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# Yields of the Field Experiments 1987

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## 87/R/CS/10 and 87/W/CS/10 Long-term Liming - Lupins

### Rothamsted Research

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87/R/CS/10 and 87/W/CS/10

LONG TERM LIMING

Object: To study the effects of different amounts of lime and phosphate on the yields and compositions of a sequence of crops. Rothamsted (R) Sawyers I and Woburn (W) Stackyard C.

Sponsors: S.P. McGrath, J. McEwen, D.P. Yeoman.

The 26th year, *Lupinus albus*.

For previous years see 'Details' 1967, 1973 and 74-86/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. CHALK Residual effects of ground chalk (tonnes CaCO<sub>3</sub>) (total applied 1962-87):

		Rothamsted total		Woburn total	
R	W	1962-78	1982-87	1962-78	1982-87
0	0	0	0	0	0
15	9	7	8	6	3
24.5	25.5	15	9.5	14	11.5
52.5	45.5	30	22.5	23	22.5

2. P Residual effects of P fertilizer applied:

	Until 1978		1981	1982	1983	
	R & W	R & W	R & W	R & W	R	W
0	0	0	0	0	0	0
P1	0	P1	P1	0	P2	P2
P2	P	P1	0	P1	P2	P4
P3	P	P3	P1	P1	P2	P4

Rates 1981-83 P1, P2, P3, P4 = 25, 50, 75, 100 kg P as superphosphate

Sub plots

3. MANGNESE Manganese applied in 1987:

0	None
MN	Manganese sprays

- NOTES: (1) Until 1978 test P was applied cumulatively, rates varied with crop, K was also applied cumulatively, to P1 and P3 plots. Since 1981 K has been applied basally (none in 1986 and 1987).  
 (2) On Sawyers I (R) manganese was applied as manganese lignin polycarboxylate ('Stoller Manganese' at 3.0 l in 200 l on 5 June, 1987 and at 9.0 l in 200 l on 11 Aug).  
 (3) On Stackyard C (W) manganese was applied at 0.19 kg Mn on 4 June, 1987 and 0.57 kg Mn on 4 Aug as manganese sulphate in 200 l.

87/R/CS/10 and 87/W/CS/10

Basal applications:-

Sawyers I (R): Weedkillers: Terbutryne at 0.98 kg with terbuthylazine at 0.42 kg in 200 l. Fungicide: Benomyl at 0.50 kg applied with the insecticide and a wetting agent ('Agral' at 0.06 l) in 200 l. Insecticide: Pirimicarb at 0.14 kg.

Stackyard C (W): Weedkillers: Glyphosate at 1.4 kg in 200 l. Terbutryne at 0.56 kg with terbuthylazine at 0.24 kg in 240 l. Fungicide: Benomyl at 1.0 kg applied with the pirimicarb and a wetting agent ('Enhance' at 0.06 l) in 200 l. Insecticides: Deltamethrin at 0.038 kg in 200 l. Pirimicarb at 0.15 kg.

Seed: Sawyers I (R): Vladimir, sown at 260 kg.  
Stackyard C (W): Vladimir, sown at 250 kg.

Cultivations, etc.:-

Sawyers I (R): Chalk treatments applied: 13 Nov, 1986. Ploughed: 14 Nov. Spring-tine cultivated, rotary harrowed, seed sown, harrowed: 31 Mar, 1987. Weedkillers applied: 13 Apr. Fungicide and insecticide applied: 9 July. Combine harvested: 17 Nov.

Stackyard C (W): Glyphosate applied: 16 Sept, 1986. Chalk treatments applied: 13 Nov. Ploughed: 28 Nov. Spike harrowed with crumbler attached, seed sown: 6 Apr, 1987. Harrowed, terbutryne and terbuthylazine applied: 13 Apr. Deltamethrin applied: 8 May. Benomyl and pirimicarb applied: 13 July. Combine harvested: 18 Nov.

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

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
CHALK					
0	0.71	1.33	2.28	2.97	1.82
15	2.86	2.25	3.47	2.65	2.81
24.5	2.98	2.24	3.69	2.56	2.87
52.5	2.87	2.31	4.04	3.17	3.10
Mean	2.36	2.03	3.37	2.84	2.65
MANGNESE	0	MN	Mean		
CHALK					
0	1.89	1.76	1.82		
15	2.69	2.92	2.81		
24.5	2.98	2.75	2.87		
52.5	3.04	3.15	3.10		
Mean	2.65	2.64	2.65		
MANGNESE	0	MN	Mean		
P					
0	2.38	2.33	2.36		
P1	2.12	1.94	2.03		
P2	3.32	3.42	3.37		
P3	2.78	2.89	2.84		
Mean	2.65	2.64	2.65		

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

GRAIN TONNES/HECTARE

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

CHALK	MANGNESE	0	MN
0	P		
	0	0.66	0.77
	P1	1.41	1.25
15	P2	2.25	2.32
	P3	3.24	2.71
	0	2.73	2.98
	P1	2.27	2.22
24.5	P2	3.52	3.43
	P3	2.26	3.03
	0	3.02	2.94
	P1	2.48	1.99
52.5	P2	3.86	3.52
	P3	2.56	2.56
	0	3.10	2.64
	P1	2.31	2.32
	P2	3.68	4.40
	P3	3.08	3.25

\*\*\* Standard errors of differences of means \*\*\*

Table	CHALK	P	MANGNESE	CHALK P
s.e.d.	0.233	0.233	0.114	0.466

Table	CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE
s.e.d.	0.283	0.283	0.567
Except when comparing means with the same level(s) of			
CHALK	0.228		
P		0.228	
CHALK.P			0.456

\*\*\*\*\* Stratum standard errors and coefficients of variation \*\*\*\*\*

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.466	17.6
BLOCK.WP.SP	16	0.456	17.2

GRAIN MEAN DM% 65.2

SUB PLOT AREA HARVESTED 0.00177

87/W/CS/10 STACKYARD C (W)

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
CHALK					
0	2.17	1.99	1.87	1.81	1.96
9	1.91	1.72	1.66	1.55	1.71
25.5	2.04	1.44	1.38	1.57	1.61
45.5	1.98	1.49	1.68	1.31	1.62
Mean	2.03	1.66	1.65	1.56	1.72
MANGNESE					
0	MN	Mean			
CHALK					
0	2.09	1.83	1.96		
9	1.72	1.70	1.71		
25.5	1.57	1.64	1.61		
45.5	1.68	1.56	1.62		
Mean	1.77	1.68	1.72		
MANGNESE					
0	MN	Mean			
P					
0	2.12	1.94	2.03		
P1	1.73	1.60	1.66		
P2	1.57	1.73	1.65		
P3	1.66	1.46	1.56		
Mean	1.77	1.68	1.72		
MANGNESE					
0	MN				
CHALK					
0	P	0	2.63	1.72	
	P1		1.82	2.17	
	P2		1.84	1.90	
	P3		2.08	1.54	
9	0		1.95	1.88	
	P1		1.89	1.56	
	P2		1.35	1.97	
	P3		1.71	1.39	
25.5	0		1.78	2.29	
	P1		1.47	1.41	
	P2		1.37	1.40	
	P3		1.67	1.46	
45.5	0		2.09	1.87	
	P1		1.74	1.25	
	P2		1.71	1.66	
	P3		1.17	1.44	



87/W/CS/10 STACKYARD C (W)

\*\*\* Standard errors of differences of means \*\*\*

Table	CHALK	P	MANGNESE	CHALK P
s.e.d.	0.107	0.107	0.098	0.214

Table	CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE
s.e.d.	0.175	0.175	0.351
Except when comparing means with the same level(s) of			
CHALK	0.197		
P		0.197	
CHALK.P			0.393

\*\*\*\*\* Stratum standard errors and coefficients of variation \*\*\*\*\*

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.214	12.4
BLOCK.WP.SP	16	0.393	22.8

GRAIN MEAN DM% 60.3

SUB PLOT AREA HARVESTED 0.00172