GUIDE TO THE MARTON EXPERIMENTAL AREA

By P.B. Lynch, Crop Experimentalist

1. A Short History of the Marton Experimental Area:

In 1911 , on the property of Sir James Wilson at Marton Junction, the Department of Agriculture laid down a series of experimental plots , with the prime object of testing varieties of wheat, oats and barley, many of which had been introduced from overseas countries. These plots were repeated in the following year and for some years annually, and the. plots became referred to as the Marton Experimental Area.

The crops grown were by no merns restricted to the cereals, but covered a wide range, which included -

Peas,
Maize,
Millet,
Sorghum,
Linseed,
Soya beans ,
Velvet beans, and
Brassicas of various kinds.

The extent of the trials increased with the years, and in 1917 about fifty acres were being used, This involved the leasing of some of the area, as by that time the original area provided gratis by Sir James Wilson had been greatly exceeded.

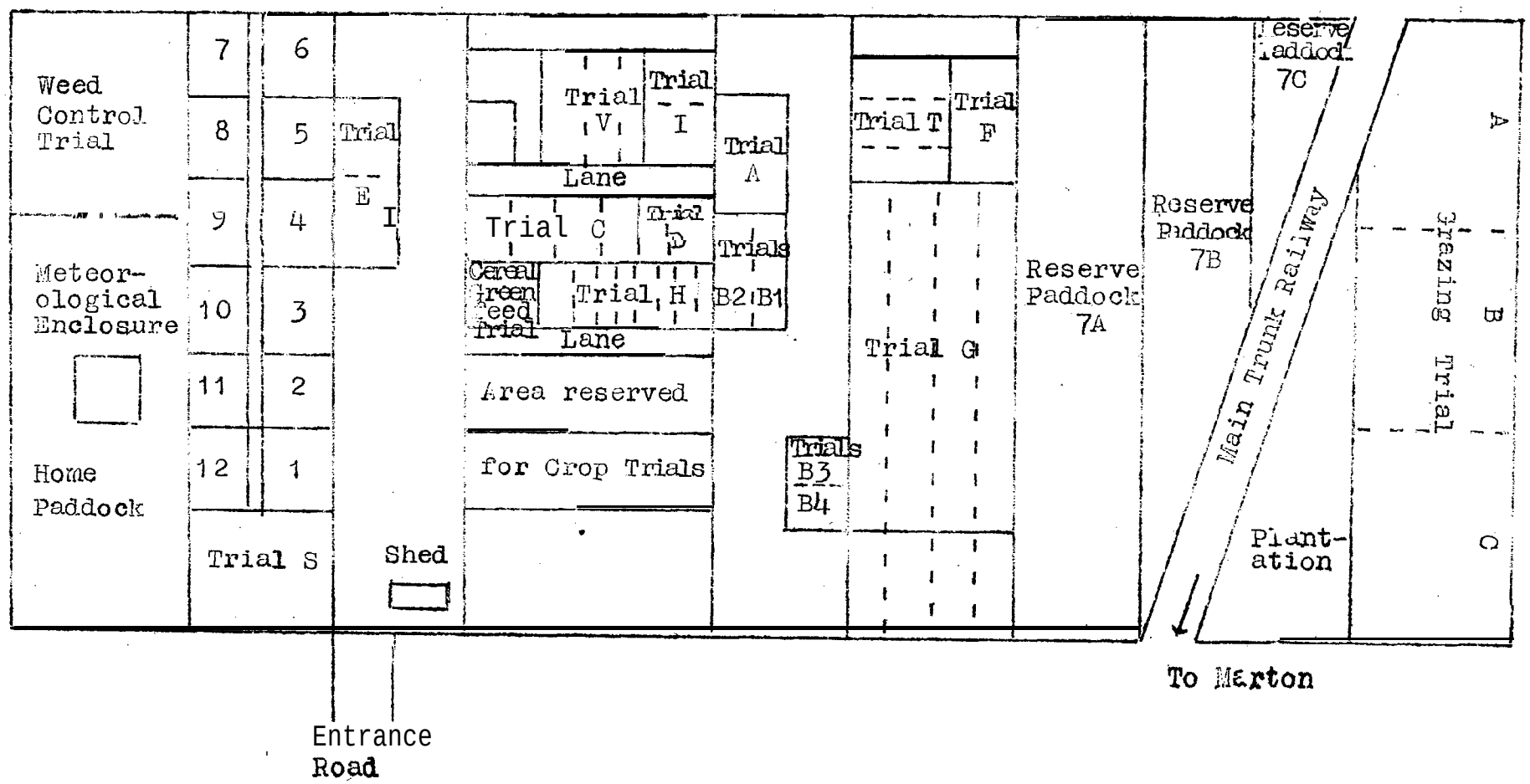
In 1919 an arrangement was made with the owner, whereby the Department of Agriculture had the use of the whole area on a Semi-permanent basis, with advantage to both parties, to be terminated by common consent when that contingency should arise. This arrangement, substantially, has been in operation since then up to the present day.

Though the venture was commenced almost wholly from the arable crop aspect, the character of the experimentation has almost completely changed in latter days, At first small portions of the area were sown into pasture to spell the land from cont inuous cropping, and on these pastures topdressing and pasture strains trials were commenced. This tendency increased until by the middle of the 1920's it had become the main feature of the area. Since 1930, experiments have consisted mainly of long-term grassland trials, with arable crops a subsidiary feature only.

These grassland trials were developed by Mr. A.W. Hudson, then Crop Experimentalist to thexFields Division, and with the adoption of his "alternate mowing and grazing" technique, they became basic research work from which a large proportion of modern pasture improvement methods has originated,

At the present time the area is still predominantly devoted to pasture trials, although a small area is annually under field crop experiments.

2. Plan of Area (Diagrammatic):



3. Route of Inspection:

From entrance to Cereal Greenfeed Trial - to Trial H, thcnae to Trials B1, B2, B3, B4, G., F, T, A, I, D, V, C, E, S, and the Weed Control Trial. The following notes on these trials are therefore arranged in that order.

4. Cereal Green-teed Trial:

Trial was drilled on 14th May, 1947, with 5 replications of each of the following varieties. The fertiliser used was 2 cwt. serpentine super 'per acre.

1.	Cape barley	103 lb. per acre.
2.	Black skinless barley	123 " " "
3.	Algerian oats	103 " " "
4.	Achilles oats	103 " " "
5.	Russet oats	103 " " "
6.	Ryecorn	144 " " "

Samples are cut from each of the plots before each grazing to ascertain the production of each species, Careful notes are taken on features such as habit of growth, palatability, etc. Achilles oat, a new cross, has previously outyielded Algerian at Lincoln and Marton for both grain and chaff. It has a larger, more attractive grain than Algerian, and is, very highly resistant to leaf rust and stem rust. Russet oat is a tall growing variety, useful for both milling and greenfeed. It is fairly extensively grown in South Canterbury.

Results to Date:

First cut on 6th September, 1947.

Yields in pounds per acre.

	Treatments						Significant Difference (5%)
	1	2	3	4	5	6	
Yields of green herbage	5,554	3,811	7,732	7,296	9,692	4,900	
Differences in yield from Cape Barley		-1,743	+2,178	+1,742	+4,138	-654	1,192
Percentage dry matter	18.6	17.8	17.2	18.6	17.0		21.4
Yields of dry matter	1,033	678	1,330	1,357	1,648	1,049	

When the above trial is completed, the area is Co be sown down for the following trial, which investigates the effect of "bottom growth" in the sward on the incidence of "blind-seed disease" of ryegrass.

Main-plot Sowings:

1. Ped. perennial ryegrass', 30 lb. p.a. + ped. white clover, 4 lb. p.a.
2. Ped. perennial' ryegrass, 30 lb. p.a. (no clover).

Sub-Plot Fertilisers:
a. No sulphate of ammonia.
b. Sulphate of ammonia,. 1½ cwt. p.a.
C. Sulphate of ammonia, 3 cwt. p.a.

5. Trial H : Ryegrass Strain Trial:

This trial has been laid down in co-operation with the Grasslands Division, Department of Scientific and Industrial Research, and compares a number of strains introduced perennial ryegrass against Grasslands Division selections, and also Italian, "short" and "long" rotation ryegrasses. The technique used to measure grassland production, namely the use of movable "frames" in separate grazing paddocks, is probably the most satisfactory to date. It is also possible to obtain stock-grazing records (and on more elaborate trials', additional stock-production data)at the same *'time* and from the same fields as the pasture production data.

T'he trial was sown on the 17th April, 1947, with 2 cwt. of, super, 1 cwt. sulphate of ammonia, and 1 cwt. blood-and-bone per acre, broadcast before sowing. Each paddock is $\frac{1}{8}$th acre:, and all are sown with 3 lb. per acre "nucleus" white clover.

Treatments:

1. Perennial ryegrass : Welsh P.B.S., pasture strain, S.101.
2. Perennial ryegrass : " " " " S. 23.
3. Italian ryegrass : 1947 nucleus.
4. Short rotation " : 1947 "
5. Long " " : 1947 "
6. Perennial " : 1947 "
7. False perenn. " : Type 5 (Blend).
8. Perennial " : Welsh P.B.S., hay strain, S.24.

Results to Date:

Period: Since sowing to 20/8/47.

Yields in lb. per acre dry matter.

	Treatment							
	1	2	3	4	5	6	7	8
Total Yield	531.5	537.0	1,646.3	1,562.2	1,500.0	966.8	1,092.1	431.6
Total Relative to 6 = 100	55.0	55.9	170.3	161.6	155.2	812.4	1,010.1	306.8
Yield of Ryegrass	412.1	421.4	1,624.4	1,520.7	1,420.2	100.0	124.3	1,010.1
Ryegrass Yields Relative to	50.7	51.9	199.9	187.2	174.8			

6. Trials B1 , B2, B3, and B4:

This series of trials forms part of an investigation into the technique of pasture trials. The method under trial is essentially the use of white clover as an "indicator" species for measuring fertiliser responses. The application of lime, phosphate and potash is known to stimulate clover growth to a greater *extent* than the grasses, whereas the reverse is probably true with nitrogenous fertilisers. This fact led to the suggestion that pure clover swards should give greater responses to the three first-mentioned substances than standard mixed swards.

Considerable difficulties have been experienced in establishing and maintaining pure clover swards. The method now used, which gives the desired 'uniformity of type, is to propagate from tillers of a single original plant until sufficient plants are obtained to plant out *the'* trial area. It has been found advantageous to use a plant with a distinctive leaf marking to

enable recognition in the field,

The first trial with a pure clover sward was carried out at Ruakura in 1944/45, and gave indications that responses could be increased many times over by the use of such means, Several trials are now in progress at the Soil Fertility Station, Hamilton, but the Marton experiments will' give , it is hoped, a critical comparison of the differences in responses between fertiliser applications on a pure clover sward and those on a standard mixed pasture.

A modified "mowing and Grazing" technique is also under trial. With plots being grazed in a common enclosure, there is a danger of "transference of fertility!' from high yielding to low yielding plots. The method being tried out is as follows :-

Area B1 (pure clover sward and Area B2 (mixed sward) : Sown autumn, 1946; first topdressing with trial treatments made on 13/5/47. These areas will be mown for one year after the date of topdressing, without grazing, so that no transference of fertility is possible, It is expected by this time that the sward will commence to deteriorate, so that duplicate areas have been established (B3 and B4), which will be used to secure production records for one year from the time of the next annual topdressing (autumn, 1948), During that time B1 and B2 will be under grazing. At the time of annual topdressing in 1949, areas B1 and B2 will commence the second. year of mowing only, and B3 and B4 the first year's grazing. The only transference of fertility that can affect mowing-results is thus the residual fertility from the fertiliser applications made one year or more previously. Such transference should be of a considerably smaller degree than that likely to occur as a result of the current year's topdressing.

Treatments on each of B1, B2, B3 and B4:

1. Reverted super
2. Serpentine super
3. Super
4. Super + lime (pre-mix)

All at equivalent P_2O_5 of 4 cwt. super per acre.

5. Above plus 1 ton carbonate of lime per acre initially and 5 cwt. per acre per annum subsequently.
6.
7.
8.

Results to Date (from B1 and B2):

Period: 29/4/47 to 10/9/47 (topdressed 13/5/47).

Yields in lb. per acre dry matter.

Trial	Treatments							
	1	2	3	4	5	6	7	8
B1 (white clover), Yields	714.6	719.1	895.4	919.5	839.0	794.4	910.3	895.0
relative to 3 = 100	79.7	80.2	(100)	102.6	93.6	88.6	101.6	99.8
B2 (mixed pasture), Yields	1282.4	1335.6	1476.4	1368.6	1373.4	1358.7	1363.8	1567.3
relative to 3 = 100	86.9	90.5	(100)	92.7	93.0	92.0	92.4	106.2

7. Trial G : Seeds Mixture and Pasture Management Trial :

The object of this trial is the investigation of the establishment, persistency and productivity of various pasture seeds mixtures under various systems of management. The trial was sown on 2nd April, 1947, with 3 cwt. superphosphate per acre, and consists of 21 strips, each containing one of the seeds mixtures enumerated below. Across these strips, four Fields have been fenced off, and each will be subjected to a different form of management, namely:

A. Hard sheep-grazing (set stocking).
B. Lenient sheep-grazing (rotational).
C. Successive hay crops and moderate sheep-grazing.
D. Continuous cutting and removal of; the herbage at 6" to 8" height, with no grazing,

One or two light grazings have been taken off the area up to the beginning of October, and the management treatments have been in force since that period.

Seeds Mixtures: (Quant it ies in lb, per acre)

1. (Control): Ped, per, ryegrass, 25 + ped, white clover, 2.
2. Ped. Italian rye,, 15 + ped. per, rye., 15 + ped. wh, clover, 2.
3. Govt. Stock short rot. ryegrass, 15 + " " " 15 + " " " 2.
4. Long rot. rye., 1.5 + " " " 15 + " " " 2.
5. " " " 3 25 + ped. white clover, 2.
6. Ped. Per. " , 10 + ped. cocksfoot, 12 + ped. wh. clover, 2,
7. " " " , 10 + Timothy, 10 + " " " 2.
8. (Control) Ped. P. Ryegrass, 25 + ped. wh. clover, 2.
9. Tall oat grass, 15 + ped. wh. clover, 2.
10. Ped. per, rye., 25 + Broad red " , 4 + ped. wh. clover, 2.
11. " " " 25 + " " " , 2 + ped. Mont. red clover, 2, + ped. wh, clover, 2.
12. " " " 25 + ped. Mont. red " , 4 + ped. wh. clover, 2.
13. " " " 25 + Alsyke clover , 2.
14. " " " Per. 25 + strawberry " , 2.
15. (Control) Ped. Rye., 25 + ped. white clover, 2,
16. Complex mixture (per. rye. 25 + S.R. rye 10 + cocksfoot 8 + Timothy 4 + crested do-gstail 1 + white clover 2 + broad red clover 2 + Mont. red clover 2 + Alsyke 1).
17. Hay mixture (per. rye 5 + Italian rye 5 + cocksfoot 8 + Timothy 4 + white clover 2 + broad red. clover 2 + Mont. red clover 2 + Alsyke 1).
18. Ped. per, ryegrass, 25 + crested dogstail, 3 + ped. wh. clover, 2.
19. Phalaris tuberosa , 10 + ped, wh, clover, 2,
20. Cocksfoot, 10 + Timothy, 6 + ped. white clover, 2.
21. (Control) Ped, per,, rye., 25 + ped, white clover, 2.

8. Trial F : Method of Sowing Pasture and Rates of Seeding:

This trial compares three methods of sowing pasture seeds and three rates of seeding, It includes the new type "Holland" coulter, which is designed to spread the seeds in the drill.

The seeding treatments are as follows :-

1. Holland coulters at 20, 40, and 60 lb. per acre.
2. Ordinary " " " " " " " " "
3. Broadcast " " " " " " " " "

The seed mixture is:-

Mother seed perennial ryegrass ,	25 lb. per acre,
" " white clover ,	2 " " "
" " cocksfoot ,	10 " " "
Crested dogstail,	3 " " "

The trial was sown on 1st April, 1947. Superphosphate was sown over all plots at the rate of 3 cwt, per acre.

The trial is an observational one only, and observations are being kept on establishment and growth of the pasture of the various treatments, while being sub jected to sheep-grazing condit ions.

Weed Control: As an adjunct to this trial, weed control treatments will be laid dorm crosswise over all treatments, as follows : -

i)	Agroxone spray,	1 gai, per acre
ii)	" "	2 gals, per acre.
iii)	Weedone "	1 gal, per acre.
iv)	"	2 gals, per acre.
v)	Control,	

9. Trial T : Perennial Ryegrass Strains:

This trial was conducted in association with the Grasslands Division of the Department of' Scientific and Industrial Besearch, and the object was to obtain a measure of comparison of the following seed mixtures:-

(1) Government "Stock perennial ryegrass , **40** lb. acre.
" " type I white clover, **3** lb. "

(2) Mother seed perennial ryegrass , **40** lb, acre.
" " type I white clover, 3 lb, "

(3) Governmen t Stock perennial ryegrass , 40 lb. acre
" " type II white clover, **3** lb. "

The trial consisted of three paddocks approximately one-half acre each, and sown In the above mixtures respectively. Sowing was carried out in October, 1940. Manuring consisted of **3** cwt. per acre of superphosphate plus **5** cwt, carbonate of lime per acre, applied to all plots annually in the *autumn,*

The enclosure technique was adopted, three weighings being obtained from each paddock when weighing cuts were made.

Results to Date:

Yields in lb, of dry matter per acre per annum, also yields relative to treatment 1 = 100.

Year	Treatment 1		2		7	
	Yields	Relative to (1)	Yields	Relative to (1)	Yields	Relative to (1)
1941/42	**10,776**	100	11,895	110.4	10,998	102.1
1942/43	10,702	100	9,495	88.7	9,214	86.1
1943/44	10,124	100	10,323	101.9	9,863	97.4
1944/45	12,191	100	12,140	99.5	11,417	93.6
1945/46	**9,209**	100	9,803	106.5	8,624	**93.6**
1946/47	9,600	100	11,109	115.7	9,686	100.9
Totals (6 yrs.)	62,602	100	64,765	103.5	59,802	95.5

The trial results were,, to some extent affected by an invasion' of goose-grass and other species, and this was parti cularly marked on Treatment 1 .

The trial is now closed, and will be used during the coming season for the following investigations into the "blind-seed" disease of ryegrass,

Paddock 1: A fertiliser trial including 5 replications of the following treatments: -

1. No fertiliser.
2. Super , 3 cwt. per acre.
3. Super, 3 cwt . per acre + sulphate of ammonia, 1½ cwt. p. a.
4. " 3 " " " + " " " 3 " "
5. " 3 " " " + " " " 6 " "

Nitrogen is to be applied at the time of shooting. In addition, to complete pasture observations, the yields of seed and the germination and percentage infection of the seed with blind-seed disease will also be determined.

Paddock 2: A "time of shutting-up" trial, areas being closed for seed at fortnightly intervals from 1st October.

Paddock 3: A trial of various fungicides applied at the pre-flowering, flowering, and pre-harvesting periods. The various treatments are:-

1. No treatment,
2. Cuprox spray,
3. Phygon spray (1 lb, to 100 gals.)
4. Dithane spray (8 lb. to 100 gals.)
5. Colloidal sulphur spray (4 lb, to 100 gals.)
6. Cuprox dust,
7. Sulphur dust,

10. Trial A : Placement of Fertilisers:

This is a trial designed to study different methods of fertiliser placement when sowing down a pasture , It studies the possible beneficial effect of placing lime and fertiliser near the areas of maximum root. development.

The fertiliser used was superphosphate at 3 cwt. per acre, and on half of the plots 1 ton of carbonate of lime per acre was used in conjunction with the superphosphate.

There had been no applications of fertiliser on this area for 15 years before the trial was commenced.

The trial was laid down on 17th April, 1946, and the methods of sowing pasture seed and lime and fertiliser were as follows: (Plots 1L, 2L, 3L 4L have lime and fertiliser applied in the manner indicated.)

1 and 1L: Fertiliser ploughed down. Seed. broadcast,
2 and 2L: Fertiliser broadcast at sowing. Seed brc adcast.
3 and 3L : Fertiliser and seed drilled through 7-inch coulters.
4 and 4L: Half fertiliser ploughed down, and half broadcast at sowing. Seed broadcast.

There are three replications of each treatment, in a "split-plot" design, the method of sowing being split into "lime" and "no lime" plots. Two control plots (no treatment) are included, --one being at each end of the trial,

Pasture Seed Mixture:

Cert. perennial ryegrass:	25 lb. per acre
Italian ryegrass:	3 " " "
Cocksfoot :	6 " " "
Crested dogstail:	2 " " "
White clover:	2 " " "
Mont. red clover:	3 " " "
Total	41 lb. per acre

Results to Date:

Yields in lb. of dry matter of pasture per acre.

Period	No Lime				Lime				Control
	1	2	3	4	1L	2L	3L	4L	
From first cut 22/7/46 to 9/9/47	6,429	7,216	5,041	7,253	7,555	8,492	5,546	8,538	4,790
Relative yields, Control = 100	134	151	105	151	158	177	116	178	100

The following table summarises the statistical analysis of the first year's production of green matter from the, trial:-

(a) Comparison of Placements:

Yields in lb. of green material per acre.

Period, Etc.	Methods							
	1		2		3		4	
	Yield	Relative to (1)=100	Yield	Relative to (1)	Yield	Relative to (1)	Yield	Relative to (1)
April, 1946 - March, 1947	29,892	100	34,812	116	22,044	74	34,092	114
Diffces. from (1) - ploughed down	-		+ 4,920		- 7,848		+ 4,200	

Significant differences (5%), 2,326
(1%), 4,651

The above. dif'ferences have been fairly consistent throughout the year. The low yield of the drilled plots is due to the slowness shown by the sward in covering the ground between the drill rows.

(b) Effect of Lime:

Yields in lb. of green material per acre.

Period, Etc.	No Lime	Lime		Diffce. in favour of Lime	Significant Differences	
	Yield	Yield	Relative to No Lime =100		5%	1%
April, 1946/ March, 1947.	28,128	32,292	115	+ 4,164	468	1,505

This lime response has been generally significant since October, 1946.

The trial will be continued for at least 3 years without additional application of fertiliser. It would seem that it is necessary to apply part of the fertiliser and lime to the ground surface, if the newly-establishing pasture is to benefit from its application. The inferiority of drilled pasture might not have been in evidence in a drier season.

11. Trial I : Residual Effect of Phosphates and Lime:

This trial is of particular interest as it probably represents one of the oldest pasture experiments in New Zealand from which accurate production records are still being obtained. It was established by Mr. A.W. Hudson in October, 1932, under the "alternate mowing and grazing" technique he devised, and for the first 8 years received annual applications of the following treatments:-

1. Superphosphate, 4 cwt. per acre per annum.
2. Basic slag, 612 lb. per acre per annum.) to give equivalent
3. Gafsa phosphate, 350 lb. per acre per annum) P_2O_5 to 4 cwt. super.

IL, 2L, 3L above, plus carbonate of lime, 1 ton initially and 3 cwt. per annum subsequently.

The following table summarises the results secured for the B-year period under regular topdressing (29/9/32 to 24/7/40).

Yields in lb. of dry matter per acre;

Relative yields (in brackets) to treatment 1 = 100, and 1L = 100.

Yield of Treatment 1	Differences from Treatment 1			Yield of Treatment 1L	Differences from Treatment 1L	
	2	3	IL		2L	3L
74,034 (100)	+ 660 (100.9)	- 3340 (95.5)	+ 5299 (107.2)	79.333 (100)	- 4,144 (94.8)	- 5,434 (93.2)

(On green weights, all the differences except (2) minus (I) are significant.)

The last fertiliser application was made in the autumn of 1940.

The following table of relative yields of dry matter (Treatment 1 = 100) will show the trend of responses to residual amounts of fertiliser and lime since that date (7 years since last topdressing).

Year	Yield of 1	Yields of Dry Matter relative to Treatment 1 = 100 and " IL = 100					
		2	3	1L	Yield of 1L	(Relative) 2L	(Relative) 3L
1940/41	8,580	99	94.8	109.4	9,386	97.3	94.8
1941/42	10,890	106.3	99.7	116.3	12,670	100.2	98.2
1942/43	7,121	100.7	99.6	111.7	7,951	95.8	99.6
1943/44	7,783	103.8	99.9	117.2	9,119	98.0	97.4
1944/45	9,722	101.1	99.1	110.8	10,775	98.6	99.9
1945/46	69945	102.3	99.0	l-I0.4	7,667	102.7	100.0
1946/47	5,390	103.0	101.7	111.3	6,001	99.9	100.6

Since April, 1946, a series of weights have been taken from the headlands and inter-plot strips which have never received fertiliser, in an endeavour to measure the residual effect of the topdressings applied in comparison with a "no manure." For the year 1946/47, the dry matter yield of these strips relative to superphosphate (Treatment I) as 100 was 85.0.

This residual effect from superphosphate 6 years after topdressing must , however , be examined against the general decline in yield which it would appear should have occurred since annual topdressings were stopped, A comparison with Trial V, which is , adjacent, shows the extent of the decline in yield which has occurred. Such a decline is also reflected in a gradual deterior-

ation of the sward.

(a) Yields of Treatment 1, Trial V. (Ped. perennial ryegrass + ped, white clover) and topdressed as follows with superphosphate:

3 cwt. at sowing 30/10/41.
3 cwt. serpentine super 23/3/43: 1 cwt. super 21/7/44:
1 cwt. super 3/4/45: 2 cwt. super 12/3/46:
3 cwt. super i- 5 cmt. lime 4/3/47.

(b) Yields of Treatment 1, Trial I (Super, 4 cwt. per acre annually till 1940, thence no treatment).

Yields in lb. dry matter per acre per annum.

Year	Trial V.	Trial I.	Difference V - I	Difference Expressed as a percentage of I (I = 100)
1940/41	-	8,580	-	-
1941/42	-	10,890	-	-
1942/43	8,333	7,121	1,212	117
1943/44	8,461	7,783	678	109
1944/45	11,439	9,722	1,717	118
1945/46	10,121	6,945	3,176	145
1946/47	9,408	5,390	4,018	174

A similar comparison between Treatment 1L (super + lime) of Trial I and Treatment 2 (M/S perennial ryegrass + type 1 white clover manured annually with 3 cwt. superphosphate + 5 cwt. carbonate of lime) of Trial I confirms the above tendencies.

Year	Trial T.	Trial I.	Difference T - I	Difference as a percentage of I.
1940/41	-	9,386		
1941/42	11,895	12,670	- 775	94
1942/43	9,495	7,951	+ 1,544	119
1943/44	10,323	9,119	+1,204	113
1944/45	12,140	10,775	+ 1,365	113
1945/46	9,803	7,667	+ 2,135	128
1946/47	11,109	6,001	+ 5,108	185

12. Trial D : Cultivation Trial:

The aim of this trial is the comparison of two different methods of incorporating a green manure crop into the soil prior to sowing down pasture, The green manure crop was barley, and the two methods used were:

(1) Ploughing under, and
(2) Discing in.

The barley crop was sown in April, 1946, and was incorporated into the soil in October, 1946. Both areas were sown to grass on 31st March, 1947, the following seed mixture being used:

Mother Seed perennial ryegrass: 40 lb. per acre.
No. 1 white clover: 2 lb. per acre.

The enclosure method for measuring production by mowing is being adopted, but as the first weights were not obtained until 8/9/47, there is little to report yet in this connection. There was practically no difference in yield at the first cutting of herbage.

13. Trial V : Ryegrass Mixtures (with "Short Rotation"):

This is a trial conducted in conjunction with the Grass-

lands Division, Department of Scientific and Industrial Research.

The comparison is between three seed mixtures, which are as follows:-

(1) Certified pedigree perennial ryegrass: 40 lb. per acre
Certified pedigree white clover: 3 lb. per acre.

(2) Short rotation ryegrass: 20 lb. per acre.
Certified pedigree perennial ryegrass: 20 lb. per acre.
Certified pedigree white clover: 3 lb. per acre.

(3) Short rotation ryegrass: 40 lb. per acre.
Certified pedigree white clover: 3 lb. per acre.

The trial was sown on 30th October, 1941, with 3 cwt. superphosphate per acre. A phosphate dressing has been given annually since laying-down.

The trial consists of 1 paddock of each treatment, and the enclosure method of measuring production is used.

Results to Date:

Production in lb. dry matter per acre and yields relative to Treatment 1 = 100.

Period	Treatment 1		Treatment 2		Treatment 3	
1942/43	8,333	100	8,437	101	7,334	88
1943/44	8,461	100	9,035	107	8,803	104
1944/45	11,439	100	12,375	108	13,407	117
1945/46	10,121	100	10,425	103	10,356	102
1946/47	9,708	100	10,742	114	9,524	101
Total to 28/5/47:	50,541	100	54,545	108	52,653	104

During the years the short rotation ryegrass is usually superior yielding in the winter and early spring period, but the perennial ryegrass is more productive during the summer. The persistency of the short rotation ryegrass under conditions of regular sheep-grazing and absence of re-seeding has been exceptionally good, as is shown by the following table:-

Yields of ryegrass in lb. dry matter per acre.

Period	Treatment		
	1 (Per. ryegrass)	2 (Short rot. + per.)	3 (Short rot.)
12/1/42-25/8/42 (3 seasons)	2,582 (86.9)	3,782 (91.8)	4,165 (95.1)
26/8/42-1/9/43	6,862 (80.3)	6,444 (76.6)	5,942 (82.2)
2/9/43-29/8/44	7,080 (81.2)	6,856 (71.9)	6,446 (66.3)
29/8/44-27/8/45	8,932 (74.7)	8,399 (67.2)	10,345 (76.4)
28/8/45-19/8/46	6,462 (64.2)	6,380 (59.0)	7,897 (76.2)
20/8/46-28/5/47 (3 seasons)	6,196 (74.8)	6,533 (71.3)	5,479 (74.0)

The figures in brackets represent the proportion of the total sward production, which has been secured from ryegrass.

14. Trial C : Timothy Trial:

In this experiment, two strains of Timothy are compared in sowings with and without. perennial ryegrass. Product ion in each case is measured by means of frames, and there are four treatments with no replications.

The sowings are as follows, all including ped. white clover, 2 lb. per acre.

1. Timothy (Abersythwyth S.48), 10 lb, p.a. + ped. per. ryegrass, 15 lb, p.a.
2. Timothy (Abersythwyth S.48), 10 lb. p.a.
3. Timothy (ordinary commercial) 10 lb. p.a.
4. " " " 10 lb., p.a. + ped, per. ryegrass, 15 lb. p.a.

The trial was sown on 28th March, 1946, with superphosphate at 3 cwt. per acre. (It is topdressed annually in the autumn with 3 cwt. serpentine super + 5 cwt, carbonate of lime).

Results to Date:

Yields in lb. per acre dry matter, and yields relative to (1) = 100.

Period: 7/10/46 to 28/5/47.

Yields, Etc.	Treatment			
	1	2	3	4
Yields	4,415	4,593	4,678	4,679
Relative to (1) = 100	100	104	106	106

An analysis of the mown herbage on 6th June, 1947, gave the following composition: -

Species	Treatment			
	1	2	3	4.
Ryegrass	75	60	44	89
Timothy				
White Clover	20	22	24	11
Other Species	1	I I	25	-

It is evident that the ryegrass where sown has practically completely suppressed the Timothy establishment.

15. Trial E : Forms of Phosphatic Topdressing:

This trial compares a number of phosphate-containing fertilisers by measuring their effect on pasture production under a "mowing and grazing" technique. Several types new to New Zealand are included, in particular "fused" and concentrated phosphates produced by the Tennessee Valley Authority, United States. A similar trial is being conducted at the Soil Fertility Station, Hamilton, The concentrated fertilisers have particular merit when one considers the transport factor connected with hill-country topdressing and the possibility of distribution of fertilisers from aeroplanss.

The trial was topdressed for the first time on 26th February, 1947, after several uniformity cuts had been secured,

It will be topdressed annually in the autumn. All phosphates are applied at a rate to give a P_2O_5 application **equivalent to** that of **3** cwt. per acre superphosphate.

Treatments:	Total % P_2O_5
1. Metaphos	**63.2**
2. Serpentine super	14.3
3. Bonedust	**20.9**
4. Heskett slag	17.0
5. Fused tricalcium phosphate	27.1
6. Superphosphate	21.7
7. Basic slag	16.1
8. Double superphosphate	49.2
9. Silico phosphate (U.K.)	32.9
C. Control	

Results to Date:

Yields in lb. of dry matter per acre and yields relative to c = 100 and-to super = 100.

Period: 28/2/47 t o 8/7/47.

	C	1	2	3	4	5	6	7	8	9
Yields	827	822	1,009	893	831	**1925**	1,186	973	1,104	1,000
Relative to c	100	**99.3**	**121.1**	108.1	100.5	111.9	143.5	117.8	133.6	121.0
Relative to (6) super	**69.7**	69.3	85.1	**75.3**	**70.0**	**8 0**	0 100	82.0	93.1	84.3
Ranking	**9**	10	3	7	8	6	1	5	2	4

16. Trial-S : Serpentine Super Trial:

This experiment, conducted under the "enclosure" technique consists of' 4 replications of the Following 3 **treatments,** each of the 12 plots being of ¼-acre and fenced off and grazed separately.

1. Superphosphat e, **4 cwt.** per acre per annum (fields 1 ,4,7,10).
2. Serpentine super,!+ " " " " " (" 2,6,8,12).
3. Super, **3** cwt. + lime, **3** cwt. (pre-mix) per acre per annum ' (" **395,991-o.**

Treatments (2) and **(3)** have each approximately the same application of total phosphate; in (2) it has been "reverted" by serpentine and in **(3)** by lime. There is, however, an excess lime application in **(3)** of about 2 cwt. per acre per annum.

The trial was laid down in 1940 and is topdressed annually in the autumn with the above treatments. Pasture production records are supplemented by full chemical analyses of soil and pasture, and by stock-grazing records.

Results to Date:

Yields in lb. of dry matter of pasture herbage per acre an.d yields relative to (1) (super) = 100.

Period between top-dressings	Treatment					
	Super.		Serp. super.		Super + Lime	
	Yield	Relative	Yield	Relative	Yield	Relative
1940/41	10,503	100	10,584	100.8	11,737	111.7
1941/42	9,979	100	10,886	107.1	12,296	123.2
1942/43	10,449	100	10,746	102.8	12,147	116.2
1943/44	9,800	100	9,834	100.3	11,444	116.8
1944145	9,108	100	8,941	98.2	10.235	112.4
1945/46	7,507	100	7,681	102.3	9,564	127.4
1946/47	8,299	100	8,578	103.4	9,571	115.3
Totals, 7 years	65,646	100	67,249	102.4	76,995	117.3

The increased yield from serpentine super over super just fails to reach significance. This result should be considered in relation to the fact that the total P_2O_5 applied in the serpentine super dressings is approximately one-quarter less than that applied in the superphosphate, and suggests a greater efficiency per unit of phosphate with serpentine super.

The other interesting feature of the trial is the unexpected and significant improvement from Treatment 3 (super plus lime) over both the superphosphate and serpentine super treatments, The result may be due to a superiority of lime-reverted super over the other two fertilisers, or it may be due to the small excess of lime (2 cwt. per acre per annum) applied with the phosphate. When the trial was laid down, it was considered that such a dressing was insignificantly small. The whole matter is of importance, however, and a number of more critical trials with lime-reverted super (with and without this small excess of lime) are being conducted at Marton (B trial series , and E) and elsewhere in New Zealand,

17. Weed Control Trial:

This trial consists of an acre of land which was sown *in* the spring of, 1946 with a very light seeding (5 lb. perennial ryegrass + 1 lb. white clover per acre). on a hastily-prepared seed-bed in adeliberate and successful attempt to secure a weed-infested pasture. Strips across the area were treated with various weedkillers at different rates per acre of sprays and dusts. At the stage {December 3rd, 1946) when the first spraying was made, the main weeds were scarlet pimpernel, spurrey, redshank , docks , black nightshade, sorrel, fathen, sowthistle, Scotch thistle,, hawkbit , dandelion, and narrow-leaved plantain.

The next stage was to apply the most successful treatment ("Weedone" spray at 2 gals. per acre) in a block across all plots in March, 1947, and sections of that block have been surface-sown and topdressed with the object of obtaining a reasonable sward from a very weedy and *open* initial establishment.

Although this result has largely been secured, even without the surface-sowing and topdressing, there are certain reservations that must be attached to this trial, namely -

(a) The danger of damage to clover species from the hormone-type weedkillers in particular.

(b) The fact that the cost of treatment much exceeds that of clean cultivation.

(c) The weeds that have been killed were mostly in a susceptible seedling stage.

(d) Many of the weeds killed were annual weeds which,, normally, would soon have been eliminated under grazing.

18. Summary:

The foregoing material' Will indicate the scope of the work nom being carried out at Marton. Details have not been given of the annual crop trials to be sown this spring, which will not be ready for inspect ion. These will be -

(a) A lamb-fattening trial , comparing the merits of sweet blue and sweet yellow lupins, chou moellier and two types of rape.

(b) A potato manurial trial investigating the effect of time of application of sulphate of ammonia.

(c) A simple potato variety trial With some 25 varieties of . potatoes.

(d) A trial of the field germination of several lines of perennial and Italian ryegrass.

It is intended in the future to carry on the work at Marton into the practical problems connected with pasture production, and to an increasing degree to utilise the grazing animal as a measuring-stick wherever possible. It is anticipated, however , that pasture herbage Weights will continue to form the basis of comparison between treatments, but these will be supplemented to a greater degree with stock records and chemical analyses of soils and pastures. A small area will be maintained for cropping trials , but it is felt that the emphasis must always remain on the pasture, which represents by far the greatest proportion of the stock-feed in most parts of the country.