphatic content of the whole area by degrees,

For this work the 4-wheel drive truck has come to be appreciated as the best unit on which to mount a blower. Their performance in climbing steep grades on all sorts of surfaces is remarkable and we cannot now 'do without them. Almost all those in use are ex-army vehicles now rapidly ageing and requiring replacement. By far the best of these are of American make, such as ex-American army trucks obtained from the Pacific Islands. Post-war models of improved performance are now available in the U.S.A. which would be ideal for our purpose, but we are unable to obtain them.

Surely this work of increasing production and thus our overseas exchange resources is of sufficient national importance to justify some allocation of dollar exchange for this purpose.

LIMING

Though all our northern lands need lime, the extent to which it can be applied on hill country is determined by both economic and physical conditions and is limited. The application of lime from the air is not economic today, though it may ultimately become so through development of special types of aircraft,

A good weight of lime is being applied yearly through blowers and this no doubt will increase as more country is roade'd for their use and as more and better 4-wheel drive vehicles and tracklaying tractors become available.

The inability to apply lime does not necessarily prevent the substantial improvement of hill country, nor 'does it prevent the establishment of clover, since the right typos of basic phosphates, if applied generously enough, have a considerable lime equivalent value which effectively supports clover. There are possibilities here in the new knowledge available concerning molybdenum, but as all the answers have not yet' been obtained, I shall not venture comment.

RATES OF APPLICATION OF PHOSPHATE

This is of some importance, particularly where it is not feasible to apply lime, and one has to rely on the lime equivalent value of the basic phosphate used to provide that minimum quantity of lime that is necessary to the life of clover and earthworms on the scale desired.

I would like to hear the comments of others on this, but my experience with the use of North African phosphate is that a substantial initial dressing of 4cwt. per acre, followed by 2 to 3cwt. the following year, gives the best result.

THE OVERSOWING OF CLOVER

It is now generally accepted, thanks to the great work done by Sir Bruce Levy, to whom the country owes much, that the full value of phosphatic topdressing cannot be obtained unless at the same time clovers are introduced to the pasture. We are fortunate in having available to us the high-producing strains of pedigree clover evolved by the Grassland Division of the Department of Scientific Industrial Research. *Lotus major* is also of great value, since it tolerates a rather lower level of fertility and is of particular value under our high rainfall conditions. It serves to hold the fort until fertility is built up to the full clover standard. For this reason I personally favour a mixture of two of clover to one of *Lotus major*, the ultimate objective being high clover establishment. This is not an easy job, and it is probably best done by a combination of methods. --- -- ---

SURFACE SOWING

Mixing seed with the fertiliser in aerial topdressing offers a good opportunity, but good results can be expected only when the mixture is put on in early autumn-late February and during March. Departmental experiments showed clearly that a far higher germination was obtained from March sowings than in any other month. Where seed cannot be put on from the air, mixing with sawdust and spreading from horseback to get a good general coverage of the area is an alternative method.

Spreading seed by means of a seed box on the blower or mixing it with the fertiliser is another alternative, but the spread of seed is limited to a fan not further than about a chain from the point of operation.

SPREADING CLOVER THROUGH THE ANIMAL

This offers an excellent method, because the seed that is excreted in the dung germinates readily, is to some extent protected from stock, and the seedling, being highly fertilised, grows and establishes rapidly.

The use of clover hay or the incorporation of a handful of seed in bales of hay as fed out is one method.

I have found the system of what I call junction paddocks to work very well. These are small enclosures of an acre or two strategically placed in corners where the subdivision fences of three or four blocks meet, with gates into each. This small area is heavily sown with pedigree clover, topdressed, and limed. An almost pure clover stand is obtained quickly, which is allowed to flower and set seed. Cattle are turned into this and when full turned out on to the adjoining block. The process is repeated at intervals of 2 to 3 days and in three or four different junction paddocks. This works well in practice, and these small paddocks are of great use in stock handling, drafting etc.

In the same way light grazing of any area where clover is established, to allow it to set seed, can be exploited to spread clover.

STOCKING AND GRAZING MANAGEMENT

This, without going into details, is an obvious part of the job of getting the best results from topdressing and the introduction of clover. The skilful use of stock needs to be more widely understood, especially the part that can be played by run cattle. In general, the ratio of run cattle to sheep tends to be too low. There is an optimum proportion which each property owner has to determine for himself, and which when attained gives best results for both stock and land. A survey of Auckland Province to provide evidence for the Royal Commission on the Sheep Industry indicated that the average proportion was 1 cattle beast to 9 sheep. I would suggest that the 'ideal on most properties would prove to be 1 beast to 5 sheep, an objective which today can be made a very payable one. Subdivision and rotational grazing have an obvious part to play in all this.

LABOUR

In addition to all the factors mentioned, there is that of labour. As Dr. W. M. Hamilton has shown in a recent address, the average farm worker in New

Zealand produces 50 per cent. more than his opposite number in Australia, twice that in the Argentine, 5 times as much as in Britain, and 20 times as much as in Japan. He has also demonstrated that every time workers are transferred by whatever means from farming to secondary industry the sum total of production is lowered and vice versa.

More men, particularly married men, must be attracted back on to the land. Wages on farms today are the highest they have ever been and are comparable with those in other industries. The chief lack is in amenities, notably housing and educational facilities, but there is no evidence that the importance of dealing with these matters is sufficiently taken into account in national policy.

THE POSSIBILITIES

To quote Dr. Hamilton further: "There is no technical reason why the revolution which has taken place on the ploughable lands should not be re-enacted on the hill lands of the North Island, though economic factors might restrict it to a lower level of intensity.

Experiments carried out by the Grasslands Division of the Department of Scientific Industrial Research at Te Awa have indicated that topdressing and oversowing with clover seed, coupled with closer subdivision can double production on this class of country in 3 or 4 years.

"Though this is possible on much of the easy hill country, it would be misleading to suggest that it is possible on all hill country. There are considerable areas where lime as well as phosphate is required, and these areas are unlikely to show the same quick response even if topdressed with lime as well as phosphate." This is a conservative and well-considered opinion.

If then you accept my estimate that the hill country of the north is now carrying 75 per cent. of the sheep and run cattle in the area, which gives us 1,050,000 sheep and 172,500 run cattle, what increase can be expected by the application of the methods I have traversed ?

---If regard-is-given-to-the tough-nature-of-some-of--- this land, but the areas still undeveloped left out of account, a conservative estimate of the increased possible stocking would be a rise of 70 per cent on present figures. This would give an increase of 735,000 sheep and 120,750 cattle on the land already developed.

If to this be added the potential capacity of the undeveloped area, it seems likely that we could envisage a total increase of well over 1,000,000 sheep and over 150,000 cattle.

This makes it evident that the possibilities in our hill country are at least as great as those in the areas of undeveloped cultivable land, a fact that is not sufficiently appreciated.

SUMMARY

1. The present sheep population of the North Auckland District is 1,400,000 and of beef cattle 230,000
2. It is estimated that 75 per cent (1,050,000 sheep and 172,500 run cattle) are carried on the hill country.
3. The total area of hill land in the 9 northern counties amenable to modern techniques of improvement is 1,127,000 acres of which a proportion is still undeveloped.
4. The prospects of increased production on this area are enhanced by the development of top-dressing by aircraft and by means of blowers.
5. There are some obstacles, for example, the lack of the right kind of phosphate (basic phosphates) in the right form-pelleted or granulated for aerial spreading. There are problems in the replacement of aircraft and 4-wheel drive vehicles of the type needed.
6. Substantial dressings of basic phosphate are advocated with the establishment of clover by several methods.
7. Proper stocking and grazing management are essential.
8. Married labour should be attracted back to this land.
9. It is estimated that present stocking could be increased by over 1,000,000 sheep and 150,000 cattle.
10. This would compare favourably with total production to be expected from the cultivable areas of unimproved scrubland.

DISCUSSION

- Q. Has Mr Moore got out any costs per ton for spreading fertiliser under various methods, particularly by blower?
- A. Costs of application were given in a survey of Akitio County published as the Department of Agriculture's Bulletin 339, "Developing Marginal Lands" (10s.). As far as I recollect aerial topdressing was the most costly and blower application much the cheapest of any. We can blow 1½ tons in 20 minutes with the tractor and trailer. For efficient topdressing you must have roads of a grade not greater than 1 in 5.
- Q. As you go north you find fertiliser works erected at intervals throughout the country. Surely farmers could do something to get works erected that would serve North Auckland.
- A. We had the fertiliser committee here for some time with ambitions of getting works somewhere near here. The erection of any sort of fertiliser works is costly. Superphosphate seems to be to some extent in the discard. We want a basic type of phosphate. A delegation of 3 went overseas to look into the sulphur position and fertilisers generally. The Government and the three statutory boards are sharing the cost (\$9000) of bringing experts out from Scotland to advise on all technical points. Until their report is made it is unlikely that there will be any forward move.
- Q. Are Northland farmers intending to run more store stock or do they intend to fatten?
- A. That depends on the individual farms, particularly on hill country. The general tendency on hill country gaining extra income from wool and store stock is to get part of the income from sale of fats. It might be advisable to continue with the improved wool clip and store stock. Personally I would not advise any change in the next 10 years. It is a better national service to continue to provide that type of stock.
- Q. Is it recommended to sow lime and fertiliser with the grass seed or earlier?
- A. (Ballinger) : In a dry season especially it may be advantageous to work lime and superphosphate into the soil before sowing the seed, but excellent results are seen with lime and fertiliser applied immediately before sowing. You can get good strikes whichever way you do it.
- Q. Is there any knowledge of Scotch tares being used on hill country to encourage cows and calves to go out?
- A. (Ballinger) : Nothing has been done with Scotch tares, but our western hill country—the steepest dolerite country—has retained grass sown by blower and if the blower will carry it, fertiliser has been put on too. Our east coast—p manuka scrub is more difficult to deal with.
- Q. Could any recommendation be made regarding control of hard fern?
- A. (Madden) : I recommend burning off the bigger patches and introducing better grasses and clovers in the ash. Spell for a while, then graze with more cattle and fewer sheep.

Q. Are there any recommendations for the eradication of ratstail on limestone?

A. (Madden) : Ratstail is stubborn and difficult, but in parts of dry Hawke's Bay it is being slowly eradicated by top-dressing and increasing the clovers, etc. It must shade its own crown to be happy. If you can get it sufficiently palatable to be grazed it will not shade its own crown.

Q. Would you recommend the use of nitrogenous fertilisers on gumland?

A. (Ballinger): Establishment on most gumland soils is satisfactory without nitrogenous fertiliser. Grasses and clovers become yellow in winter, but you can not graze them then because the ground is too wet. In early spring they can be stimulated, but I doubt whether it should go on then.