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Yields of the Field Experiments 1977

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77/R/CS/10 and 79/W/CS/10 Long-term Liming - Oats

Rothamsted Research

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77/R/CS/10 and 77/W/CS/10

LONG TERM LIMING

Object: To study the effects of different amounts of lime on the yields of a sequence of crops. The effects of P, K and Mg are also studied - Rothamsted (R) Sawyers I and Woburn (W) Stackyard C.

Sponsor: J. Bolton.

The 16th year, spring oats.

For previous years see 'Details' 1967, 1973 and 74-76/R&W/CS/10.

Design: 2 randomised blocks of 16 plots, split into 2.

Whole plot dimensions: 6.40 x 18.3.

Treatments: All combinations of:-

Whole plots

1. LIME Ground chalk (tonnes CaCO_3) (total applied 1962-63):

R	W
0	0
5	5
10	12
20	19

2. P205 Phosphate, applied cumulatively to previous dressings, as superphosphate (kg P205):

0
63

3. K20 Potassium, applied cumulatively to previous dressings, as muriate of potash (kg K20):

0
126

Sub plots

4. MG Magnesium, applied cumulatively in 1974, 1976 and 1977 only, as Epsom salts (kg Mg):

0
112

Basal applications:

Sawyers I (R): Manures: N at 80 kg, combine drilled. Weedkillers: Dicamba with mecoprop and MCPA ('Banlene Plus' at 4.9 l in 220 l).

Stackyard C (W): Manures: N at 95 kg, combine drilled. Weedkillers: Ioxynil at 0.53 kg plus mecoprop at 1.6 kg in 420 l.

Seed: Sawyers I (R) and Stackyard C (W): Manod, sown at 200 kg.

Cultivations, etc.:-

Sawyers I (R): Deep-tine cultivated twice: 31 Aug, 1976. Ploughed: 11 Dec. Treatment P and K applied: 29 Mar, 1977. Treatment Mg applied: 30 Mar. Power harrowed, seed sown: 4 Apr. Weedkillers applied: 30 May. Combine harvested: 5 Sept.

Stackyard C (W): Power harrowed: 16 Aug, 1976. Ploughed: 23 Nov. Spring-tine cultivated with crumbler attached: 9 Mar, 1977. Treatment P, K and Mg applied: 18 Mar. Spring-tine cultivated with crumbler attached, seed sown: 31 Mar. Weedkillers applied: 30 May. Combine harvested: 3 Sept.

77/R/CS/10 SAWYERS I(R)

GRAIN TONNES/HECTARE

***** TABLES OF MEANS *****

P205	0	63	MEAN
LIME			
0	2.74	3.78	3.26
5	3.33	3.61	3.47
10	3.23	4.30	3.77
20	3.13	4.04	3.58
MEAN	3.11	3.93	3.52
K20	0	126	MEAN
LIME			
0	3.50	3.03	3.26
5	3.56	3.38	3.47
10	3.82	3.72	3.77
20	3.68	3.48	3.58
MEAN	3.64	3.40	3.52
K20	0	126	MEAN
P205			
0	3.29	2.92	3.11
63	3.98	3.88	3.93
MEAN	3.64	3.40	3.52
MG	0	112	MEAN
LIME			
0	2.38	4.14	3.26
5	3.01	3.93	3.47
10	3.54	4.00	3.77
20	3.64	3.52	3.58
MEAN	3.14	3.90	3.52
MG	0	112	MEAN
P205			
0	2.71	3.51	3.11
63	3.58	4.29	3.93
MEAN	3.14	3.90	3.52

77/R/CS/10 SAWYERS I(R)

GRAIN TONNES/HECTARE

***** TABLES OF MEANS *****

MG	0	112	MEAN		
K20					
0	3.30	3.97	3.64		
126	2.98	3.82	3.40		
MEAN	3.14	3.90	3.52		
P205	0		63		
K20	0	126	0	126	
LIME					
0	3.19	2.29	3.81	3.76	
5	3.38	3.29	3.74	3.47	
10	3.26	3.20	4.38	4.23	
20	3.34	2.91	4.01	4.06	
P205	0		63		
MG	0	112	0	112	
LIME					
0	1.90	3.58	2.86	4.71	
5	2.91	3.76	3.11	4.10	
10	2.94	3.52	4.14	4.47	
20	3.09	3.17	4.20	3.87	
K20	0		126		
MG	0	112	0	112	
LIME					
0	2.75	4.24	2.00	4.05	
5	3.11	4.01	2.92	3.85	
10	3.56	4.07	3.51	3.92	
20	3.78	3.57	3.50	3.47	
K20	0		126		
MG	0	112	0	112	
P205					
0	2.85	3.73	2.57	3.28	
63	3.75	4.22	3.40	4.36	
	K20	0		126	
	MG	0	112	0	112
LIME	P205				
0	0	2.35	4.02	1.45	3.14
	63	3.16	4.45	2.55	4.96
5	0	2.97	3.79	2.85	3.73
	63	3.24	4.23	2.98	3.97
10	0	2.80	3.71	3.08	3.32
	63	4.33	4.43	3.94	4.51
20	0	3.29	3.40	2.89	2.93
	63	4.28	3.75	4.11	4.00

77/R/CS/10 SAWYERS I(R)

GRAIN TONNES/HECTARE

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	LIME	P205	K20	MG
SED	0.232	0.164	0.164	0.085

TABLE	LIME P205	LIME K20	P205 K20	LIME MG
SED	0.328	0.328	0.232	0.261
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: LIME				0.169

TABLE	P205 MG	K20 MG	LIME P205 K20	LIME P205 MG
SED	0.184	0.184	0.463	0.369
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: P205	0.120			
K20		0.120		
LIME.P205				0.239

TABLE	LIME K20 MG	P205 K20 MG	LIME P205 K20 MG
SED	0.369	0.261	0.521
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: LIME.K20	0.239		
P205.K20		0.169	
LIME.P205.K20			0.339

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	15	0.463	13.2
BLOCK.WP.SP	16	0.339	9.6

GRAIN MEAN DM% 83.4

77/R/CS/10 SAWYERS I(R)

STRAW TONNES/HECTARE

***** TABLES OF MEANS *****

P205	0	63	MEAN
LIME			
0	2.85	3.95	3.40
5	2.22	4.18	3.20
10	2.45	4.32	3.38
20	2.08	4.08	3.08

MEAN	2.40	4.13	3.26
------	------	------	------

K20	0	126	MEAN
LIME			
0	3.71	3.09	3.40
5	2.91	3.50	3.20
10	3.06	3.70	3.38
20	3.05	3.11	3.08

MEAN	3.18	3.35	3.26
------	------	------	------

K20	0	126	MEAN
P205			
0	2.46	2.34	2.40
63	3.91	4.36	4.13

MEAN	3.18	3.35	3.26
------	------	------	------

MG	0	112	MEAN
LIME			
0	3.10	3.70	3.40
5	3.21	3.19	3.20
10	3.24	3.52	3.38
20	3.14	3.03	3.08

MEAN	3.17	3.36	3.26
------	------	------	------

MG	0	112	MEAN
P205			
0	2.31	2.48	2.40
63	4.03	4.23	4.13

MEAN	3.17	3.36	3.26
------	------	------	------

MG	0	112	MEAN
K20			
0	3.16	3.20	3.18
126	3.18	3.52	3.35

MEAN	3.17	3.36	3.26
------	------	------	------

77/R/CS/10 SAWYERS I(R)

STRAW TONNES/HECTARE

***** TABLES OF MEANS *****

P205	0		63	
K20	0	126	0	126
LIME				
0	3.33	2.36	4.08	3.81
5	2.20	2.24	3.61	4.76
10	2.30	2.59	3.82	4.81
20	1.99	2.16	4.11	4.06

P205	0		63	
MG	0	112	0	112
LIME				
0	2.56	3.14	3.64	4.25
5	2.20	2.24	4.23	4.14
10	2.31	2.58	4.17	4.46
20	2.18	1.97	4.09	4.08

K20	0		126	
MG	0	112	0	112
LIME				
0	3.73	3.69	2.47	3.71
5	2.89	2.92	3.54	3.45
10	2.86	3.26	3.62	3.79
20	3.17	2.93	3.10	3.12

K20	0		126	
MG	0	112	0	112
P205				
0	2.37	2.55	2.25	2.42
63	3.96	3.86	4.11	4.61

	K20	0		126	
	MG	0	112	0	112
LIME	P205				
0	0	3.16	3.50	1.95	2.78
	63	4.29	3.88	2.99	4.63
5	0	2.17	2.24	2.23	2.24
	63	3.61	3.61	4.85	4.67
10	0	2.11	2.49	2.50	2.68
	63	3.61	4.03	4.73	4.89
20	0	2.03	1.95	2.33	2.00
	63	4.31	3.91	3.87	4.24

STRAW MEAN DM% 71.2

PLOT AREA HARVESTED 0.00247

77/W/CS/10 STACKYARD (W)

GRAIN TONNES/HECTARE

***** TABLES OF MEANS *****

P205	0	63	MEAN
LIME			
0	2.06	2.82	2.44
5	2.17	3.10	2.63
12	2.44	2.91	2.67
19	2.90	2.92	2.91
MEAN	2.39	2.94	2.66
K20	0	126	MEAN
LIME			
0	2.42	2.46	2.44
5	2.56	2.70	2.63
12	2.65	2.69	2.67
19	2.85	2.98	2.91
MEAN	2.62	2.71	2.66
K20	0	126	MEAN
P205			
0	2.22	2.56	2.39
63	3.01	2.86	2.94
MEAN	2.62	2.71	2.66
MG	0	112	MEAN
LIME			
0	1.97	2.91	2.44
5	2.50	2.77	2.63
12	2.59	2.76	2.67
19	2.89	2.93	2.91
MEAN	2.49	2.84	2.66
MG	0	112	MEAN
P205			
0	2.17	2.62	2.39
63	2.80	3.07	2.94
MEAN	2.49	2.84	2.66
MG	0	112	MEAN
K20			
0	2.47	2.76	2.62
126	2.50	2.92	2.71
MEAN	2.49	2.84	2.66

77/W/CS/10 STACKYARD (W)

STRAW TONNES/HECTARE

P205	0		63		
K20	0	126	0	126	
LIME					
0	2.18	1.94	2.66	2.98	
5	1.96	2.37	3.16	3.04	
12	2.12	2.76	3.18	2.63	
19	2.64	3.16	3.05	2.79	
P205	0		63		
MG	0	112	0	112	
LIME					
0	1.51	2.60	2.43	3.21	
5	1.98	2.35	3.01	3.18	
12	2.33	2.55	2.84	2.97	
19	2.85	2.96	2.93	2.91	
K20	0		126		
MG	0	112	0	112	
LIME					
0	1.98	2.85	1.96	2.96	
5	2.45	2.67	2.54	2.87	
12	2.70	2.60	2.47	2.92	
19	2.76	2.94	3.02	2.93	
K20	0		126		
MG	0	112	0	112	
P205					
0	2.04	2.41	2.30	2.82	
63	2.91	3.12	2.70	3.02	
	K20	0		126	
	MG	0	112	0	112
LIME	P205				
0	0	1.73	2.62	1.29	2.59
	63	2.23	3.09	2.62	3.33
5	0	1.79	2.12	2.16	2.58
	63	3.10	3.22	2.92	3.15
12	0	2.09	2.14	2.57	2.95
	63	3.32	3.05	2.37	2.89
19	0	2.53	2.76	3.16	3.16
	63	2.99	3.12	2.88	2.71

77/W/CS/10 STACKYARD (W)

GRAIN TONNES/HECTARE

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	LIME	P205	K20	MG
SED	0.094	0.067	0.067	0.058
TABLE	LIME P205	LIME K20	P205 K20	LIME MG
SED	0.133	0.133	0.094	0.125
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: LIME				0.116
TABLE	P205 MG	K20 MG	LIME P205 K20	LIME P205 MG
SED	0.088	0.088	0.189	0.177
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: P205	0.082			
K20		0.082		
LIME.P205				0.163
TABLE	LIME K20 MG	P205 K20 MG	LIME P205 K20 MG	
SED	0.177	0.125	0.250	
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: LIME.K20	0.163			
P205.K20		0.116		
LIME.P205.K20			0.231	

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP	15	0.189	7.1
BLOCK.WP.SP	16	0.231	8.7

GRAIN MEAN DM% 79.3

77/W/CS/10 STACKYARD (W)

STRAW TONNES/HECTARE

***** TABLES OF MEANS *****

P205	0	63	MEAN
LIME			
0	1.31	2.16	1.74
5	1.67	2.67	2.17
12	2.02	2.82	2.42
19	2.23	2.83	2.53

MEAN	1.81	2.62	2.21
------	------	------	------

K20	0	126	MEAN
LIME			
0	1.56	1.91	1.74
5	2.02	2.32	2.17
12	2.21	2.63	2.42
19	2.29	2.77	2.53

MEAN	2.02	2.41	2.21
------	------	------	------

K20	0	126	MEAN
P205			
0	1.71	1.91	1.81
63	2.33	2.91	2.62

MEAN	2.02	2.41	2.21
------	------	------	------

MG	0	112	MEAN
LIME			
0	1.41	2.06	1.74
5	2.08	2.26	2.17
12	2.36	2.47	2.42
19	2.58	2.48	2.53

MEAN	2.11	2.32	2.21
------	------	------	------

MG	0	112	MEAN
P205			
0	1.69	1.93	1.81
63	2.53	2.71	2.62

MEAN	2.11	2.32	2.21
------	------	------	------

MG	0	112	MEAN
K20			
0	1.93	2.11	2.02
126	2.29	2.52	2.41

MEAN	2.11	2.32	2.21
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77/W/CS/11

SOIL STRUCTURE

Object: To study the residual effects of peat, at a range of nitrogen levels, on the yield of ryegrass - Woburn Stackyard II.

Sponsor: A.E. Johnston.

The 14th year, ryegrass.

For previous years see 64/C/20(t), 65/C/19(t), 66/C/11(t), 67/C/8(t), 68/C/31(t), 69/W/CS/11(t), 70/W/CS/11(t), 71/W/CS/11, 72/W/CS/11(t) and 73-76/W/CS/11.

Design: Single replicate of 5 x 4. Levels of peat in 4 randomised blocks of 5 plots.

Whole plot dimensions: 2.13 x 3.05.

Treatments: All combinations of:-

1. PEAT Peat (tonnes dry matter - total applied 1963-72):

0
8
55
110
165

2. NPERCUT Nitrogen fertiliser as ammonium nitrate (kg N per cut), cumulative to previous treatments:

0
30
60
90

Basal applications: Manures: Ground chalk at 2.5 tonnes. P at 85 kg, as triple superphosphate, K at 300 kg, as potassium bicarbonate, Mg at 55 kg, as magnesium sulphate in 1976. None in 1977.

Seed: RvP ryegrass, sown at 50 kg in 1976.

Cultivations, etc.: - N applied: 25 Mar, 1977, 1 June, 26 July. Cut three times: 1 June, 20 July, 29 Sept.

NOTE: Crop samples were taken for N, P, K and Mg analysis.

1ST CUT MEAN DM% 27.3
2ND CUT MEAN DM% 31.3
3RD CUT MEAN DM% 23.6

TOTAL OF 3 CUTS MEAN DM% 27.4