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Results of the Classical and Other Long-term Experiments 2004

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2004

Rothamsted Research

04/R/PG/5 - Park Grass

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04/R/PG/5

PARK GRASS

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

The 149th year, hay.

For previous years see 'Details' 1977 and 1973 and 74-03/R/PG/5.

Treatments: Combinations of:-

Whole plots

1. MANURE Fertilizers and organic manures:

N1	Plot 1	N1
K	Plot 2/1	K since 1996 (as 2/2 before)
O(D)	Plot 2/2	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 13/1	None (D/F until 1993/1995)
D/PM(F)	Plot 13/2	D/PM (F until 1999)
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 in years with no farmyard manure)	
P:	35 kg P (15 kg P to plot 20 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 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 t every fourth year	
F:	Fishmeal every fourth year to supply 63 kg N (stopped 1999; replaced by PM)	

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1. MANURE Fertilizers and organic manures(cont.)

PM Pelleted poultry manure at 2 t, every fourth year to supply 63 kg N (started 2003)

MN: P K Na Mg as above

Sub-plots

2. LIME Liming plots 1-18 (excluding 18/2):

A Ground chalk applied as necessary to achieve pH7

B Ground chalk applied as necessary to achieve pH6

C Ground chalk applied as necessary to achieve pH5

D None

NOTE: Lime was applied regularly 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 was applied in 2003, the fourth application in a triennial scheme of soil pH analysis and remedial chalk applications.

[This note was incorrect in 97-01/R/PG/5 Yield book entries.]

LIME Liming plots 18-20:

NOTE: Differential rates of lime were applied to sub-plots 2 and 3 regularly 1920-1974. Since 1975 plot 18-1 has been split into two for treatments 'C' and 'D' as 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.

[This note was incorrect in 97-01/R/PG/5 Yield book entries.]

Experimental diary:

16-Feb-04 : T : : P applied.
04-Mar-04 : T : : K, Si, Na, Mg applied.
27-Apr-04 : T : : N applied.
01-May-03 : P : : Cut paths.
14-Jun-04 : T : : Cut sample areas for yield, sampled and weighed, and carted cut grass.
15-Jun-04 : T : : Cut sample areas for yield, sampled and weighed, and carted cut grass. Cut discards.
16-Jun-04 : B : : Tedded hay.
17-Jun-04 : B : : Rowed up and baled hay.
22-Jun-04 : B : : Topped headlands.
29-Jun-04 : B : : Topped SW corner.
11-Nov-04 : T : : Cut sample areas for yield, sampled and weighed, and carted cut grass.
12-Nov-04 : B : : Cut discards.

NOTE: Samples of herbage from cut was taken for chemical analysis. Unground samples of herbage from all plots were archived.

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1ST CUT (14-17/6/04) DRY MATTER TONNES/HECTARE

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

	LIME	A	B	C	D	MEAN
	MANURE					
N1	1	2.48	2.66	1.94	0.82	1.97
K	2/1	2.36	2.90	2.20	2.30	2.44
O(D)	2/2	2.16	2.56	1.54	2.80	2.27
O	3	2.42	2.79	1.73	2.37	2.33
P	4/1	3.05	3.64	3.35	3.15	3.30
N2P	4/2	3.91	3.44	4.29	1.57	3.30
N1MN	6	5.52	5.69			5.60
MN	7	5.08	6.11	4.98	3.81	4.99
PNAMG	8	3.16	3.92	3.06	3.35	3.37
MN(N2)	9/1	4.70	4.87	5.42	2.22	4.30
N2MN	9/2	6.69	5.97	5.87	4.38	5.73
N2PNAMG	10	4.38	4.35	4.94	2.79	4.11
N3MN	11/1	6.99	7.14	6.70	5.21	6.51
N3MNSI	11/2	6.39	7.06	6.65	6.46	6.64
O	12	2.53	2.11	2.13	1.66	2.11
(D/F)	13/1	4.70	5.20	4.83	4.30	4.76
D/PM	13/2	3.91	6.06	5.91	5.78	5.42
MN(N2*)	14/1	4.42	5.13	5.00	5.17	4.93
N2*MN	14/2	4.99	6.19	6.59	5.22	5.75
MN(N2*)	15	3.88	4.35	4.50	3.45	4.05
N1*MN	16	5.14	5.66	4.29	4.16	4.81
N1*	17	3.00	3.55	2.87	3.14	3.14
N2KNAMG0	18/1			4.46	1.32	2.89
N2KNAMG2	18/2					4.08
N2KNAMG1	18/3	3.31	3.75			3.53
D0	19/1					4.96
D2	19/2					5.90
D1	19/3					5.06
D/N*PK0	20/1					5.97
D/N*PK2	20/2					6.36
D/N*PK1	20/3					5.95

1ST CUT MEAN DM% 29.3

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2ND CUT (11/11/04) DRY MATTER TONNES/HECTARE

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

	LIME	A	B	C	D	MEAN
	MANURE					
N1	1	1.31	1.44	0.90	0.27	0.98
K	2/1	0.91	1.03	0.70	0.91	0.89
O(D)	2/2	0.82	1.51	1.02	1.42	1.19
O	3	0.84	1.55	0.99	1.59	1.25
P	4/1	1.19	1.38	1.59	1.58	1.44
N2P	4/2	1.13	1.16	1.28	0.69	1.06
N1MN	6	1.40	1.59			1.49
MN	7	1.58	2.14	1.71	1.35	1.69
PNAMG	8	1.18	1.38	1.51	1.61	1.42
MN(N2)	9/1	1.98	1.89	1.20	0.16	1.31
N2MN	9/2	2.25	2.17	1.68	2.51	2.15
N2PNAMG	10	0.50	1.81	2.19	1.89	1.60
N3MN	11/1	2.36	2.37	2.08	3.14	2.49
N3MNSI	11/2	3.10	2.69	2.33	2.68	2.70
O	12	1.89	2.13	2.66	2.15	2.21
(D/F)	13/1	2.39	2.50	2.31	1.48	2.17
D/PM	13/2	2.15	3.63	3.50	3.29	3.14
MN(N2*)	14/1	2.03	2.25	1.64	1.97	1.97
N2*MN	14/2	1.36	2.16	2.11	2.09	1.93
MN(N2*)	15	1.82	2.11	1.57	1.16	1.67
N1*MN	16	2.08	2.52	2.21	1.91	2.18
N1*	17	1.49	1.88	1.75	1.68	1.70
N2KNAMG0	18/1			1.86	0.57	1.22
N2KNAMG2	18/2					2.28
N2KNAMG1	18/3	1.76	2.32			2.04
D0	19/1					2.38
D2	19/2					2.81
D1	19/3					2.83
D/N*PK0	20/1					2.87
D/N*PK2	20/2					3.07
D/N*PK1	20/3					2.72

2ND CUT MEAN DM% 27.6

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TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

LIME MANURE	A	B	C	D	MEAN
N1 1	3.79	4.10	2.83	1.09	2.95
K 2/1	3.27	3.93	2.90	3.20	3.33
O(D) 2/2	2.98	4.07	2.55	4.23	3.46
O 3	3.26	4.35	2.72	3.96	3.57
P 4/1	4.24	5.02	4.94	4.73	4.73
N2P 4/2	5.03	4.60	5.56	2.26	4.36
N1MN 6	6.92	7.27			7.10
MN 7	6.65	8.25	6.68	5.16	6.69
PNAMG 8	4.34	5.31	4.57	4.97	4.79
MN(N2) 9/1	6.68	6.76	6.62	2.38	5.61
N2MN 9/2	8.94	8.14	7.55	6.90	7.88
N2PNAMG 10	4.87	6.17	7.12	4.68	5.71
N3MN 11/1	9.35	9.51	8.78	8.35	9.00
N3MNSI 11/2	9.50	9.75	8.98	9.14	9.34
O 12	4.43	4.23	4.79	3.81	4.31
(D/F) 13/1	7.08	7.69	7.14	5.78	6.92
D/PM 13/2	6.06	9.69	9.41	9.07	8.56
MN(N2*) 14/1	6.45	7.38	6.63	7.14	6.90
N2*MN 14/2	6.35	8.35	8.70	7.30	7.68
MN(N2*) 15	5.71	6.46	6.07	4.62	5.71
N1*MN 16	7.21	8.18	6.50	6.08	6.99
N1* 17	4.49	5.43	4.62	4.81	4.84
N2KNAMG0 18/1			6.32	1.89	4.11
N2KNAMG2 18/2					6.36
N2KNAMG1 18/3	5.07	6.07			5.57
D0 19/1					7.34
D2 19/2					8.71
D1 19/3					7.89
D/N*PK0 20/1					8.84
D/N*PK2 20/2					9.43
D/N*PK1 20/3					8.67

TOTAL OF 2 CUTS MEAN DM% 28.4