

Falkland Islands Agricultural Department



Grassland Improvement

Proceedings of a Conference
held at
Stanley, 18th July 1966.

Proceedings of a Conference on

GRASSLAND IMPROVEMENT

held on Monday 18th July 1966

in the Council Chamber, Town Hall, Stanley

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GRASSLAND WORK AT ROY COVE - 1954 - 1966S. Miller

I would like to begin with a brief history of the origins of Yorkshire fog on Roy Cove, as sheep pasture and why we encourage its growth.

Long before the days of sheep, when the early sealers made their base in and around Hope Harbour and West Point Island, about 150 years ago they must have had hay on their ships to feed cows or what other livestock they may have had on board.

The hay taken ashore must have been responsible for the development of the Yorkshire fog areas which were already well spread when sheep farming began in the late sixties and early seventies of last century. These areas which gradually became very heavily stocked with sheep, in spite of the stocking with little or no control, continued to thrive and the grass to spread.

In the thirties I made Grace Cove peninsular into a paddock of some 400-600 acres and we used it, and still use it, in the same manner in which we use our present newer paddocks - sheep in at a stocking rate of about 1 to 2 sheep per acre, and then out again to allow the feed to recover.

Grace Cove under this kind of management gave such good feeding value that during the last war it occurred to me that we could do even better with a few more similar areas.

In 1954 we began experiments near the settlement, where we cultivated some 200 acres between 1954 and 1958, trying different types of implements and differing seeds mixtures, including white clover and some of the better English pasture grasses.

At the end of this 4 year period we were able to come to various conclusions.

Firstly, as the large scale use of fertiliser was uneconomic we had learned that Yorkshire fog was the best grass to develop. With no fertiliser at all, it comes away quickly, gives an early bite in spring and makes heavy growth in summer and into the autumn. It seems impervious to frosts and maintains some slight growth even through the winter.

The clover and English grasses however, in part disappeared and where they did not entirely disappear, their growth was minimal and the Yorkshire fog, where it was in the mixture, gradually took charge. The second conclusion we came to was that cultivation by rotavator did not give as good a seed bed as the plough and discs.

Indeed we found that rotavation took as long to arrive at a reasonable seed bed, used more fuel and was tough on the tractors.

In rotavating it is a case of 1st gear and maximum throttle; in ploughing with 2 to 3 furrow ploughs each making a 14 inch cut, gears used were second or third according to the nature of the soil packing, and in second gear not necessarily full throttle.

So having learnt something of what we had to tackle, we began our present regular grassland operations in 1958.

I will describe the kind of team we use a little later, but in general we start ploughing if we can in the autumn and well into winter. The winter frosts do quite a lot of work for us in crumbling the upturned soil. In the spring, September usually, we go in with the discs - first with the furrows and the second time across them. We then roll with a heavy tandem Cambridge roller next sow the seed using a drill which puts the seed in an inch or more deep, with seed drills about 2½ to 3 inches apart.

We then give the area a second and final rolling and that is it. Germination when using dressed seed is fairly rapid and young grass is well through in about 4 to 6 weeks.

We allow stock on it as soon as they can get a bite. There are two schools of thought about how soon to graze new grass but we find our method of cropping early is successful, and I can quote from Dr. William Davies, one of the world authorities on grassland development. Dr. Davies, in his book, "The Grass Crop", says - "The sooner it is grazed the better the 'take' and the more successful and rapid is full development."

Having arrived at a reasonably well-covered and thriving area of new grassland, we are then only halfway to success. The ultimate and maximum benefit can only be attained by fencing off these areas so that grazing can be controlled and managed.

It is very necessary to crowd on stock in the summer when growth is at its fastest because if it is allowed to get too long and therefore rank, sheep will not keep it down, and it is the short sweet feed that gives maximum benefit to the sheep.

We remove the sheep when the area has been heavily grazed and we find that in a matter of weeks only, grass is sufficiently away again to take more stocking - though if we are past the main summer growth we do not put back so many.

Paddocks so handled will give maximum feed right around the year.

And now with regard to the labour and implements. We find that two men working together make a good team. They have a living caravan with cooking stove, and also a workshop caravan to keep the oil and tools away from the living quarters.

They have gas welding equipment with them and do all minor repairs on the spot to save a journey into the settlement.

Each has a 4-wheel drive tractor, mounted plough, and mounted discs. The drill is also a mounted implement. In fact the only machine which is not mounted on the hydraulic system is the very heavy roller. Apart from easier transport, if these implements are mounted, when the operators strike rocky or other rough areas, with a touch on the lever with one finger the implement is up in the air and can be lowered again when the bad patch is passed. We use 2-3 furrow ploughs, with semi-digger bodies, and the maximum or 14 inch cut. We began in 1958 with one-way, or reversible ploughs but these are expensive to buy and maintain and are not so easily stiffened as the conventional plough. And we do have to strengthen all our implements; in fact the makers would be hard put to it to recognise some of their products. Cultivation on British fields is a different story to working the rough and tough land in this Colony.

We have found that October is not a good month for planting. It is normally the driest month of our year and seed can very easily germinate and then perish through lack of water.

We expect to begin drilling seed about mid-November, and this normally lasts to about the first week January, depending upon that season's acreage to be sown.

I think it is an undoubted advantage, in this semi-arid country to drill rather than broadcast seed. If the seed is broadcast and covered lightly, as the book tells you to do, it has less chance of surviving drying winds in the top half inch of soil than if it is drilled somewhat deeper. It may take a little longer to appear but it will be well rooted when it does.

In the early days we were a little fearful of wind erosion of the soil after cultivation, but after 12 years of experiment and organised land improvement we no longer fear it.

In the spring and summer you will see the machines operating on a windy day in a cloud of dust and the driver will be as black as your hat. But you will not see soil blowing on its own where no machine is working. The reason appears to be from the accumulation upon the surface of a large number of small sticks and chewed up roots, which do not interfere with planting nor

with growth, but do make thousands of miniature wind breaks.

We used to use undressed fog seed from Britain and New Zealand, but this had to be sown at 25 to 30 lbs per acre to make any show and was moreover wasteful. After the initial years we changed to dressed seed drilled at about 7 lbs per acre. This had been both more efficient and more economical.

I said a little earlier that after the experimental years we found that fog was our most successful grass. We used most of the better known English grasses and clover, but none thrived at all and some disappeared as we could not, for obvious economical reasons, use any fertiliser. Such fertiliser costs from £30 to £45 per ton and unlike the happy British farmer who in bulk receives in subsidies nearly 300 million of the taxpayers' money, we have to pay the whole bill.

Most of our soil on Roy Cove has a pH of no higher than 4 to 5, which is moderately acid. Potash and phosphate content is medium to low; nitrogen is practically negligible except in the native green flats where stock have congregated for decades, but under these conditions Yorkshire fog thrives and thrives well.

Some critics have assured me that these areas will all revert to native bush and inferior growth. I am now entirely confident that they will not even if they are not well managed.

We have our criterion in the 150 year old areas in Grave Cove. This camp which has only been fully handled within the last 30 years, shows not only a bigger spread of fog in that camp, but it has spread far and wide into the neighbouring camp, Bramble Point, where there is now some 400 to 500 acres of self-germinated and flourishing Yorkshire fog ground.

I would sound one note of warning. If white grass areas are cultivated and sown to fog and are neither fenced nor controlled white grass which is a rapid grower, can easily smother the fog which because it is more succulent, will be kept grazed short by stock.

I would like to emphasise the very real importance of management of these grassland areas. Grazing management is so important to ensure that the feed produced is fully utilised and the maximum concentration of stock possible will return fertility to the soil through dung and urine. In this connection in soil tests I have done at Roy Cove of native green valleys where stock have always concentrated, the nitrogen content of the soil is much better than on the less heavily stocked main areas.

As our only income is from wool we all try to ship it home in as good condition as possible. We have found that for about three seasons after sowing we have to keep woolly sheep off these new blocks from early spring to shearing as there is too much uncovered area that makes dust in windy weather.

This is unfortunate because these areas grow all too quickly in October and November and by the time we can start to pile the clippies on to them growth is too far ahead.

There is no way in which to avoid this, but after about three seasons, other things being equal, we can and do use the established grasslands right through the spring and so keep growth at the correct and maximum nutritional height.

It will have become apparent that to obtain this maximum production we are often moving flocks in and out of paddocks, but it is only by so doing that we can achieve their best possible use.

We winter-save some of the more sheltered areas for lambing and so are able to move ewes into them about 10 days before lambing commences and thus on to new and growing feed which is ideally suited to the pregnant ewe. At present we are able to lamb about three quarters of our breeding ewes on saved paddocks.

During summer months when grass can so easily get ahead of the sheep's capacity to keep it down, cattle can play a very important part and where possible they should be concentrated in

areas where growth is too long for sheep. Unfortunately with no freezer in the Colony we cannot make the use of cattle that we should as we are unable to dispose of surplus, but cattle are excellent mowing machines for excess growth.

The work we have been doing has cost us a little under £4 per acre under normal circumstances. I have heard numerous critics of the lowness of this figure but recently I sent a copy of our annual costing for the 1964-65 season to a well known authority in London; he found that costing to quote his words "substantially correct".

For the future we hope to try to introduce something other than Yorkshire fog. No animal likes to dine on a diet of one item only. We would have had experimental areas this winter of Aberystwith 173 clover, suckling clover and sheep's fescue, but unfortunately all the seed for this was amongst the 200 tons of cargo short-shipped on the 'A.E.S.' last December. When it reached us late in February, the clover inoculant which I had already received was out of date and so we have had to postpone the whole scheme until next summer.

I am doubtful about the Aberystwith 173 clover, fairly certain of the suckling clover which grows well round settlements, and very hopeful of sheep's fescue which is the main constituent of the green hills in Wales and Scotland at higher levels and on acid soils. It is not however quite as cheap as Yorkshire fog.

Discussion

A. B. Monk asked if Mr. Miller left areas of natural pasture so that the white-grass bogs etc. could act as shelter.

S. Miller replied that on fencing off blocks of camp they left unimproved areas as shelter. Clumps of fachine and rushes encountered during cultivation were also left for this reason. Experimental planting of fachine bushes had also been tried but although alive the plants had been eaten down by sheep. This was strange as the sheep did not bother the large areas of natural fachine on the farm. Mr. Miller said he was considering putting wire netting round the bushes.

A. B. Monk asked if the seed produced by the fog was viable.

S. Miller replied that a combine had been bought to save seed but the seed did not seem to remain viable or even to get ripe. Some of it seemed to mature as the plants spread in the camp.

R. G. Vinson wondered if there was any camp on Roy Cove to compare with the rank white grass of the East Falkland.

S. Miller answered that they did not have it in bulk but those areas which had been sown had exhibited a quicker strike due to the higher moisture content of the soil. He suggested that white grass soil varied and it would be worth doing a soil analysis before embarking on any large scale cultivation.

R. Pitaluga inquired if Roy Cove had much balsam bog.

S. Miller said that all they had was in the mountains and unploughable. He wondered if it would put something into soil if cultivated in.

J. Clement said that there was an area of balsam bog near the old Anson farm which had been rotavated very successfully.

The whole bog broke up with very little effort to form a good tilth. Unfortunately the seed used in this case was only partly viable and a very patchy strike was obtained.

S. Miller suggested that there was some merit in balsam bog as horses tended to nibble at it. He also added that he was not decrying rotavators as such but he had found them more expensive in operation.

D. Barton asked if there was not a tendency for the young plants to lift and grow in clumps thus allowing erosion round them.

S. Miller said this was so and the clumps were sometimes 3-4 inches high but very little soil blew away. The spaces tended to grow in with native species.

R. Pitaluga wondered if Mr. Miller had any trouble from seeds in the wool.

S. Miller said that only the cheek pieces of the ram lambs had much seed in them and that was at wiggling time in March.

J. Clement asked if there was any change in the dentition of the sheep.

S. Miller said that he had not noticed as only the teeth of old sheep were inspected for culling.

J. Clement thought that there might have been a change for the better as rank growth tended to ruin their mouths and some sheep had undershot jaws already.

S. Miller said that on his camp the teeth were usually well worn down but whether the fog would reduce the wear or not he could not say.

EXPERIMENTAL WORK AT DOUGLAS STATIONJ. Reid

Most of our work has been concerned with trying different methods of cultivation in regard to the introduction of Yorkshire fog, mainly on hard dry diddle-dee camp.

One method we tried was that of 'sod-seeding' or drilling fog seed straight in, using an ordinary combine corn drill.

In cases where there were fairly large amounts of diddle-dee and where the going was fairly rough, we first levelled this off with a heavy 'frame' constructed of truck rails, towed behind a tractor, and which proved very effective, and in fact the bigger the bogs, the more effective it was.

After this treatment, fog seed was drilled in in 14 inch drills at about 7 lbs/acre, this work being done mainly in the spring and early summer.

Germination was fairly good with this method, though rather patchy particularly where diddle-dee bogs had just been removed, and where the seed bed was not sufficiently consolidated. Also, owing to the roughness of the ground being covered, some seed was probably sown rather too deep, though the object was in fact to drill the seed deep enough, so that adequate moisture was available.

This work has now been done some 5 or 6 years, and while fog has been introduced quite successfully by this method and has persisted quite well, except where there is plenty of moisture, the fog has not made a great deal of growth annually, but has rather tended to run straight to seed. It was also noted that while there was a fair strike in the first season, some seed from the original sowing continued to germinate in the following seasons. This result being partly due to lack of consolidation, moisture and the fact that some seed was buried too deeply.

In general however, the results tend to suggest that the cut made by the disc coulter of an ordinary drill does not break up the surface mat and reduce competition from the existing sward sufficiently to allow the fog to grow as vigorously as one would like.

Rotavation. This is a useful method of breaking up a tough surface mat, and also for levelling off roughage such as diddle dee or white grass bogs, however our experience is that the rotavator mixes up the surface trash with the soil in endeavouring to prepare a seed bed, and this resultant mixture of soil and trash is very difficult to consolidate, and a poor strike usually results from sowing straight onto freshly rotavated ground.

If however, the rotavated ground can be left for a year or so to allow the trash to break up and settle down, then good results may be expected, but on the whole, rotavation alone does not appear to be a good method of preparing a seed bed, and in fact this stirring up process rather tends to dry out the soil to the point that it is so much more difficult to consolidate, except perhaps in very wet camp.

Ploughing. This method normally gives good results, followed by discing and rolling, and we have generally obtained a good strike when the seed is sown either fairly early in the spring, or late in the summer. Usually we have drilled in about 10-12 lbs of fog seed to the acre in 7 inch drills, and this method is probably best when conditions are fairly dry, but otherwise when conditions are more favourable broadcasting would probably give better coverage, and, unless a good cover of well established fog has been obtained before winter sets in, then a certain amount of damage is often brought about by frost lift. There is also a risk of erosion through soil being blown away.

Discing. This is a method which seems to offer some advantages over those I have already mentioned. Unfortunately we did not have any really heavy discs which would normally be used for this type of work, however by adding a considerable amount of ballast we were able to get fairly good penetration with an ordinary set of disc harrows, and with up to four discings were able to obtain a reasonable tilth. After rolling, fog seed was drilled in at the usual rate fairly early last spring and has become well established.

The advantages of this method seem to be that not all the original existing grazing is removed entirely, and in fact what remains of the better finer grasses is in fact stimulated by the treatment. Diddle-dee, particularly the bigger bogs, is well broken up, and while a certain amount of trash is left on the surface, this seems to offer a fair amount of cover for the germinating plants and at the same time there is very little bare ground left, which might be subject to erosion. Another point which is also probably in favour of this method, is that the more fertile top soil is not being buried, and while this may also apply to rotavation, discing does also help to achieve consolidation, and which in itself seems to be a limiting factor particularly on drier ground.

While so far we have only tried this method on the drier diddle-dee ridges, it does appear that with really heavy discs, good results may also be obtained on some white grass camp, when the object is to improve the existing grazing, rather than to effect a complete changeover to a more or less pure stand of fog or any other grass, and I would favour this approach in developing any large areas initially.

In conjunction with the different types of cultivation we have tried, we have also done some small trials in introducing clovers, and about 5 years ago we drilled in small amounts of white, Montgomery red and subterranean clovers which had been treated with a commercial inoculant. All these varieties germinated well in the spring and seemed well established during the first summer, with a fair amount of plants flowering in the autumn, however in the second year there was a marked reduction in the number of plants seen, and now it is only with difficulty that an isolated plant may be found, and these are chiefly of Montgomery red clover which seemed to persist best in this trial.

Now, this year, we have done a small trial with inoculated seed which had also been pelleted with a mixture of lime (dolomite) and phosphate (nauru) in the hope that the addition of the fertiliser might help. So far results seem quite promising, and all varieties have germinated, most have been found to be nodulated, and some have flowered this autumn. We will now have to wait and see how these clovers persist, and which is the main difficulty, and while the use of large amounts of fertiliser may be out of the question, it seems possible that small amounts incorporated in a pellet with the seed may be just as effective.

Varieties used in this trial have been white, Montgomery red, subterranean, suckling, and alsyke, and also serradella, trefoil and lucerne, these last three being much later in germinating than the others, and also not doing nearly as well.

In connection with the work I have already mentioned, and also existing camps, we have been attempting where possible, to spell these at intervals mainly during the summer months when there is some growth. This appears very necessary to allow any introduced grasses, and also the better native grasses, to become well established and re-seed and spread, and we have had fairly good results in some cases, however in others the spell is much too short during the growing season to be of much benefit. We now need further subdivision to allow us to make more flexible use of these, and this can only be done by sub-dividing some of our larger camps which are not so evenly or efficiently grazed the size they are at present.

In conclusion, I would like to suggest that while the introduction of grasses such as fog on a large scale will undoubtedly give quicker and greater returns than subdivision alone, at the same time both must go hand in hand both to allow some sort of rotational grazing and/or spelling both to make full use of these better grasses and also to allow them to develop their full potential, and also at the same time to prevent their being over-grazed and eaten out.

Discussion

S. Miller inquired how cultivation was carried out after the heavy bars and how was the trash disposed of.

J. Reid replied that in the case of the sod-seeding they did not get rid of the trash.

S. Miller asked if they burned.

J. Reid said no.

S. Miller agreed that burning could be difficult and expensive.

C. D. Young described the Douglas Station frame as being very heavy and made of truck rails, having a similar effect to the bren tracks used on Saunders.

J. Reid explained that there was a gap between the rails to let the trash pass through

S. Miller asked if a wheeled or crawler tractor was used.

J. Reid said a wheeled one which had occasionally become stuck on high bogs. The frame would also be effective on balsam bogs which would weather down.

L. G. Blake asked if the clovers had been sown in conjunction with grasses.

J. Reid said they had.

L. G. Blake inquired if there had been more effective growth of the grasses where there were clover plants.

J. Reid answered that the clover had not survived the second season in the first case and in the second it had only been sown this season so it was too early to draw a conclusion.

He thought the grass seemed slightly better.

G.C.R. Bonner asked if the clover trials were carried out in the open camp.

J. Reid said they were.

S. Miller asked for figures for the cost of pelleting.

C. D. Young said it was still in the experimental stage here.

A commercial product was available but he did not as yet have a price for it. The process would not be expensive as only two thirds of the seed weight of pelleting material was used plus inoculant and adhesive and these were all cheap.

Labour would probably be the main cost and large amounts could be done in a cement mixer. He had experienced trouble in making a good pellet so was looking into the commercial product.

S. Miller said that they had tried clover without success as white and subterranean clover had flourished in the first season but had not appeared thereafter.

C. D. Young said that the main cost of clover establishment would still be that of the seed itself.

R. G. Vinson asked if Mr. Reid had been referring to fog when he described germination after the first season as he had not noticed this in any of the sod-seeded work.

J. Reid said he was referring to fog as some did seem to come up after a year or two.

R. G. Vinson wondered what type of ground it was, theirs had been wet.

J. Reid replied that his experience was with dry ground.

C. D. Young pointed out that seed would remain viable in the ground for several years.

S. Miller asked if a disc drill had been used.

J. Reid said it was an ordinary combine drill.

S. Miller suggested that seed would appear over quite a long period of time.

J. Reid agreed that in some cases it did.

S. Miller said that they had found that the seed came through over a period of time due to variations in the depth of the drill.

J. Reid had found that seed was still coming through when the sheep were grazing the sward.

J. Wilson asked if Mr. Reid considered subdivision more important than reseeding.

J. Reid said that the introduction of grasses would give better and quicker results than subdivision alone but the two must go hand in hand.

R. Pitaluga asked if the diddle-dee had been heaped up and burned.

J. Reid said that it had not.

SUBDIVISION AT PORT HOWARDD. M. Pole-Evans

(paper read by C. D. Young)

At Port Howard we have 4 main groups divided as under:-

- (1) Shag Cove Top Sides
- (2) White Rock East
- (3) Six Hills
- (4) The Warrah

Dealing with each in the above order, Shag Cove Top Sides is made up of the following camps:-

	<u>Acres over 600 feet</u>	<u>Total acres</u>
Second Creek	627	4,474
No. 10	361	2,449
No. 9	562	1,670
No. 8	970	2,982
No. 7	300	2,097

This block is all poor, soft, peaty ground of the open white grass type with little or no fine grasses.

The following stock is carried - Rams, 300 on Second Creek after being taken off the ewes until shearing. Hoggets, 7,000 - 8,000 shorn on to Second Creek and grazed from there from early November to early December. Wethers, 10,000 are then shorn on to Second Creek after which they are rotationally grazed through Nos. 7, 8, 9, 10 and back to Second Creek until the end of March.

Some years cattle are wintered on these blocks.

White Rock East is made up of the following camps:-

	<u>Acres over 600 feet</u>	<u>Total acres</u>
Peat Banks	385	5,698
White Rock Point	none	1,681
Near End	none	2,153
Little Mountain	218	1,667
Home Flock	none	1,328

This block grazed the undermentioned stock this year:-

3,000 4 tooth ewes on a rotation from shearing to dipping.

489 cattle rotated from September to May.

252 cattle wintered 1965. Split up and not rotated.

4,300 ewe hoggets dipping to shearing. These are rotated once during the winter and twice during the spring.

This block is mostly good grazing on shallow peat with no subsoil, the only beach available to stock is in Peat Banks the remainder being cliff. During dry summers this land dries out too much. It is also very difficult to burn, owing to salt air from the sea, hence our heavy cattle stocking over the last few years to eat the roughage and consolidate by treading.

Six Hills is made up of the following camps:-

	<u>Acres over 600 feet</u>	<u>Total acres</u>
Front Six Hills	none	1,802
Ram Paddock Mt.	991	2,300
Pond Ridge	115	2,161
Gladstone Valley	26	1,848
Mt. Jock	593	2,388
Triple Chance	631	2,657
Gap Paddock	none	427

This block grazed the undermentioned stock this year:-

120 beef oxen on Jock, Gladstone Valley and Triple Chance.
7,900 shearlings rotated over the whole except Front Six Hills, from early December to the end of March.
9,820 lambs weaned on to the Front of Six Hills until dipping early March. This camp is virtually free of ditches and we only had a loss of 3.96% this year.

4,570 hoggets dipping to shearing, rotated once during the winter and twice during the spring.

This block is good mixed grazing with open beach but has a lot of bad ditches. Since we have subdivided same there is a vast improvement to the herbage on Mt. Jock, Triple Chance and the Ram Paddock Mt., where, when open, the stock very rarely grazed.

The Warrah is made up of the following camps:-

	<u>Acres over 600 feet</u>	<u>Total acres</u>
Frizley Bay	72	5,797
Boundary Corner	16	5,152
Mt. Edgeworth	1,255	7,124
Mt. Arthur	278	3,978
Bridge Mountain	761	5,091

This block grazed the undermentioned stock:-

7,325 wethers from March to December. Here we divide the wethers into each camp until September 1st. when they are rotated twice over the whole block before shearing.

The carrying capacity of this block will be increased, this being only the second year of its subdivision. Mt. Edgeworth is poor ground, the remainder is fair grazing but with a lack of fine grasses on a lot of the white grass ridges.

Our idea is to carry more stock by improving the herbage, by controlled grazing and heavier tramping at the same time making easier, closer shepherding.

We are running 38,622 sheep this year which is the highest turned out off the dip at Port Howard since 1916. Last year we ran 1,152 cattle, in 1916 the figure was 349.

The writer cannot emphasise too much the importance of controlled burning, especially after shifting a flock off a camp that had just previously been eaten out.

Discussion

A. G. Barton asked if electric fencing was used at Port Howard.

C. D. Young said not yet but Mr. Pole-Evans hoped to control cattle with some kind of electric fence in the future.

Sir Cosmo Haskard said that there was one electric fence in use at Port Howard for strip grazing kale.

C. D. Young replied that the type of fence under discussion would be a heavy duty one for use in controlling large mobs of cattle in the camp so that the ground could be surface sown as is done in New Zealand.

G.C.R. Bonner asked for details of the New Zealand type of fence.

C. D. Young said that the fence was common in New Zealand and was similar to a normal type of fence except that it had far fewer standards and used chain droppers and 12 $\frac{1}{2}$ gauge steel wire which was electrified. The costs in New Zealand had been reduced from £600 to £200 per mile. It was not likely that a similar reduction could be made here.

S. Miller asked if Mr. Young had seen the similar type of electric fence at Lephimore.

C. D. Young said he had only read the report but the H.F.R.O. had seemed quite impressed with the fence. The New Zealand fence needed a track bulldozed out for it to prevent shorting of the bottom wire. A herbicide could be used for this but would also be expensive.

J. Clement inquired if Mr. Pole-Evans had any trouble in controlling his cattle.

C. D. Young said that this had not been mentioned and he did not know if a top barbed wire was used or not. Cattle would become used to handling but if hungry after being used to clean up the feed they would tend to break down fences.

S. Miller asked on what camp Mr. Pole-Evans had had his increase.

C. D. Young answered that this was not stated but he got the impression that the smaller the subdivision the greater the increase.

K. Luxton said that the biggest marked increase had been in the White Rock section.

WINTER GRAZING OF TUSSAC AND RESULTS OF SUBDIVISION
ON WEST POINT ISLAND

R. Napier

(paper read by C. D. Young)

The late A. E. Felton of West Point Island was the first farmer in the Falkland Islands to recognise the value of tussac as winter feed for sheep.

Some tussac plantations on West Point are as much as eighty years old and as far as available records show are grazing the same numbers of sheep for the months May June July and August as they were seventy years ago. All the tussac plantations have areas of Yorkshire fog, one plantation containing about 40% fog and another only about 15% fog, the plantation containing 40% fog has a total area of about 28 acres and can graze 200 sheep for the months June July and August, the plantation containing only 15% fog has a total area of about 35 acres and can graze 500 sheep for the months May June July and August. The other plantations on West Point contain from 20 to 30% fog and there is no doubt that the more fog there is in a tussac plantation the lower the number of sheep it will carry.

As can be seen from the above remarks large amounts of Yorkshire fog are wasted for eight months or more in the year. However I think one must also bear in mind the fact that however deep the snow may be the sheep can always get feed and shelter in tussac.

Apart from the great value tussac has for winter feed for sheep I consider that any attempt to destroy tussac by heavy grazing would result in serious erosion long before fog or other grass's could be established.

Tussac on small islands such as Dunbar Island presents many problems not least of which is the cost of fencing, however the solution may be to stock islands such as these for a couple of years in succession and then remove all stock for a year to enable the tussac to recover fully, however on islands such as Dunbar which have been stocked continually for the past seven years it may be necessary to keep stock off for perhaps two years, it is intended to remove all stock from Dunbar not later than 1968, and it will be interesting to see how long the tussac does in fact take to recover.

Mr. A. R. Wannop visited West Point in December 1960 and although he was impressed with the subdivision already carried out, he advised that we subdivide on an even greater scale, this subdivision has been almost completed, and results have been far beyond what I had even hoped, and it is hoped that by 1970 we will be able to carry one sheep to the acre on West Point which would be an increase of about 20% from 1960. In the near future it is hoped to sow such grass's as cocksfoot etc. and perhaps experiment with fertiliser.

It may be of interest that our smallest camp on West Point is about 200 acres and largest about 400 acres.

NOTES ON SOD-SEEDING AT DARWIN 1956-1960R. G. Vinson

To commence I should say most of my information has been collected from reports and records may by Mr. Gilruth and Mr Shaw, also from conversations I had with them.

Sod-seeding was first started at Darwin in December 1956, when about 20 acres were done. This was on reasonably dry ground, and considered fairly good white grass camp.

The sod-seeder a Cuthbertson product, was fitted with a Massey Harris combined seed and manure box, to which were attached 3 Disc Coulters, 3 feet apart, the grass seed being sown in the drills made by the discs.

The plot was divided in experimental plots, with various artificial manures being tried, including North African Phosphate and Basic Slag.

Reports state best results were obtained in the damper areas, irrespective of whether it had had any artificial manure or not.

This machine was destroyed shortly after this by a fire in Goose Green.

Early in 1957 an Australian sod-seeder was purchased, this machine was not nearly as suited to Falkland Island conditions as the one made by Cuthbertson, and several snags were encountered. Eventually after sod-seeding about 100 acres this machine was shipped to England and several modifications made to it.

Two new sod-seeders from Cuthbertson arrived in the early part of 1958 and sod-seeding continued till the end of June, about 900 acres being done.

No artificial manure was being used now, as it increased the cost per acre considerably, and did not appear to give much benefit. Cleaned Yorkshire fog seed was being sown at the rate of 8 lbs. per acre, under average conditions 4 acres per hour were being covered by one machine.

The cost per acre at this stage worked out at the following for 1958:-

8 lbs. Yorkshire fog seed @ 2/9	£1. 2. 0.
Fuel and oil	10 $\frac{1}{4}$
Labour	7 $\frac{1}{2}$
Depreciation on equipment	3. 4.
Overheads and sundries	2. 6.
Cost per acre	<u>£1. 9. 4.</u>

Later it was found inadvisable to continue sod-seeding after the end of March or early April, as generally a very poor take was obtained later than this.

Sod-seeding started again in September, 2,720 acres being covered by the end of the year.

Experiments were carried out with other grasses, red fescue, timothy, brome, cocksfoot, ryegrass clover, etc., but Yorkshire fog was the only grass that showed any promising results.

During 1959 a total of 5,040 acres were sod-seeded, almost entirely with fog, a little wild white clover being added to the fog seed in places. The clover germinated fairly well, but did not stand through the first winter, although it had been inoculated before planting.

In 1960 another 2,000 acres were sown, making a total of over 11,000 acres sod-seeded since the operation started at the end of 1956.

Sod-seeding was then suspended, to observe results, and see if grassland improvement would be effective by this method.

It was realised from the start, any obvious results or benefit to stock would take longer than by ploughing or rotavating, however by this method a far greater area could be covered at far less cost.

Conclusions

Results to date are very varied, the only place a good coverage and spread has been obtained is in the first 20 acres done in the Burnside area, here the fog predominates. I do not know if there was any fog here, before being sod-seeded, if there was not, it has been quite an impressive take.

The Streams camp, where considerable areas were sod-seeded, is nearly all white grass. Here fog is easily found amongst the rank undergrowth, although not very noticeable with the first casual glance, on barer places it is usually kept short by the sheep.

This was for many years our poorest ewe flock, but for the last 2 years these ewes have come in for shearing in quite good condition, older shepherds tell me, the best they have seen them for years, so it would seem the sod-seeding is giving some results, although as yet the lambing has not improved. To date this camp has been continually stocked, this has not given the fog the best chance to seed itself, although fog seed heads are often seen amongst the rough white grass. In future I hope to rest this camp for a few months during the summer to see if the fog will spread from its own seed.

Another camp, Tranquildad where extensive sod-seeding was done, results to date are disappointing. The white grass here is less dense and coarse than the Streams camp, and I for one would have expected better results. I now think the discs on the sod-seeder cut in further here, so the seed was planted too deep, with the disc cut closing in and stifling germination of the seed.

Unfortunately clover is almost non-existent in our outside camps, although it grows quite readily in the immediate vicinity of most settlements. If we could find some legume that would establish itself freely under our conditions, it would be a big step forward towards improving our pastures.

To sum up, I think it fair to say, as yet the sod-seeding has not produced the results that were hoped for, but it certainly cannot be considered a complete failure. With careful grazing and resting of these camps, I think we may well see more benefit from this sod-seeding in years to come, than we do at present.

Discussion

S. Miller asked for Mr. Vinson's opinion of the circles which had been ploughed in the camp east of Darwin by Mr. Shaw. The fog seemed to have come away well from the air.

R. G. Vinson answered that just before he went to Darwin all of that area had been more or less fenced off with a view to lambing sheep there as it would be easier for shepherding and would rest the camp. It had been overgrazed far too heavily and had not had the opportunity to come on. If it were not given a rest erosion might occur.

S. Miller said that all the Roy Cove work had been on diddle-dee and he was interested to see a comparison between it and white grass as he believed that success could be achieved. He had wanted Mr. Vinson's opinion of these circles. If they had not been controlled up till now it would be difficult to express an opinion.

R. G. Vinson replied that he could not answer the question. He considered that white grass lent itself to improvement by subdivision and rotation of grazing as there was a lot of fine good grass in it in the shelter whereas there was little grass in the diddle-dee camps. Cultivating would show more spectacular results in small fern than white grass though he would not say that white grass could not be cultivated too. Since the ground between Fitzroy and Green Patch had been heavily stocked it looked rather like an oatfield from a distance.

C. D. Young pointed out that this was due to Christmas bush so the area was going back.

J. Clement said there had been a large increase in Christmas bush both there and on the side of the Estancia mountain. For some years good results had been obtained as that block had 12,000 sheep put on it. The camp was now divided so as to try and prevent the sheep from hanging the fences and overgrazing one side of the camp. Some form of seeding might be tried. He asked if any attempt had been made to burn off any of the very rough white grass on sod-seeded camp.

R. G. Vinson said one small patch had been done in a horse paddock and the drills were now more obvious than before. He thought it would be better to burn before sod-seeding.

L. G. Blake asked with which modification to the sod-seeder the best results were obtained.

R. G. Vinson said the one which cut a slit gave better results than the one which actually removed a slice of ground.

G.C.R. Bonner suggested that the success of the Burnside area was due to the fact that around that area had been used as stock holding paddocks for years when there was a dip there.

R. G. Vinson said that he was not alluding to one of the small paddocks around Burnside.

A. G. Barton thought that the Burnside barn had been used as a garage for the machinery in which case there could have been more seed dropped in that area.

R. G. Vinson explained that the area in question was some distance from the barn and he did not think that this could have been the case.

S. Miller said that with reference to Christmas bush it was the only plant which had reappeared in their reseeds and then only in small quantities.

G.C.R. Bonner said that this had also been their experience and it also tended to appear after burning.

S. Miller blamed the fluffy easily blown seed for this.

PASTURE IMPROVEMENT AT HILL COVEL. G. Blake

In 1958 it was decided, after seeing the success that Roy Cove was having in growing fog, to attempt to improve the quantity of feed available at Hill Cove and so stave off a reduction in sheep numbers. This was our basic aim, with the hope that if the system we chose proved satisfactory to continue, and so increase our production.

The system we chose was based on the rotavator. The reasons for this were -

1. The seed scattered on the recently rotavated government tracks was growing well.
2. The rotavator needed no skill in operation.
3. The speed of the operation.
4. Our experience with the plough on a white grass sod, in the settlement, indicated difficulty in breaking this up to get a seed bed. And we wanted a system we could operate on all types of our camp.

It is possible that if we had settled on the plough and persevered with it we would have overcome the white grass sod.

However the system we use is rotavate once, seed then roll. We have tried rotavating twice with little or no difference in the result. If there is sufficient plant growth that will burn we burn it. We have burnt the top sod once, by accident, with good results but it is rather dangerous.

Up until last year the bulk of our work was done September to April, however last year we were able to get all our rotavating done April/September, thus freeing our labour for part of the season. The seeding we did February, March and April. This may be a little late but frost damage to date is not noticeable.

None of the areas we did in the early years have been fenced, except for a small patch of 120 acres. This area went from a poor strike to a good pasture in the ten months rest it had. I am of the opinion that under the system we use, the more rest we can give our grass in its first year the better the final result.

MACHINES

Rotavators. We have tried both mounted and trailed rotavators. The mounted rotavator seemed to give a slightly better result, but was prone to many more breakages. These breakages were largely due to the fact that when the tractor went through a sharp hollow like a small dry ditch, the rear of the tractor was supported by the rotavator, so putting a great strain on the frame. The trailed rotavator does not have this disadvantage and also tends to ride over tough obstacles, so reducing the peak strain on the power shaft. We now use 60" trailed machines.

SEEDERS

"Green seeder". A roller-mounted broadcaster of wooden manufacture. In camp use the woodwork is apt to open up allowing seed leaks, these are increased with wear. A cheap way of rolling and seeding at once.

"Blom Drill". Does little more than broadcast on rotavated ground, as there is little weight on the coulters. Weak construction and liable to damage.

"Brillion". A broadcast mechanism between two cambridge rollers. The rollers are staggered so that the rear roller splits the ridges made by the front roller, giving a drill action. Very strong but expensive. We have only used this machine this season but the results so far are very good.

"Australian Sod-Seeder". An expensive machine with 9" wide drill spacing. Used without prior cultivation on the barest ground it gives a fair take. It is however very slow with a lot of time wasted clearing the trash which is collected. We

did not cost this operation separately, but the impression was that it would be little cheaper than our usual system. It was not a popular machine to use.

RESULTS

We have only five years from which to draw conclusions, but I think that we can expect an increase in the lamb marking figures the season after seeding. This will depend on the area of grass sown in any camp, but an acre to five sheep does seem to give us at least a five percent increase in the lamb marking. The fall in the loss figure by one or two percent could be due to seasonal variation.

In the first few years of our work, we spread our effort over as many of the ewe camps as possible, doing two or three hundred acres in each. We have now covered most of these and are concentrating on one or two camps each year doing blocks of ground which can in the future be conveniently cut off for lambing, and are handy for the shepherds. We hope to continue this block system and extend into the hogget camps to allow concentration for spring shepherding.

Why didn't we subdivide instead of rotavate? We wanted quick returns and considered subdivision too slow.

		<u>COSTINGS</u>						
		<u>1961/2</u>	<u>1962/3</u>	<u>1963/4</u>	<u>1964/5</u>	<u>1965/6</u>		
<u>Wages, Overtime.</u>								
	<u>Bonuses</u>	£289	£489	£371	£259	£582		
<u>Passages, Provident</u>								
	<u>Fund, OAP</u>	£ 68	£ 95	£ 95	£ 80	£105		
<u>Fuel Oil</u>		£179	£270	£192	£150	£220		
<u>Seed</u>		£448	£657	£658	£670	£973		
<u>Depreciation</u>								
Ford Tractor	59 £860	£ 49	£ 52	£ 40	£ 24			
Ford Tractor	60 £1013	£ 75	£ 78	£ 60	£ 36	£ 13		
Ford Tractor	62					£ 60		
Green Drill	59 £44	£ 3	£ 3					
Green Drill	62 £65	£ 6	£ 6					
Rotavator EMO50	59 £273	£ 22	£ 19					
Rotavator H60	60 £341	£ 31	£ 27	£ 25	£ 22	£ 20		
Rotavator EMO60	62 £360		£ 36	£ 32	£ 29	£ 26		
Chain Harrows	61 £20	£ 2	£ 2					
Old Roller	£30	£ 3						
Gang Rollers	62 £192		£ 19	£ 17				
Blom Drill	62 £155		£ 15	£ 14	£ 12			
Brillion Drill	65 £249					£ 43		
<u>Total</u>		£1175	£1768	£1504	£1282	£2042		
<u>10% to cover unaccounted costs</u>		£ 117	£ 177	£ 150	£ 128	£ 204		
<u>Total</u>		£1292	£1945	£1654	£1410	£2246		
<u>Acres seeded</u>		686	1100	753	822	1119		
<u>Cost per acre</u>		£1.17.6.	£1.15.6.	£2.6.0.	£1.16.8.	£1.16.6.		
<u>Year</u>	<u>59/60</u>	<u>60/1</u>	<u>61/2</u>	<u>62/3</u>	<u>63/4</u>	<u>64/5</u>	<u>65/6</u>	<u>Av. 50/1-60</u>
Lambs Marked	47.5	59.9	60.6	72.0	61.0	66.9	68.8	54.9
% loss ewes	17.1	12.4	13.0	4.2	8.3	3.4	10.0	12.69
Net tons wool	93.0	97.5	95.1	103.2	112.4 ⁺	103.0	109.0	93.7
Area in sheep camps	63	261	561	1244	1867	2776	3895	

+ first year machine shears

Discussion

S. Miller asked if any areas had been burned apart from the accidental burning.

L. G. Blake replied that last year anything which would burn had been burned and some had been done two years ago. There was difficulty in getting it to burn and they were thinking of trying to burn topsoil again.

G.C.R. Bonner asked if Mr. Miller had meant burning trash.

L. G. Blake explained that they had only burned this once by accident as had been mentioned. This was what he meant when he talked of burning topsoil.

S. Miller said that with rotavation they had good results after a burn but very poor results without one though it was difficult to burn.

L. G. Blake thought that burning the rotavated soil could be dangerous. They had very poor takes on heavy diddle-dee whether or not it had been burned.

A. B. Monk asked if it was correct that the best results had been in non white grass areas and the poorest on white grass areas.

L. G. Blake answered that the white grass areas only looked poorer as in the diddle-dee there was a regrowth of goose grass which did not occur in the white grass. The Teal River camp had given a 10% increase in lambs therefore there was a definite improvement over the original vegetation.

A. B. Monk asked if they had had a stock increase comparable to that at Roy Cove.

L. G. Blake said that total stock increase had been small but it was only three years since they had started improving large areas in the sheep camps. In the Main Point area they had increased by 400 sheep on 800. There had been a general stock increase due to more young sheep.

A. B. Monk asked if the lower cost than ploughing merely reflected the difference in the quality of the work.

L. G. Blake answered that it had been a profitable operation e.g. an extra 200 lambs for one year's expenditure of £500. Costings in any year were in direct proportion to the area done.

A. B. Monk pointed out that Mr. Miller put the sheep straight on to the improved pasture but Mr. Blake had advocated a rest for a year. His own experience was that the more you stocked established fogs - with rests - the better it came on. Mr. Blake appeared to be doing the reverse of Mr. Miller.

L. G. Blake said that the system was contrary to general grass management but it was due to the results observed that a rest was given in the early stages. All the improved ground was open to continuous grazing when sheep were on that camp and it was to allow the plant to get well established that this initial rest was given. It was partly due to the difficulty in consolidation and the plant had to get a root down and build up food reserves so that it could stand rough treatment.

J. Clement asked if ground had been left for a year before planting and if so had any difference been noticed between that and ground not so left.

L. G. Blake replied that this had not been done deliberately but it often happened that ground cultivated in the early autumn lay for nearly a year before being sown. He had not thought to look for any difference.

J. Clement thought that later planting would give more consolidation.

L. G. Blake agreed that the longer it could be left up to a point the better. If left too long you would get poor seed penetration and subsequent poor take. There was one piece at Hill Cove which had not been seeded at all and it was growing in on its own, though very slowly.

S. Miller suggested that the difference in grazing technique was due to the fact that they fenced but Hill Cove did not. Roy

Cove therefore had greater control and the first sheep put on were taken out fairly soon and the grass left to recover.

L. G. Blake thought that this was almost certainly the answer. They had had to cover a lot of ground quickly to improve the diet. The main object was to fence but there was much fencing to be renewed before starting on the improved pasture.

S. Miller said that although the methods appeared to be diametrically opposed they were not.

R. G. Vinson asked why the seed at Hill Cove appeared in drills though Mr. Blake said that it had been broadcast.

L. G. Blake answered that after the "Blom" the seed came away in lines although it was on the surface. The Australian sod-seeder had been used as a drill for one season. The new machine dropped the seed in lines on the surface but the splitting of the ridges by the Cambridge rollers gave a drill action.

R. G. Vinson asked if Mr. Blake considered it any advantage to actually drill the seed.

L. G. Blake was sure that it was an advantage provided it was not put in too deep. The new machine virtually drilled the seed.

S. Miller pointed out, with reference to grazing, that if the sward was not grazed down by sheep the geese would get it.

The number of geese had increased at Roy Cove.

L. G. Blake pointed out that the geese would not graze along dense sward but preferred something short. A long sward also gave a carry over for the winter.

Sir Cosmo Haskard asked if there was any erosion problem.

L. G. Blake said only if a clay bank got in the way and even then there was an establishment of fog in the bottom of the clay bank.

EXPERIMENTAL WORK FOR THE COMING SEASONC. D. Young

I cannot start on any discussion of the future of agricultural experimentation without mentioning the work which has been done in the past. I allude particularly to the reports of Wannop and Davies and would urge any of you who have not read these most informative publications to do so as soon as you can. If the suggestions embodied in these two reports were implemented we would see a great change for the better in our sheep farming methods. The basis of all previous recommendations in these islands has been subdivision of camps and rotational grazing and I can do no better than thoroughly endorse these recommendations and say that this is the only method that could, without doubt, be applied to any piece of ground here and would certainly give results. Fencing is also an essential part of any regrassing scheme, and should be the first step in any improvement work which is undertaken.

In the time of Dr. Gibbs and others in the Agricultural Department some experimental work was done on the common and other places. Gibbs produced a report on this and it makes very interesting reading. Unfortunately it was never published - why I cannot say - and there are only about four copies of it in existence, two of these are in circulation among the farm managers.

Gibbs and his predecessors succeeded in establishing improved pastures on small areas with the aid of fertilizers and lime. Needless to say such methods are not economic for camp improvement due to the high cost of the imported materials involved though there is a definite place for fertilizer use in settlement fields.

This brings us to taking a look at the methods of improvement open to us. We can try, as Gibbs did, to increase the fertility of our very infertile soils, or we can grow something on them which will tolerate this infertility - if necessary after some special pre-treatment. To do this it is necessary to understand something of the nutrition of plants. A plant absorbs its food as salts which are dissolved in the soil water and in order that the more palatable plants should grow it is essential that the soil should not be too acid. Acidity is measured on the pH scale which runs from 1 to 14 with extreme acidity at one, extreme alkalinity at 14 and neutrality at 7. The optimum pH for good grassland would be between 6 and 7. Unfortunately the soils here have pHs between 4.5 and 5.5 and this is too acid. The application of large quantities of lime would rectify this but as I have already said this is not economic. There is, however, a possibility that the lime requirement could be reduced by the application of one or more trace elements. These trace elements are those which are only necessary in very small amounts and are separate from the major elements (carbon, hydrogen, oxygen, nitrogen, phosphorus and potassium) which the plant obtains from air, water and artificial fertilizers. There has been a spectacular reduction in the lime requirement of some New Zealand soils by the application of molybdenum and it is possible that a similar effect could occur here, though not necessarily with the same element. It is not only lime which has an interaction with other elements - there is a complicated interaction among all the major and trace elements. In order to investigate the possible deficiencies of the local soils I plan an experiment which involves all the 11 major and trace elements and I will be able to see their effects alone and in combination with each other. There is just a chance that we may be able to topdress our pastures with something at much more economic rates. In this connection I must mention a small experiment at Douglas Station involving copper, molybdenum, lime and phosphate in various

combinations. This has been put down on a very short sward containing clover but as yet only the lime and phosphate are showing any effect.

The alternative to increasing the fertility, which I mentioned, was to grow only these plants which will tolerate the poor soil conditions; and indeed if there are no results from the preceding idea this will be about the only method open to us as the next step after subdivision.

We all know that Yorkshire fog will grow here most successfully and, so far as it goes this is very good, and is a vast improvement over the native pasture. However this grass is not very palatable to sheep due to its hairyness though it is eaten in quantity. Other grasses have been tried here though they do not seem to be as good as fog outside of the settlement fields. However I intend to try out as many other species as possible in the hope that something may turn up which will be as good as fog even if only under certain circumstances.

It has been generally assumed that legumes will not grow well here and certainly the white clover plants which can occasionally be seen in the camp do not appear to be thriving. Legumes could play an important part in the improvement of our grasslands. This group of plants - of which the clovers are the best known - enters into a symbiotic (i.e. mutually advantageous) relationship with a bacteria called rhizobium. This bacteria lives in nodules on the plant roots and can absorb the major food element, nitrogen from the air. More nitrogen than the bacteria itself needs is absorbed and the surplus is available for use by the legume and any other plant growing in close proximity. Thus it can readily be seen that all legumes will build up fertility in the soil. In Falkland Island soils the rhizobium do not occur naturally and all legume seed must therefore be inoculated with a special culture of the bacteria. Legumes require a non-acid soil and a supply of phosphate and it has recently been established that the plant will grow well if the seed has a coating of lime and phosphate stuck on to it at the same time as it has been inoculated with the rhizobium. Such seed is termed pelleted seed and is commercially available or can be manufactured on the spot. I am going to experiment with a large variety of legumes but it seems likely that success will be achieved with white or suckling clover rather than anything else. It should also be remembered that all legumes are rich sources of protein and are highly palatable to all stock. At Fitzroy and Douglas Station variety trials involving about 40 grasses and clovers have been set up. Most of the grasses have germinated but the legumes have not done so well, due probably to poor pelleting technique and the winter frosts as they were only sown in late February.

There is available to us another method of increasing production and this is by supplementary winter feeding. This method is being tried with some success at Port Howard. In this case the supplementary feed is home grown silage and it is fed to the ewes for the six weeks prior to lambing. Any home grown feed can be used and at West Point the sheep are turned into the tussac for the winter and this is the same basic principle in operation. In the Welsh hills a system of feeding a special supplement which claims to stimulate the rumen and increase the intake of roughage has been used with some success. Such a system may well have an application here and I am hoping to try it out.

Many people have shown a great interest in silage making and it may not be inappropriate to say a few words about it here. Silage can be made with either grass or oats and the crop should be cut rather earlier than for hay. Better results are obtained if the material is wilted for some hours before collection. The silage can be made in a pit or in an above ground clamp, the pit

can be lined with concrete or left with earth walls. Concrete lined pits or bunkers as they are sometimes called can be built above the ground. The material is carted to the silo, laid down in layers and consolidated with a tractor. Once full the top is covered with earth or plastic sheeting the latter giving the more effective seal and being easier to apply. Silage can also be made under vacuum by sealing it inside plastic sheeting. This method has given good results in Britain and New Zealand. Further information on the subject can be had in the Ministry of Agriculture's pamphlet on silage making.

Discussion

L. G. Blake asked if it was worthwhile growing clover here as he believed that the soil temperature here was about the minimum at which clover would fix nitrogen.

C. D. Young said that nitrogen fixation - like all growth - commenced at 42°F (5°C) and rose to a maximum at 70°F to 80°F (20°C - 25°C). As the soil temperature in the Falklands was above 42°F for five months of the year it was logical to assume that nitrogen fixation occurred for that time.

S. Miller remarked that the soil here showed virtually no trace of lime but in the analysis in Davies report the plants showed a full complement of lime.

C. D. Young said that it was not quite a full complement as all the Falkland Island plants were slightly below the Welsh ones in the analysis. He did not know where the lime came from. Possibly the plants were more deep rooted as plant roots will grow very fast to reach nutrients. Native plants like white grass had a low lime requirement therefore there would not be too much competition from the native sward (Editorial note:- Davies says when talking of native herbs "... some of these are quite rich in both lime and phosphoric acid, although growing on soils that appear to be markedly deficient in one or both of these minerals." He also says "Eight species of pasture plants show on analysis a similar protein and mineral content, whether grown in the Falkland Islands or in Britain. These include three grasses, one clover and four herbs, all of which are common pasture plants in Britain.").

S. Miller thought that by ploughing as opposed to rotavation they might turn up something which could be the reason for the better success.

C. D. Young tended to think that the greater success was due to better consolidation but any form of cultivation would render the soil nutrients more available as the wetting and drying of the peat led to oxydation and the release of nitrogen and phosphate.

S. Miller pointed out that fog did not deteriorate if kept short and sweet.

C. D. Young agreed that it was less unpalatable if kept short though it was always hairy. He was not decrying fog and its slight unpalatability was of no significance as it was all that would grow well in the camp. It was not suitable for sowing in a settlement field as it made very poor hay.

S. Miller had found that sheep did not like a diet of pure fog but liked to be able to graze on some native feed as well.

C. D. Young added that sheep preferred a short sward. Many herbs were good extractors of minerals from the soil and perhaps this was what the sheep were looking for in the native feed.

S. Miller asked if subterranean clover had to be pollinated by bees.

C. D. Young said he was not sure.

A. G. Barton asked for further information on some seed from the Atlas Mountains which had been sent out here several years ago but had proved unsuccessful.

C. D. Young said that work was being done on this at Hurley. The idea was to get a grass that would grow in winter and plants from the Mediterranean area did this as the summer there was too hot and dry. Grasses such as certain fescues had been tried but would not really be suitable for the Falklands as they were intended for high production areas. He added that fog seemed to grow in the winter here.

S. Miller agreed with this.

L. G. Blake added that the trees at Hill Cove also grew in the winter somewhat to their detriment.

J. Clement asked why peat mould made grass greener when scattered about from the bottom of the peat stack.

C. D. Young answered that this was due to the chemical and physical breakdown of the peat and the accompanying release of nutrients, especially nitrogen.

J. Wilson asked which was more important, grasses or legumes.

C. D. Young said that they were equally important. Some success had been achieved with grasses and now the main question was to see if legumes could be introduced as well.

J. Wilson suggested using portions of legume sod.

C. D. Young said they would not spread.

J. Wilson said that he had seen it done.

C. D. Young pointed out that this was a slow and laborious way of planting legumes on thousands of acres. Clover could only be spread by planting seed.

A. B. Monk wondered if this was so and quoted an example of a lawn which had been top sodded then left and was now a mass of clover.

C. D. Young suggested that this was due to roots being left in the ground.

S. Miller said that he had inoculated settlement fields with soil from patches of established clover.

C. D. Young pointed out that Mr. Monk's lawn would have been well inoculated but it was not possible to compare lawns or settlement fields with the open camp.

R. G. Vinson wondered why clover could not be established from sods.

C. D. Young said that seed was the only way of planting clover on any scale. It spreads quickly in a fertile soil but here it would only do so slowly. The planting of little plugs of clover was not a practical proposition for camp improvement.

R. G. Vinson said that he had planted sods of clover which had spread to quite large areas in five or six years.

C. D. Young suggested that this was not on an average piece of camp.

R. G. Vinson replied that in some places it had spread and in others it had not. He could see no difference between the areas.

C. D. Young said that the business of planting little lumps of clover in the camp had little practical application.

G.C.R. Bonner asked if anyone had any further comments to make before he closed the meeting.

L. G. Blake said that he would like it to go on record that no scheme would work without people who are willing to work at it and any effort by the farm is only as good as the men who do the job.

CONCLUSIONG. C. R. Bonner

It has given me great pleasure to take the chair for part of this conference, which I hope will be the first Falkland Islands Grassland Conference. We have had a very stimulating discussion all morning on the agricultural work at Roy Cove and the rotavating done at Hill Cove. We have also heard about the sod-seeding done by Douglas and in Lafonia and had food for thought in the work being done with pelleted seed and artificial fertilizers. The proceedings today have been a very useful start. Conferences such as this are playing an increasing part in agriculture over the years and do a great deal for the advancement of our industry. I hope the succeeding years will see this meeting becoming an annual event when we can all meet together and exchange ideas and reports on what we have been doing. We are a completely pastoral country and should make every effort to increase our main crop of grass.

Finally I would like to thank all those who came along and spoke today and also all those who stimulated the discussions with their questions.

