REPORT ON PASTURE IMPROVEMENT EXPERIMENTS CARRIED OUT IN THE FALKLAND ISLANDS DURING 1965 - 1968

by

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INTRODUCTION

The wool production in the Falkland Islands in 1898 was slightly greater than that in 1967. This sums up the complete lack of progress in the field of grassland improvement which has been made in these islands over the last 70 years. It is not through lack of advice but rather lack of initiative that this state of affairs has come to pass. Indeed there has been, over the years, a wealth of good advice made available to anyone who cared to take it. There has been the Munro Report, the Davies Report, the Gibbs Report (now to be published after a lapse of 22 years) and the Wannop Report. All these reports, had they been heeded, contain enough sound advice to have doubled the wool production of the Falklands since the first one was written in 1924.

It is most depressing for an agriculturist to come out here to what is supposedly a virgin field and find that so much work has been done by his predecessors but that so little attention has been paid to it.

It will be argued that there is nowadays an upsurge of interest in grassland improvement in the islands today but only the next 10 years or so will tell if this is a case of bolting the stable door after the horse has gone. There are at the moment, about fifteen farms involved in some form of land improvement; had this been the case even 20 years ago the present economy would be infinitely healthier.

In view of the increased interest in the improvement of pastures it is unfortunate that the Government did not see fit to provide better facilities for research when the post of Grasslands Officer was created. An office cum laboratory which is so small that it was formerly used as a stationery cupboard is not in the least convenient and no great effort was made to provide larger premises. To carry out any advanced programme of research without an experimental farm is a hopeless task and unless immediate steps are taken to provide such an establishment there is little point in bringing out another agriculturist to a post in this Colony.

In view of the great amount of background detail in the Gibbs report which will soon be published this present effort is confined mainly to the investigations carried out over the last three years.

EXPERIMENTAL WORK

Season 1965/66.

The experimental materials ordered from the United Kingdom did not arrive till the end of February so use had to be made of such seed as was available; namely - ladino white clover, trefoil smooth, stalked meadow-grass and Yorkshire fog. A small trace element investigation was also set up at Douglas Station with copper, molybdenum, lime and phosphate.

Clover introduction

At San Carlos, on 17th December 1965, 2 lbs. ac. white clover was oversown on a field sown with Yorkshire fog a month earlier. The seed was broadcast by hand and rolled in, with a Cambridge roller 2 days later.

By June 1967 there were only one or two healthy clover plants to be seen.

Trace elements with lime and phosphate

At Douglas Station strips of trace elements were sprayed at right angles to strips treated with lime and phosphate. Trace element treatments were:- 140 gm/ac. sodium molybdate, 2:3 kg/ac. copper sulphate and a combination of both. The lime and phosphate treatments were:- lime at 2 ton/ac., phosphate at $\frac{1}{2}$ ton/ac., phosphate at 1 ton/ac. and a combination of lime at 2 ton/ac. and phosphate at 1 ton/ac. Controls were included in both treatments and a small plot of 5 cwt. magnesium sulphate/ac. was sprayed.

In February 1966 the lime plus phosphate was the only treatment showing greener and this advantage persisted until March 1967, but could not be seen the following spring. The area had been fenced off from grazing animals in February 1967.

Grasses and legumes trial

This was set up as follows (asterisks mark if sown at that site):-

	Johnson's Harbour	Hoggarth's Dairy.	Fitzroy.
Clover at 2 lb/ac. +Yorkshire fog at 8 lb/ac.	*	*	*
Clover at 2 lb/ac.	*	*	*
Clover at 2 lb/ac. +S.S.M.G. at 12 lb/ac.		*	*
Trefoil at 2 lb/ac.	*	*	*
Trefoil at 2 lb/ac. +Yorkshire fog at 8 lb/ac.	*	*	*
Trefoil at 2 lb/ac. +S.S.M.G. at 12 lb/ac.		*	*
Subterranean clover at 8 lb/ac.		*	
Yorkshire fog at 8 lb/ac. +S.S.M.G. at 12 lb/ac.			*

Cultivations were: Johnson's Harbour:- surface sown; Fitzroy:- chain harrowed and rolled after rotavation; Hoggarth's dairy:- broadcast on heavily disced ground. Dates of sowing were: Johnson's: 8th January, Fitzroy: 20th January, and Hoggarth's 12th February.

At Johnson's after 2 years there were only occasional fog plants to be seen on the appropriate plots.

At Fitzroy by October 1967 the fog had grown well though it was patchy on some plots. The smooth-stalked meadow grass was small and unhealthy and seemed to be decreasing.

There was a great regrowth of native grass at the dairy site and by February 1968 the whole area was completely green again. Nodulated white clover plants were found on all plots it had been sown on (all clovers had been pelleted and inoculated before sowing). This site was a lot more fertile than the other two as it had been used for grazing cattle for many years so this accounts for the growth of the clover.

Varieties Trial

At the end of February at Fitzroy and Douglas Station a varieties trial identical to the one set up in the 1966/67 season was set up (see later). At Douglas the frost killed everything over the winter. The only annual plant that appeared was rye and it was very small. At Fitzroy the annuals which showed were:- blue lupins (3 in.), rape, fodder radish (good) and white turnips. All that survived the winter was some sheep's fescue and a trace of bent.

Both these sites were cultivated the spring after sowing.

Season 1966/67

Varieties Trial

About 32 varieties of grasses, legumes and brassicas were tried out on 10 yd. by 10 yd. plots. The sites, dates of sowing and cultivation methods are given below:

Site	Date	Cultivation
Teal Inlet	21.10.66	Ploughed and disced. After sowing seed was covered with a chain and rolled 3 times. Diddle-dee ground.
Douglas Station	26.10.66	Ploughed and disced 2 years previously out of white grass. Seed disced in and rolled once.
Moody Valley	14.11.66	Ground had been ploughed out from site of old pig run and then disced and rolled. After sowing it was harrowed and rolled.
Rincon Grande	22.11.66	Treated with ripper and lightly rotavated. Seed disced in and not rolled. Diddle-dee ground.
San Carlos	25.11.66	Ploughed, rotavated, rolled and chain harrowed. Seed chain harrowed in and not rolled.
Darwin	2.12.66	Seed was split in halves and used on 2 adjacent cultivations on diddle-dee ground. One half was disced 5 times and the other ploughed and disced. Both were rolled before sowing and the seed was harrowed and rolled in.
Fitzroy	6.12.66	Ground had been rotavated out of white grass as a trial oatfield. It was chain harrowed before sowing, harrowed again afterwards and rolled twice.
Roy Cove.	14. 1.67	Area had been ploughed and disced from diddle-dee and short fern, seed was disced in and rolled.
Hill Cove	18. 1.67	Site had been rotavated out of heavy diddle-dee. Chain harrowed before and after sowing and rolled.
Port Howard	24. 1.67	Surface sown on well grazed white grass.

All seeds were broadcast by hand.

Varieties shown, together with seed rates are given in the following table:-

Variety	Seed Rate (lb/ac.)
S50 timothy S48 timothy S23 perennial ryegrass S143 cocksfoot S170 tall fescue Sheep's fescue	All at 10 lb/ac.

Variety	Seed Rate (lb/ac.)	
Chewings fescue Smooth-stalked meadow-grass Rough-stalked meadow-grass Crested dogstail Canadian red fescue S59 red fescue Annual meadow-grass	All at 10 lb/ac.	
Strawberry clover	4	
Suckling clover	4	
Birdsfoot trefoil	4	
Trefoil	4	
S100white clover	4	Not included Douglas or Teal Inlet.
Kent wild white clover	4	Not included Douglas or Teal Inlet.
S151 red clover	8	
Sweet clover	10	Not included at Fitzroy.
Lucerne	20	
Alsyke clover	6	
Sainfoin	50	Not included, Darwin, Hill Cove, or Roy Cove.
Blue lupin	112	
Sarradella	10	Only at San Carlos, Fitzroy, Roy Cove, Rincon Grande and Hill Cove.
Ribgrass	10	Not inculded Darwin.
White turnip	12	
Fodder radish	10	
Rape	12	
Rye	157	
Oats (padarn)	140	

Soil Analyses of some sites:-

Site	pH	L.R. (cwt/ac)	Soluble nutrients (ppm in soil)				
			P	K	Mg	Cu	Co
Rincon Grande	4.9	130	3.1(1)	429(4)	428(6)	0.1(L)	0.27(L)
Hill Cove	4.5	100	3.1(4)	193(2)	401(6)	0.1(L)	0.03(VL)
Port Howard	4.5	100	2.9(1)	226(3)	291(5)	0.33	0.2(L)
Roy Cove	4.9	80	1.6(0)	300(4)	240(4)	0.11(L)	0.31(L)
Fitzroy	4.0	100	1.0(0)	162(2)		0.15(L)	0.07(VL)
San Carlos	4.4	80	1.6(0)	288(3)		0.25(L)	0.2(L)

L.R. - Lime requirement
(L) - Low
(VL) - Very Low

Figures in brackets after P, K and Mg values are the classified "index numbers".

All legume seed was pelleted with a mixture of lime and phosphate from Uruguay and inoculated with Uruguayan or New Zealand inoculant.

Results. Grasses.

Sheep's fescue - This was the best grass on all sites giving up to a 90% cover of healthy flowering plants after one year. On average the ground cover was about 50%.

Chewings fescue - this was the next best with an average cover of about 30% after one year and a maximum of 70%. The plants were again healthy and flowering though not as large as sheep's fescue.

These two grasses were by far the most outstanding under all conditions, none of the others being so consistently good.

Perennial rygrass, bent and S59 red fescue were all fairly similar. They did not perform consistently and gave an average ground cover of about 15% after the first year with a maximum ranging up to 60%. The plants never grew to much more than 2 - 3 ins. though they were usually fairly healthy in appearance. Cocksfoot, annual meadow grass, S48 timothy, Canadian red fescue, S50 timothy and smooth-stalked meadow-grass gave an average ground cover, after a year, of 10% with a maximum up to 50% on occasion.The plants were usually healthy enough but small and sometimes rather yellow.

Tall fescue produced a 50% cover at Hill Cove but made little growth elsewhere. The patches that did grow were almost invariably healthy and up to 6 ins. tall.

Rough-stalked meadow-grass only produced a few plants.

Oats usually produced a short (3-4 ins) cover of fairly healthy plants,by the autumn after sowing.

Rye was similar to oats but sometimes grew to about a foot in height. There was sometimes quite a re-growth of rye in the following year.

Legumes

Blue lupins grew well sometimes reaching a foot in height but on average they were only about 5 ins. They were all frosted off in the first winter.

Serradella also grew well and produced a reasonable cover of plants about $1\frac{1}{2}$ - 2 ins. high.

Alsyke clover. S100 white clover, Kent wild white clover, S151 red clover and suckling clover all produced a few rather small plants by the summer after sowing but none was very vigorous.

Sainfoin, lucerne, sweet clover and birdsfoot trefoil were sometimes present as a trace in the following summer.

The only nodulation which occured was a slight amount in the suckling clover at Teal Inlet. None of the other legumes survived the winter.

Brassicas etc.

All these results refer to the autumn after sowing (except ribgrass).

Fodder radish gave variable results; under some conditions it produced a crop up to a foot high (average 8 in.) with a 60% ground cover but on other sites there was no growth at all.

Rape gave similar results to radish but did not grow so tall or have such a good ground cover. Good results for both were obtained at the same sites.

White turnip was also very variable giving quite large plants at some sites and nothing at others.

Ribgrass only gave a few odd plants but the red clover which was present as an impurity in the seed grew quite well in one or two places.

The effect of grazing by geese on these small plots was demonstrated at Rincon Grande where Mr. Turner put small fences round parts of the rye, S59 red fescue and S48 timothy plots. Inside these fences the rye grew to 4 ft., the red fescue to 6 ins. and the timothy to 9 ins.

Little can be said about the results from different types of cultivations as the sites were not all adjacent and were sown at different dates. At Darwin where ploughed land and disced land were used side by side the ploughed site gave much better results though they were not very good. The best results of all came from Rincon Grande where the cultivation was rough and the seed was not even rolled in. These better results could be due to the higher pH, rain at the right time or the discing in of the seed keeping it nearer moisture. With the other sites the earlier sown ones seem slightly better as there has not been sufficient time for the other ones to catch up. For this reason and again because of the separation of the sites it is not possible to deduce anything from this experiment about the best date for sowing.

The Port Howard surface sown was one of the poorest but a considerable lapse of time is sometimes required before any results can be seen from this method of sowing.

The effect of the major and trace elements on various swards.

All the major and trace elements (except iron, sodium, silicon and chlorine) were sprayed or scattered on two sets of 3 yd. by 39 yd. strips. These strips ran at right angles to each other and a control was included. Each element therefore appeared alone, at twice the original rate and in combination with every other element.

The elements were applied as follows:-

Nitrogen (N)	124 lbs/ac urea (50 units)
Phosphorus (P)	120 lbs/ac triple superphosphate (50 units)
Potassium (K)	93 lbs/ac potassium chloride (50 units)
Calcium (Ca)	Varying rates of lime (see later)
Magnesium (Mg)	4½ cwt/ac magnesium sulphate
Sulphur (S)	½ cwt/ac elemental sulphur or 2½ cwt/ac calcium sulphate.
Boron (Bo)	10 lb/ac borax
Maganese (Mn)	8 lb/ac manganese sulphate
Zinc (Zn)	1 lb/ac zinc sulphate
Copper (Cu)	12 oz/ac copper sulphate
Molybdenum (Mb)	6 oz/ac sodium molybdate

The last 4 on the list were sprayed through a watering can in about half a gallon of water, usually with a commercial detergent as a wetting agent.

The dates, sites and rates of application of lime are given in the following table:

Date	Site	Rate of Lime
23. 9.66	Roy Cove	3½ tons/ac
24. 9.66	Fox Bay East	1¾ tons/ac
15.10.66	West Point	3 ton/ac
20.10.66	Teal Inlet	1¾ tons/ac
26.10.66	Douglas Station	1 ton/ac

Date	Site	Rate of Lime
29.10.66	Salvador	1 ton/ac
24.11.66	San Carlos	3½ ton/ac
7.12.66	Fitzroy	3½ tons/ac (from Shell Point)
17. 1.67	Hill Cove	3½ tons/ac

At Roy Cove, Fox Bay East, Teal Inlet, Douglas Station, and San Carlos the site was on an area of well-established Yorkshire fog. At Fitzroy and Hill Cove a Yorkshire fog and clover mixture was sown for the purpose at the same time as the experiment was put down. At West Point the site was a native sward of bent and Yorkshire fog and at Salvador it was a sward of bent and smooth-stalked meadow-grass.

All the sites were fenced against grazing.

The soil analyses for some of the sites of this experiment are given below.

Site	pH	L.R.	Soluble nutrients (ppm in soil) P	K	Mg	Cu	Co
Teal Inlet	4.2	80	1.1(0)	300(3)		0.33	0.27(L)
Fitzroy	4.0	100	1.0(0)	162(3)		0.15(L)	0.07(VL)
San Carlos	4.2	80	4.9(1)	345(3)		0.43	0.27(L)
Fox Bay East	4.2	80	1.3(0)	428(4)		0.15(L)	0.14(VL)
Hill Cove	4.5	100	31(4)	193(2)	401(6)	0.10(L)	0.03(VL)
West Point	4.8	50	4.4(1)	238(3)	401(6)	0.14(L)	0.52

L.R. - Lime requirement in cwt calcium carbonate per acre
(L) - Low
(VL) - Very low.
Figures in brackets after P, K and Mg values are the classified "index numbers".

Results

Roy Cove - by May 1967 one of the N strips was slightly greener but this was no longer the case by November 1967.

Fox Bay East - In January 1967 the P strips were greener and stronger and this advantage persisted till December 1967.

West Point - By January 1967 the N strips were taller and greener and remained slightly greener till October 1967 at which time there was also a slight greening of the lime strips. By January 1968 there was no effect visible.

Teal Inlet - In February 1967 there was a greening and heightening of the N strips. This was still visible in November 1967 as was a slight improvement in the P strips.

Douglas Station - No effect ever visible.

Salvador - In March 1967 there was a slight greening up of one of the N strips but this was no longer noticeable in the following November.

San Carlos - The N strip was taller and thicker in June 1967, and this persisted, though to a lesser degree, until December 1967.

Fitzroy - In March 1967 the P strips were very green and thick compared with the others and the N strips were quite green. The advantage of the P strips continued till November 1967 when it was still very noticeable.

Hill Cove - No effect ever visible.

On all sites the lime had still not all been washed into the ground at the last time of viewing.

It can be seen that nitrogen and phosphate were the only treatments which gave results and these were neither very significant nor consistent.

New Zealand pelleted and inoculated clovers

Commercially prepared white and subterranean clovers were sown as in the following table. (seed obtained from Coated Seed Ltd., Christchurch).

Site	Date	Rate (lbs/ac) sub	white	Method of sowing
Stanley Common	15 Nov. 66	6	4	Surface Sown (2 sites)
Fox Bay East	Nov. 66	6	4	Harrowed into rotavated ground
West Point	21 Nov. 66	3	2	Surface sown
Rincon Grande	22 Nov. 66	6	3	Disced into skim-rotavated ground
Salvador	4 Dec. 66	6	3	Harrowed into clay patch and rolled
Douglas Station	5 Dec. 66	6	4	Drilled into established sward
Roy Cove	13 Jan. 67	3	2	Surface sown
Port Stephens	24 Feb. 67	3	2	Drilled into burned ground

Results

On Stanley Common, Roy Cove and West Point there was a slight germination but by the following spring there were no plants to be seen.

At Port Stephens and Douglas Station there was quite a good germination of fairly healthy plants but by the following summer there were only a few stunted white clover plants to be seen. They were not nodulated.

The white clover at Rincon Grande and Fox Bay East produced a thick, fairly even cover of light green plants and some at Fox Bay were flowering the following year. The sub. clover at Fox Bay established well but was somewhat reduced over the first winter; by the following summer there were still quite a few large plants some of which were setting seed. The sub. clover at Rincon Grande also lost some plants over the winter but there were still quite a few left the following summer. None of the clover at these two sites was nodulated.

On first germinating some of the Salvador plants were very stunted and very few of either type were found next spring. By summer there were only one or two small clumps of white clover left but some of these plants were slightly nodulated.

Surface sowing of clover into established Yorkshire fog.

At Roy Cove and Hill Cove white clover was surface sown at $\frac{1}{2}$, 1, $1\frac{1}{2}$ and 2 lbs/ac on to a well established sward of Yorkshire fog. The seed was pelleted with a 50:50 mixture of lime and rock phosphate from Uruguay and inoculated with inoculant from U.S.A. Dates of sowing were: Roy Cove - 23 Sept. 66, and Hill Cove 18 Jan. 67. Half the area was rolled in each case; the rolling being done at Roy Cove with the tractor wheels. There was about 25% bare ground at Roy Cove but none at Hill Cove.

Results

In January 1967 at Roy Cove there were a few stunted and sick looking clover plants on the two higher rate plots but these did not persist into the winter.

There was never any sign of clover plants on the Hill Cove plots.

Hay and other fodder crops.

Trials were set up in the settlement fields at Douglas Station, Port Howard and Fox Bay West to determine the best grasses for hay-making and to look into the suitability of some other fodder crops. Rates of sowing were as follows: (all rates in pounds per acre):-

Variety	Fox Bay	Douglas	Port Howard
Oats (padarn)	140	140	140
Rye	157	157	157
Bent, S50 timothy, S48 timothy, S23 perennial Ryegrass, S143 cocksfoot, S170 tall fescue, Chewings fescue, Smooth-stalked meadow grass, Rough-stalked meadow grass, Crested dogstail, Canadian red fescue, S59 red fescue		all at 10 lb/ac on all sites	
Rape	12	12	12
Fodder radish	10	10	10
White turnips	12	12	12
Lupins (blue)	-	112	-
Commercial perennial ryegrass	-	20	-
Stormont Zephyr perennial ryegrass	-	20	-

2 lb/ac white clover and 1½ lb/ac red clover were sown on the whole area at Port Howard and Fox Bay West, both were pelleted and inoculated. Dates of sowing were:- Port Howard, 24th January 1967; Douglas, 26th October 1966. (Only Fodder radish, lupins, rye, oats, commercial P.R.G. and Stormont Zephyr were sown at this date, the rest being sown on 16th January 1967). Fox Bay 27th September 1966. The Port Howard and Fox Bay plots were broadcast and harrowed in and the Douglas ones were drilled; all were rolled.

Soil Analyses	pH	LR	Soluble Nutrients (ppm in soil)				
			P	K	Mg	Cu	Co
Port Howard	4.8	110	4.4(L)	209(3)	161(3)	0.18(L)	0.33(L)

Results

At Fox Bay there was a massive invasion of chickweed and all plots except oats and rye were smothered. The oats produced a thick and healthy stand but the rye was not so thick and the plot had a patchy appearance. Occasional non-nodulate clover plants were seen. This experiment was ploughed up the following winter.

At Port Howard the best grasses were perennial ryegrass, cocksfoot, S.48 timothy, S.50 timothy and bent in that order. The ryegrass was not much more than 2 ins. high in May but it was well established and healthy looking. The cocksfoot was nearly the same and the others were progressively poorer. Neither the radish nor the turnips grew to any height but they were grazed down by the geese. There were only a few small clover plants visible. This experiment was also ploughed up the following winter.

None of the grasses planted at Douglas in January survived the winter as they may not have been well enough through to stand the frost. They could also have been blown out as the field used was very dusty and tended to blow. The commercial P.R.G. and the Stormont Zephyr established quite well and were 5 - 6 ins. high and flowering by January 1968, though still in the 7 in. drills in which they were planted. The rye was heavily grazed by geese and only grew to 6 - 8 ins. Some fodder radish grew to 1 ft. but most plants were stunted. The oats were variable in height from 6 ins. to 1 ft. and had been slightly grazed by geese. The lupins gave an even cover about 9 ins. high.

It is intended to give the commercial P.R.G. and the Stormont Zephyr 150 units/ac each of N, P and K.

Erosion Control

At West Point and Salvador an attempt was made to sow seed directly into the large eroded clay patches which occur on both farms.

Twelve varieties of legumes (9 at Salvador) were sown on 30th October 1966 at Salvador and on 6th January 1967 at West Point. The plots were split in half and the two halves oversown with oats and rye. All legume seed except lupin was pelleted and inoculated. Seed rates were as follows:-

	Salvador	West Point
Strawberry clover	4 lb/ac	8 lb/ac
Kent wild white clover	not sown	8 lb/ac
S100 white clover	not sown	8 lb/ac
Suckling clover	4 lb/ac	8 lb/ac
Birdsfoot trefoil	4 lb/ac	8 lb/ac
S151 red clover	8 lb/ac	16 lb/ac
Sweet clover	10 lb/ac	20 lb/ac
Lucerne	20 lb/ac	40 lb/ac
Alsyke clover	6 lb/ac	12 lb/ac
Sainfoin	50 lb/ac	100 lb/ac
Serradella	not sown	20 lb/ac.
Oats (padarn)	140 lb/ac	280 lb/ac
Rye	157 lb/ac	314 lb/ac

The West Point plots received 128 lb/ac triple superphosphate.

Adjacent to the above experiments two plots of blue lupins were sown; $\frac{1}{4}$ acre at 112 lbs/ac at Salvador and $\frac{1}{8}$ acre at 224 lbs/ac at West Point. The West Point plot was undersown with Yorkshire fog at 16 lbs/ac and one half of it received 256 lbs/ac triple superphosphate.

The Salvador plots were all harrowed in with a harrow made from old bren-gun carrier tracks and rolled; the West Point plots were all raked in by hand owing to the stony nature of the ground.

Soil Analyses for the two sites are given below:-

Site	pH	LR	Soluble nutrients (ppm in soil)				
			P	K	Mg	Cu	Co
West Point	4.6	100	0.7(0)	97(1)		0.68	0.24(L)
Salvador	5.3	40	0.3(0)	115(2)			

Results

West Point - the oats grew to 4 - 5 ins. in the first year and in the following year, there was a patchy regrowth of plants up to about 8 ins. tall. The rye was thinner and shorter than the oats and regrew in a similar manner. The only legume to be seen was some stunted serradella.

The lupins grew to a height of 3 - 4 ins. before being frosted off. The Yorkshire fog had a thin but even cover of healthy plants on the side treated with phosphate but a very patchy cover on the untreated side. It received a setback over the winter but by January 1968 there was a 50% cover of flowering fog on the fertilised side and only a 5% cover on the other. There was a tendency for soil and vegetable matter to be caught among the grass plants thus preventing further erosion and leading to a build up of soil on bare clay.

Salvador - The oats here grew to 6 - 8 ins. with some healthy looking patches. The rye was 2 - 3 ins. high and looked very poor and thin. Sainfoin produced a thin, even cover of plants about 2 ins. high and yellow in appearance. There were also a few stunted red clover plants. The lupins grew to 5 - 6 ins. and were healthy in appearance. None of the plants survived the winter but a few seeds got caught in the dead remains of the lupins and produced grass plants.

None of the legumes on either site became nodulated.

Cover crops.

As it was thought possible that a cover or 'nurse' crop might improve the establishment of grasses and clovers, a Yorkshire fog (6 lb/ac)/white clover (4 lb/ac) mixture at Roy Cove was oversown as follows:-

Rye @ 157 lb/ac
Oats @ 140 lb/ac
Fodder radish @ 13 lb/ac.

Date of sowing was January 1967.

By May the radish was small and stunted, the rye was short and very thin. The oats were 3 - 4 ins. and healthy and the fog was thin but healthy. There was no sign of the clover which had been pelleted and inoculated. The following November the rye produced plants up to 15 ins. high and very strong in patches, but on average a thin stand of healthy plants. There was no sign of the oats and a few radish plants were still growing. The fog had made good growth but did not

appear to be any more vigorous on any of the plots. The state of the fog will be more readily observed once the rye has been grazed off.

Experimental Work 1967/68

New Zealand pelleted and inoculated clovers.

Because of the variable results achieved - in the preceeding season it was decided to try out several sowing dates. The seed was despatched from New Zealand on three dates as follows:- 1st lot - 19th May, 2nd lot - 23rd June and 3rd lot - 31st July.

Sites, dates of sowing, cultivations and seed rates are given in the following table. The seed rates refer to weight of pelleted seed.

Site	Rate (lbs/ac) White	Rate (lbs/ac) sub	Dates of sowing Lot 1	Dates of sowing Lot 2	Dates of sowing Lot 3	Cultivations
West Point	4	6	11 Sept	9 Oct	28 Oct	Surface sown.
Port Howard	4	6	11 Sept	2 Oct	23 Oct	Surface sown.
Stanley Common (1)	8	12	12 Sept	30 Sept	-	Surface sown (12 Sept white only)
Stanley Common (2) (near stables)	8	12	12 Sept	30 Sept	19 Oct	Surface sown.
Fitzroy	4	6	15 Sept	13 Oct	25 Oct	Ploughed and disced ground sown with sheep's fescue cocks foot and S.S.M.G.
Salvador	4	-	15 Sept	-	1 Nov	Harrowed into clay patch.
Fox Bay West	4	6	22 Sept	18 Oct	31 Oct	Drilled into rotavated ground.
Fox Bay East	4	6	-	-	-	Sown with fog into ploughed ground
Fox Bay East	4	6	-	-	-	Surface sown (white only on last 2)
Moody Valley	-	-	4 Sept	4 Sept	-	Forked into ploughed ground.

The Moody Valley plots were small samples which had been sent by airmail in case the inoculum did not survive the long sea passage. The third lot did not arrive.

Both clovers of lot 3 sown at - West Point, Fitzroy and Fox Bay East were molybdenised. The small plots at Moody Valley included molybdenised and normal treatments.

Results

West Point - no clover ever seen.

Port Howard - at the end of November one sub. clover plant was found on lot 1.

Stanley Common (1) - In February 1968 a few tiny white clover plants from lot 2 were seen.

Stanley Common (2) - In February 1968 there were a few small and reddish sub clover plants on lot 3 and some very small white plants could be seen on the same lot.

Fitzroy - by February 1968 results were as follows:-

Lot 1 - the sub. had given quite an even cover of small yellow plants with a few larger ones; the white was, on average, quite thick but rather yellow and small, though there were some greener and thicker patches.

Lot 2 - the sub. was small and yellow but quite even and with a few larger plants. The white was stunted and yellow.

Lot 3 - the sub. was quite healthy but patchy and the white was fairly even but with some thicker patches and some yellow ones.

Salvador - in January 1968 there were only a few stunted white plants on lot 3.

Fox Bay West - by December 1967 the results were as follows:-

Lot 1 - both clovers had been frosted off and some seed of the sub. seemed to be just germinating; there were a few white plants.

Lot 2 - the sub. was at the 2 leaf stage and was very good at the place where a carcase had been burned; the white was just germinating.

Lot 3 - the sub. had just germinated and was particularly visible in the wheelmarks. There was no sign of the white.

Fox Bay East - by December 1967 the results were as follows:-

Cultivated. Lot 1 - the sub. had come through thickly but there only remained some 2 leaf plants. There were only occasional small white plants.

Lot 2 - a few small sub. plants and no white.

Lot 3 - neither showing as not long sown.

Surface sown; lot 1 - both types showed occasional stunted plants with the sub. slightly thicker. Many plants had been blown out by the wind as the site was sandy.

Lot 2 - an even scatter of tiny, newly germinated white plants was visible.

Lot 3 - not yet visible as not long sown.

Moody Valley - germination was very poor or non-existent on all plots and by February 1968 there were only 3 plants on the second lot of white clover (molybdenised).

At no time was nodulation observed on any of the clovers sown in this experiment. Due to the poor results it is not possible to come to any conclusion about the best date for sowing. It is worth mentioning, however, that the earliest sowing at the Fox Bays were practically wiped out by the frost and this may have been the cause of poor results elsewhere e.g. Moody Valley.

None of the surface sown plots were any good and this could be due to lack of moisture as September and October are very dry months. It is not likely that much of the clover which is at present growing will survive the winter.

Erosion Control

Because some success had been achieved in the previous season with Yorkshire fog and fertilisers, lupins and sainfoin it was decided to carry on along those lines with more varieties of grasses and lupins.

Clay patches on the same two farms were chosen. At Salvador 10 varieties of grass were sown at 10 lb/ac and the plots split and one half of each plot give 45 units N, 47 units P and 60 units K per acre. Five of the plots were oversown with blue lupins and the other five with white lupins, both being inoculated the day before sowing.

At West Point the layout was similar but the grasses were sown at 14 lb/ac, the fertiliser applied at 60 units N, 62 units P and 80 units K per acre and 6½ plots were oversown with blue lupins and 3½ with white.

Dates of sowing were West Point - 10th October 1967 and Salvador - 2nd November 1967.

The grasses sown were - smooth-stalked meadow-grass, chewings fescue, S59 red fescue, S143 cocksfoot, perennial ryegrass, sheep's fescue, Canadian red fescue, bent, S50 timothy and Yorkshire fog.

An acre of pelleted and inoculated sainfoin was sown at Salvador at 16 lbs. per acre.

Results

The comparative results from both experiments were similar - though the Salvador grew much better. The difference was due to the lack of rain at West Point where most of the growth was confined to the drainage channels cut in the clay. All the grasses did much better with fertiliser and in fact there was very little growth without it. Perennial ryegrass was the best in January 1968 with healthy plants about 2 ins. high. S59 red fescue, smooth-stalked meadow-grass and Yorkshire fog were the next best with a thinner cover of smaller plants. None of the others did better than producing a few small plants, except cocksfoot and it was not as good as the others. A better idea of the performance of the grasses will be obtained next year after the plants have stood a winter and the lupins have died off.

Both lupins grew 5 - 6 ins. and neither type had nodules. The blue lupins were stronger and greener on the plot which received the fertilizer. The white lupins did not show so much improvement on the fertilizer plot. Both types of lupin grew better in the drainage channels as there was more moisture and better coverage of the seed; a large amount of the seed did not grow as it was not properly covered.

The sainfoin at Salvador produced an even growth of plants about 1½ - 2 ins. high in January 1968. There was no nodulation and the plants were a yellowish-green colour.

Varieties trial

The grasses and legumes used in this trial were those which were growing best in the autumn of the 1966/1967 season.

The following grasses were sown at 10 lb/ac. (Port Stephens 5 lb/ac) Bent, Sheep's fescue, chewings fescue, S50 timothy, cocksfoot, Canadian red fescue, S23 perennial ryegrass, S59 red fescue and smooth-stalked meadow-grass. All sites were sown with clover mixtures which are given in the following table along with dates of sowing and types of cultivation.

Site	Date	Legumes sown	Cultivation
Port Stephens	6 Oct 67	2 lb/ac white clover + ½ lb/ac red clover	Direct drilled into previously burned ground.
West Point	11 Oct 67	4 lb/ac suckling clover	Seed broadcast on area which had been Dutch harrowed, then harrowed in Diddle-dee and balsam bogs with bent/pigvine.

Site	Date	Legumes sown	Cultivation
Fitzroy	28 Oct 67	3 lb/ac white clover + 1 lb/ac red clover	Seed drilled into ploughed and disced white grass with Brillion seeder.
Douglas Station	4 Nov 67	3 lb/ac suckling + 2 lb/ac Montgomery red clover. (sown Jan 68).	Seed broadcast and rolled into rotavated diddle-dee/small fern ground.
Teal Inlet	6 Nov 67	None(seed lost)	Ground ploughed and disced. Seed broadcase chain harrowed and rolled.

The white clover was a 50:50 mixture of S100 and Kent wild white clover and all clovers were pelleted with gafsa rock phosphate and inoculated with New Zealand inoculant. Plot sizes were:- Port Stephens, Fitzroy and Teal Inlet - 1 acre. Douglas - ½ acre; West Point 1/10 acre.

At Douglas and Teal Inlet ½ acre plots of pelleted and inoculated subterranean clover at 6 lb/ac were included. And at Fitzroy a 3 acre plot of inoculated serradella at 10 lb/ac was included.

Seed for similar experiments to the above was sent to Port San Carlos and Johnson's Harbour for surface sowing on to heavily stocked ground in January or February.

Results.

Insufficient time has elapsed since these plots were sown to allow for other than a preliminary appraisal. The main idea in having the large plots was to see how well the grasses and legume stood up to grazing. It will therefore be several years before any concrete results emerge. All the sites were re-visited in January 1968 when these observations were made.

Port Stephens:- The site had been invaded with groundsel since sowing and there had also been a considerable re-growth of goosegrass, mountain berry and liverwort. Germination of all grasses was very patchy and was better on the less trashy ground where there had been a slight 'burning-in' by the fire. Chewings fescue, sheep's fescue, cocksfoot and perennial ryegrass were the best. S59 red fescue could not be found and the others were intermediate. Clover growth was very patchy and poor; none of the plants were nodulated.

West Point:- No trace of any of the sown species was found as there had been very little rainfall since the date of sowing.

Fitzroy:- Germination was again very patchy with better growth in the hollows and wheelmarks. It did not seem that the Brillion drill was giving enough cover and consolidation. Sheep's fescue was the best grass with a fairly even, though thin, cover of plants 1½ - 2 ins. high. The rest gave a patchybut healthy cover of small plants. The clover plants were small and infrequent in occurence and were not nodulated.

Douglas Station:- Only the chewings fescue and the Canadian red fescue, which were together on a damper and better consolidated part of the site, produced anything more than a few small plants. These two gave a 5% ground cover of short but healthy plants. The poor results with the other grasses were due to the loose and chunky nature of the seedbed produced by the rotavator. A few sub. clover plants grew and some of them were nodulated.

Teal Inlet:- Cocksfoot, perennial ryegrass and timothy gave an even strike of healthy plants about 2 ins. high. Bent was thin and poor and smooth-stalked meadow-grass was intermediate. The fescues were all poor; they were all on the southerly exposure of a hill whereas the others were on the north side and in a valley. The difference between the two groups was quite marked and it seems that exposure can be an important factor in the establishment of grasses. The sub. clover plot had a thin even cover of plants at the 5 - 6 leaf stage and some plants were nodulated.

Control of pigvine (Gunnera magellanica) by herbicides.

At West Point and on Stanley Common three rates each of five herbicides were sprayed on to patches of pigvine. They were sprayed through a watering-can in approximately $\frac{1}{2}$ gallon of water each. Dates of spraying were: West Point 28th November 1967, and Stanley Common - 22nd December 1967. The herbicides used were:-

2 - 4 D at 1,2 and 3 gal/ac.
MCPA at 2,4 and 6 gal/ac.
ATA at 1,2 and 3 gal/ac.
MCPB at 2, 4 and 6 gal/ac.
CMPP at 3, 6 and 9 gal/ac.

Results

The West Point plots were re-visited on 17th January 1968 and the Stanley ones on 10th February 1968. The percentage kills for the low (L) medium(M) and high (H) rates are given for both sites in the table. The figures for degree of kill are all visual estimates.

	West Point			Stanley		
	L	M	H	L	M	H
MCPA	90	99	100	0	25	50
2-4 D	90	95	100	0	50	70
CMPP	50	100	100	0	30	50
MCPB	10	30	50	Leaves turning red and scorched.		
ATA	0	5	5	0	0	5

At West Point almost complete control was achieved with MCPA 2-4 D, and CMPP at the top two rates. At the low rate MCPA and 2-4 D gave almost as complete control. The results from Stanley while not as good show a similar pattern. The poorer kill with the Stanley trial would be partly due to the fact that the pigvine sprayed in this experiment was smaller and better protected by grass than that on West Point. The later spraying date could also have made a difference. As was to be expected the ATA gave a good kill of the surrounding grass at the top two rates.

Discussion of Experimental results and other observations.

The comments and suggestions in this section are drawn from observations of work done on the farms as well as the work in the experimental section of this report.

Grass varieties for sowing in camp

It has been known for many years now that Yorkshire fog will thrive when sown in the camp. It is highly tolerant of poor soil conditions and is very aggressive in habit. It is, however very hairy in the leaf and tends to shoot to stem rather quickly. These two attributes make it rather unpalatable and under ideal grazing conditions it should be kept short and leafy. Fog has the great advantage of growing in the winter. There are other 'native' or 'naturalised' grasses growing here which make a large contribution to the feed of the grazing animal. The most notable of these are bent, sheep's fescue, smooth-stalked meadow-grass and wavy hair grass.

Sheep's fescue was the only one of these which grew well from seed (seed of wavy hair grass is not available commercially), and both it and chewings fescue would be worth sowing in strips on the more fertile and sheltered parts of a cultivated area. The grazing of the fescues would have to be very carefully controlled as, owing to their greater palatability, sheep would tend to graze them harder than fog. They would not do well in a mixture with fog as the latter invariably takes over completely any seed mixture in which it is sown.

The poor performance of bent and smooth-stalked meadow-grass is surprising in view of their prevalence in certain areas. It was suggested by Dr. Gibbs that the smooth-stalked meadow-grass found here was a different variety from that obtainable commercially, and in view of the less vigorous appearance of the plants from the imported seed the idea seems probable. A similar theory could be applied to bent insofar as the bent sown (agrostis tenuis) may be less suited to Falklands conditions than, say agrostis magellanica. It is possible that perennial ryegrass and cocksfoot may have a place in the camp under very favourable conditions but without the use of some sort of fertilizer it is most unlikely that they would thrive for any length of time.

The effect of the major and trace elements.

In this experiment the only response obtained was from N and P with one small reaction to lime. In the course of time as the lime is washed into the soil a further result should become evident. A greater response to P would have been obtained with a higher rate - say 150 units - as the amount applied could be rendered unavailable very rapidly due to a high level of fixation in these soils. The response to N is to be expected as it is not likely that there is a great amount of available nitrogen in these soils.

As regards the trace elements it is possible that the grasses in these swards may not respond as they are better able to extract trace elements than ryegrass, cocksfoot, clover etc., i.e. they are already getting all they require and hence an increased uptake would not show up as an increase in growth.

It is also possible that the lack of lime (not yet washed in to the soils) and phosphate (rendered unavailable) is limiting production and hence the demand for trace elements is low.

The matter of trace element deficiencies needs further investigation as nearly all the soil analyses show the soils to be low in copper and cobalt and it is still possible that there are others in short supply.

Establishment of legumes

Without doubt it is possible to grow healthy clover plants in these islands. One only has to look about the Stanley road verges to see this is so. It is therefore not climatic conditions which are making it difficult to establish legumes here.

In the 1966/67 season the pelleting materials used were lime and phosphate from Uruguay. It was suspected that the lime was calcium hydroxide and the phosphate was not rock phosphate and hence the innoculum did not survive. The following year dolomite and gafsa phosphate were obtained direct from U.K., but the dolomite was late in coming so pelleting was done with the phosphate only. Nodulation in 1966/67 had been non-existent and in the following year only a few subterranean clover plants nodulated. It could be that both the gafsa and dolomite are vital (they are in fact important) but the commercial pellets from New Zealand which are gafsa/dolomite coated only nodulated on one occasion. The three month travelling time could have been fatal to the inoculum but the expected life of inoculum in these pellets is four months.

The only fairly successful growth of clover was at Hoggarth's dairy on what is, by Falkland Islands standards, a fairly fertile piece of ground. However a sample of commercially pelleted seed airmailed from New Zealand in 1966 was successfully grown in a greenhouse in soil from one of the sourest parts of Stanley common. Nodulation in this case was achieved. It must therefore be possible to grow nodulated clover, in these acid soils without recourse to liming and topdressing with phosphate (both practices are out of the question anyway).

The annual legumes (lupins and serradella) grew well in comparison with the others though the lupins were never nodulated. Serradella was nodulated at Fitzroy and if it grew well enough to flower (as it may do later this year) there is a chance that it could set seed for the following year; assuming pollination took place. It is worth mentioning that serradella is a member of the lupin family which is very tolerant of acid soil conditions. Other members of this family may be worth investigating as to their suitability for Falkland Islands conditions.

Hay and fodder crops

The growing of oats as a hay crop is a laborious and expensive process which is carried out on too many farms today. It is not too difficult to establish a good sward of grass suitable for cutting as hay, and this has been done on a few farms. It is much easier, and cheaper to topdress a grass field once a year than to go to all the bother of ploughing and sowing expensive oat seed.

Yorkshire fog does not make good hay owing to its stemmy growth but cocksfoot, perennial ryegrass or timothy could produce excellent crops if the fertility was right. This last point is important as it is obvious from the experimental work that it is useless to expect a good crop from a field which will normally only grow a mediocre crop of oats. It goes without saying that if clover is established in the hayfield (and it is easier to do this than establish it in the open camp) a saving in the amount of nitrogenous fertilizer used will result, quite apart from the enhanced feeding value of the final crop.

The only alternative to grass hay worth considering, is the use of a fodder crop such as rape, kale or fodder radish. These crops have the great advantage that they can be fed off *in situ* with the help of an electric fence, thus keeping most of the fertility in the field. All these crops have been tried in the islands and all have grown well on various occasions. Fodder radish grows very quickly and tends to go to seed far too soon but if sown late it could provide the first grazing break of the winter. Thousand headed kale has been grown with considerable success at Port Howard and Pebble Island but the depredations of the geese have reduced production considerably. Rape has been grown once at Pebble and seems to be alright.

All these brassica crops also require a reasonable level of fertility and this can either be applied from the bag or as shed manure and sheep carcases. A useful rotation between the brassica

fodder crops and grass hay could be worked out as there would eventually be a build up of weeds if the brassicas were sown continuously.

Types of cultivation for camp improvement

The essential point about any method of cultivation is that it should provide as near as possible ideal conditions for the germination of seed. These are a fine seedbed, good consolidation and adequate moisture. A rotary cultivator working in diddle-dee/small fern ground will produce none of these conditions, but the same machine working in conditions of minimal vegetation (e.g. at Chartres) will produce an excellent seedbed. Because of its 'fluffing up' action the rotary cultivator (unless followed by very heavy rolling) does not normally give as firm a seedbed as that produced by ploughing and discing. Consolidation, and, hence moisture availibility is, however a problem of all cultivated land in the Falklands; the better growth in the tractor wheelmarks is a common sight on all newly sown land. If land were left for a year or more between cultivating and sowing, the action of the weather would help to break down the clods and firm up the ground. All seedbeds should be rolled with the heaviest roller possible, both before and after sowing.

When a large area of heavy diddle-dee is being cultivated untouched strips should be left at regular intervals. This will afford shelter to sheep and lambs when the sward is established and also reduce the chance of any wind erosion occuring before the land has been sown.

The cultivation of white grass is a problem in itself and not a great amount of it has been turned in. The most satisfactory results are achieved with a plough of the lea type having a long mould board and turning a furrow at least twice as wide as it is deep. Complete inversion of the furrow is essential. Such a plough exists at Douglas Station. The problem with this type of ploughing is that it leaves soil which is susceptible to blowing and it might again be advantageous to leave unploughed strips.

It is difficult to obtain a good seedbed economically therefore any drill used has to be able to work in poor conditions. The best type is a robust machine with disc type coulters at about 4 ins. spacing. The idea is to get the seed well into the ground as there is so little moisture available and the top of the soil is liable to blow away. The only machine of this type used in the islands is the ordinary corn drill used at Port Stephens and it has coulters 7 ins. apart. Germination is usually very good and variations are due to the seedbed (merely burned over diddle-dee ground) rather than any faults in the drill. The Danish drills in use on several farms do a good job of work but their Suffolk type coulders do not give enough penetration. The performance of the "Brillion" drill does not justify the numbers bought recently in the Colony. Under good conditions (e.g. Chartres) it does a fine job but with a rougher and drier seedbed the seed is not well enough covered.

Dates of sowing of grasses in camp improvement.

Grass has been sown successfully in the Falklands in all months from September to April. A great deal depends on the actual conditions at the time of sowing and the occurrence or otherwise of a few showers of rain can make a great difference. In the 1966/67 varieties trial the October and November sowings apparently gave better results than those put down in January. However as the experiments were on different sites with different soil conditions and micro-climates little significance can be attached to these results. The best time for sowing seems to vary from farm to farm but on the whole, early spring (September) and summer (January and February) give the best results. Depending on the incidence of frost and the rainfall these times can be varied between farms. A

series of sowings at regular intervals carried on for some years could throw a lot of light on this subject. The Falkland Islands have a dry climate and the best use must be made of the available rainfall.

Control of erosion

On many farms there are large clay patches which are slowly growing as the years go by. This growth is not always apparent to somebody who is looking at the patch all the time and there is a great tendency to assume that things are just the same as they were in father's day. This is not so and efforts should be made to fill these areas of erosion in. The areas should be fenced off (some of the old rolls of fencing which are tipped on the beach or left as monuments in the camp would do for this) and an effort made to grow seed on them. Grass can be established with the help of fertilizers and if applied from the bag triple superphosphate would be enough to get Yorkshire fog established. Carcases, kelp, shed manure, peat-mould, and stained pieces of wool all make useful fertilizers and some of these on their own, without seed being sown, would go a long way towards covering in clay patches.

Lupins also grow well on clay and if nodulated could be a useful source of nitrogen to the young grass plants. This was the reason for their inclusion in the erosion control experiments but as they failed to nodulate it is doubtful if the small amount of shelter they provided was a significant factor in assisting in the establishment of the grasses. The presence of the fertilizer was the critical factor.

Control of pigvine with herbicides.

This is largely a question of economics. Whether 2-4 D, MCPA or CMPP is used depends on their landed cost, and whether or not any herbicide is used depends on the value of the improvement that it would bring about. If pigvine were killed out on, say, West Point there would still remain the problem of what to do with the bare patches. In these areas where it is growing in association with grass there would be little problem as the grass would soon take over, if necessary with some assistance from a topdressing of guano. But in those areas where the pigvine was too thick to allow the growth of grass it would be difficult - though not impossible - to establish grass. Cultivation by hand and planting at the wettest time of the year would probably be the answer.

Subdivision and rotational grazing.

This is the most important single method of improvement available in these islands. In view of the number of times that it has been advocated as an improvement method it is surprising that so little subdivision has been done. It is impossible to control large areas of re-seeded ground without adequate fencing and in fact the fencing should be there before the re-seeding is started. In recent years many farms have worked out a system of spelling camps but there are still too many large camps. The splitting up of camps would be greatly encouraged if the farms themselves were split into smaller units. The most intensive farms in the islands are all comparatively small.

With reasonably sized camps burning would be completely unnecessary and all the cleaning up could be done by cattle. Cattle are disliked intensely in many quarters here, chiefly because they make no money and nobody knows anything about how to work them. They are accused of breaking down fences but this does not seem to be a problem at Port Howard which uses cattle as scavengers and runs more per sheep than any other farm on the Islands. It would be repetitive to go over all the suggestions for further subdivision and increasing cattle numbers mentioned in the reports of Munro etc. so the present author will confine himself to endorsing their remarks completely.

The point of subdivision is, of course, so that rotational grazing can be practised with its resultant reduction of coarse vegetation in favour of the finer grasses and the spelling which these grasses get.

Suggestions for further experiment.

The work of trace elements and establishment of legumes must be carried on and the benefits of rotational grazing should be demonstrated on an experimental farm.

It is almost unbelievable that such a valuable food as tussac has been allowed to practically vanish on some farms. It would be of considerable interest to see if it could not be grown as a row crop in a field with proper cultivations and fertilizer dressings. There are a great many fairy tales told about where tussac will not grow. None of them are true and there is no reason why the plant should not be grown on a large enough scale to provide valuable winter feed for young stock. It is argued that on a large farm tussac plantations would have to be huge to have any effect. The answer to this is that most farms are far too large anyway and if they were a reasonable size a little tussac would go a long way.

Supplementary feeding either with a proprietary compound such as "Rumevite" or straight urea needs to be investigated. Something which stimulated the rumen and supplied extra nitrogen could cause an increase in the utilization of white grass with a consequent improvement in pastures.

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GRASSLANDS OFFICER.

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