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Yields of the Field Experiments 1994

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94/R/PG/5 Park Grass - Old Grass

Rothamsted Research

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94/R/PG/5

PARK GRASS

Object: To study the effects of organic and inorganic manures and lime on old grass (for hay).

The 139th year, hay.

For previous years see 'Details' 1967 and 1973 and 74-93/R/PG/5.

Treatments: Combinations of:-

Whole plots

1. MANURE

Fertilizers and organic manures:

N1	Plot 1	N1
O(D)	Plot 2	None (D until 1863)
O	Plot 3	None
P	Plot 4/1	P
N2P	Plot 4/2	N2 P
N1MN	Plot 6	N1 P K Na Mg
MN	Plot 7	P K Na Mg
PNAMG	Plot 8	P Na Mg
MN(N2)	Plot 9/1	P K Na Mg (N2 until 1989)
N2MN	Plot 9/2	N2 P K Na Mg
N2PNAMG	Plot 10	N2 P Na Mg
N3MN	Plot 11/1	N3 P K Na Mg
N3MNSI	Plot 11/2	N3 P K Na Mg Si
O	Plot 12	None
D/F	Plot 13	D/F
MN(N2*)	Plot 14/1	P K Na Mg (N2* until 1989)
N2*MN	Plot 14/2	N2* P K Na Mg
MN(N2*)	Plot 15	P K Na Mg (N2* until 1875)
N1*MN	Plot 16	N1* P K Na Mg
N1*	Plot 17	N1*
N2KNAMG	Plot 18	N2 K Na Mg
D	Plot 19	D
D/N*PK	Plot 20	D/N*P K

N1, N2, N3:	48, 96, 144 kg N as sulphate of ammonia
N1*, N2*:	48, 96 kg N as nitrate of soda (30 kg N to Plot 20, only in years with no farmyard manure)
P:	35 kg P (15 kg P to Plot 20, only in years with no farmyard manure) as triple superphosphate in 1974 and since 1987, single superphosphate in other years
K:	225 kg K (45 kg K to Plot 20, only in years with no farmyard manure) as sulphate of potash
Na:	15 kg Na as sulphate of soda
Mg:	10 kg Mg as sulphate of magnesia
Si:	Silicate of soda at 450 kg
D:	Farmyard manure at 35 tonnes every fourth year
F:	Fish meal every fourth year to supply 63 kg N
MN:	P K Na Mg

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Sub-plots

2. LIME Liming:

- A a Ground chalk applied as necessary to achieve pH7
- B b Ground chalk applied as necessary to achieve pH6
- C c Ground chalk applied as necessary to achieve pH5
- D d None

NOTE: Lime was applied regularly, and at the same rate, to all 'a' and 'b' sub-plots of Plots 1 to 17 (except 12) from 1924. Differential liming started in 1965 on certain 'b' and 'c' sub-plots (except on Plot 12) and in 1976 on certain 'a' sub-plots (including Plot 12) and 12b. Lime last applied in 1994.

Chalk applied 1994 (tonnes CaCO₃):

Plot	a	b	c
1	7.0	1.5	0.8
2	7.0	-	0.3
3	7.0	-	0.3
4/1	7.0	-	0.3
4/2	12.1	8.6	3.6
6	7.0	1.5	-
7	7.0	-	0.3
8	7.0	-	0.3
9/1	21.0	11.5	8.8
9/2	15.1	8.6	5.1
10	12.1	8.6	5.1
11/1	22.0	10.5	9.0
11/2	14.0	10.5	9.0
12	3.0	0.8	0.3
13	5.0	-	0.3
14/1	7.0	-	-
14/2	2.2	-	-
15	3.0	0.8	1.3
16	2.2	-	-
17	2.2	-	-
18	12.1	6.6	8.1

None applied to plots 18/2, 19 and 20. This application was the first in a triennial scheme of soil pH analyses and chalk applications.

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Additional sub-plots (Plots 18, 19 and 20 only) (tonnes CaCO₃ applied every fourth year 1920-1964):

N2KNAMG0	18-1	None
N2KNAMG2	18-2	13.5
N2KNAMG1	18-3	7.9
DO	19-1	None
D2	19-2	6.3
D1	19-3	1.1
D/N*PK0	20-1	None
D/N*PK2	20-2	5.6
D/N*PK1	20-3	1.1

Since 1965 Plot 18-1 has been split into two for treatments 'c' and 'd' above and Plot 18-3 split into two for treatments 'a' and 'b'. Plots 19 and 20 received no further chalk after 1968; plot 18/2 no further chalk after 1972.

NOTE: For a fuller record of treatments see 'Details' etc.

Experimental diary:

19-Nov-93 : T : P applied.
24-Nov-93 : T : K, Na, Mg and Si applied.
21-Jan-94 : T : Chalk application started.
08-Feb-94 : T : Chalk application finished.
21-Apr-94 : T : N applied.
27-Jun-94 : B : First sample cut. Remaining area cut for hay (started).
28-Jun-94 : B : Remaining area cut for hay (finished). Hay turned.
29-Jun-94 : B : Hay turned.
30-Jun-94 : B : Hay turned and rowed up.
01-Jul-94 : B : Hay baled.
29-Nov-94 : B : Second sample cut, herbage removed (started).
30-Nov-94 : B : Second sample cut, herbage removed (finished).
Remaining area cut, herbage removed.

NOTES: (1) Herbage samples from selected plots were taken for chemical analysis.
(2) A comparison of hay and silage yields was made on selected plots.
(3) Number and biomass of individual plant species were measured on all plots.

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1ST CUT (27/6/94) DRY MATTER TONNES/HECTARE

***** Tables of means *****

	LIME	A	B	C	D	MEAN
	MANURE					
N1	1	3.23	3.26	3.57	2.22	3.07
O(D)	2	2.82	3.84	2.44	2.22	2.83
O	3	2.90	3.39	1.95	2.17	2.60
P	4/1	3.88	4.74	3.28	3.22	3.78
N2P	4/2	4.33	3.68	4.00	2.48	3.62
N1MN	6	5.92	5.74			5.83
MN	7	5.39	5.62	5.80	4.56	5.34
PNAMG	8	3.93	4.76	3.80	3.55	4.01
MN(N2)	9/1	5.12	3.67	1.87	2.70	3.34
N2MN	9/2	6.45	6.50	5.70	6.19	6.21
N2PNAMG	10	4.92	4.24	4.15	3.13	4.11
N3MN	11/1	6.52	7.53	6.33	4.83	6.30
N3MNSI	11/2	6.57	6.56	6.60	5.73	6.36
O	12	3.09	3.04	1.88	1.95	2.49
D/F	13	4.58	5.53	5.19	5.13	5.11
MN(N2*)	14/1	5.02	4.57	4.00	3.37	4.24
N2*MN	14/2	2.82	6.66	5.31	4.88	4.92
MN(N2*)	15	4.47	5.44	5.29	4.71	4.98
N1*MN	16	5.12	5.61	4.85	4.82	5.10
N1*	17	3.85	3.56	3.19	3.04	3.41
N2KNAMG0	18/1			4.94	2.77	3.86
N2KNAMG2	18/2					4.32
N2KNAMG1	18/3	4.54	3.82			4.18
D0	19/1					5.76
D2	19/2					5.56
D1	19/3					5.99
D/N*PK0	20/1					5.63
D/N*PK2	20/2					5.82
D/N*PK1	20/3					5.48

1ST CUT MEAN DM% 28.1

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2ND CUT (30/11/94) DRY MATTER TONNES/HECTARE

***** Tables of means *****

	LIME	A	B	C	D	MEAN
	MANURE					
N1	1	2.36	1.17	0.86	0.20	1.15
O(D)	2	0.80	0.98	0.88	0.80	0.87
O	3	0.67	0.87	0.81	0.91	0.82
P	4/1	0.91	0.72	0.92	0.73	0.82
N2P	4/2	1.18	1.25	0.55	0.26	0.81
N1MN	6	0.80	0.84			0.82
MN	7	0.77	1.06	1.13	0.58	0.88
PNAMG	8	0.62	0.72	0.84	0.91	0.77
MN(N2)	9/1	0.56	0.55	0.19	0.02	0.33
N2MN	9/2	0.83	0.99	0.44	0.42	0.67
N2PNAMG	10	0.75	0.97	0.74	0.77	0.81
N3MN	11/1	1.17	0.86	0.82	0.55	0.85
N3MNSI	11/2	1.48	1.30	0.78	0.76	1.08
O	12	0.33	0.53	0.68	0.51	0.51
D/F	13	1.39	1.31	0.88	1.09	1.17
MN(N2*)	14/1	1.67	1.11	0.83	0.74	1.09
N2*MN	14/2	1.97	2.07	1.25	1.09	1.60
MN(N2*)	15	1.00	1.37	0.97	0.75	1.02
N1*MN	16	1.40	1.52	0.92	0.86	1.17
N1*	17	0.57	0.54	0.78	1.09	0.75
N2KNAMG0	18/1			0.67	0.18	0.42
N2KNAMG2	18/2					1.07
N2KNAMG1	18/3	0.79	0.79			0.79
D0	19/1					1.43
D2	19/2					3.29
D1	19/3					1.38
D/N*PK0	20/1					1.64
D/N*PK2	20/2					1.93
D/N*PK1	20/3					2.16

2ND CUT MEAN DM% 32.8

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TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

***** Tables of means *****

LIME		A	B	C	D	MEAN
MANURE						
N1	1	5.59	4.43	4.43	2.42	4.22
O(D)	2	3.62	4.83	3.32	3.02	3.70
O	3	3.57	4.26	2.76	3.08	3.42
P	4/1	4.79	5.46	4.20	3.94	4.60
N2P	4/2	5.50	4.93	4.55	2.74	4.43
N1MN	6	6.72	6.58			6.65
MN	7	6.16	6.68	6.93	5.14	6.23
PNAMG	8	4.55	5.47	4.65	4.46	4.78
MN(N2)	9/1	5.68	4.21	2.06	2.72	3.67
N2MN	9/2	7.28	7.49	6.15	6.61	6.88
N2PNAMG	10	5.68	5.21	4.89	3.91	4.92
N3MN	11/1	7.69	8.38	7.15	5.37	7.15
N3MNSI	11/2	8.04	7.86	7.38	6.49	7.44
O	12	3.41	3.58	2.56	2.46	3.00
D/F	13	5.98	6.84	6.07	6.22	6.28
MN(N2*)	14/1	6.69	5.68	4.83	4.12	5.33
N2*MN	14/2	4.79	8.73	6.56	5.97	6.51
MN(N2*)	15	5.47	6.81	6.25	5.46	6.00
N1*MN	16	6.52	7.13	5.77	5.67	6.27
N1*	17	4.42	4.09	3.97	4.14	4.15
N2KNAMG0	18/1			5.62	2.95	4.28
N2KNAMG2	18/2					5.39
N2KNAMG1	18/3	5.33	4.61			4.97
D0	19/1					7.18
D2	19/2					8.85
D1	19/3					7.38
D/N*PK0	20/1					7.28
D/N*PK2	20/2					7.75
D/N*PK1	20/3					7.64

TOTAL OF 2 CUTS MEAN DM% 30.4

PLOT AREA HARVESTED 0.00002