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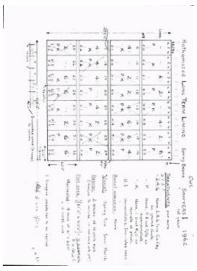
Collection of Plans for the Rothamsted Long-term Liming Experiment



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Rothamsted Research

Rothamsted Research (1962-1996) *Default Title ;* Collection Of Plans For The Rothamsted Long-Term Liming Experiment, pp 1 - 29

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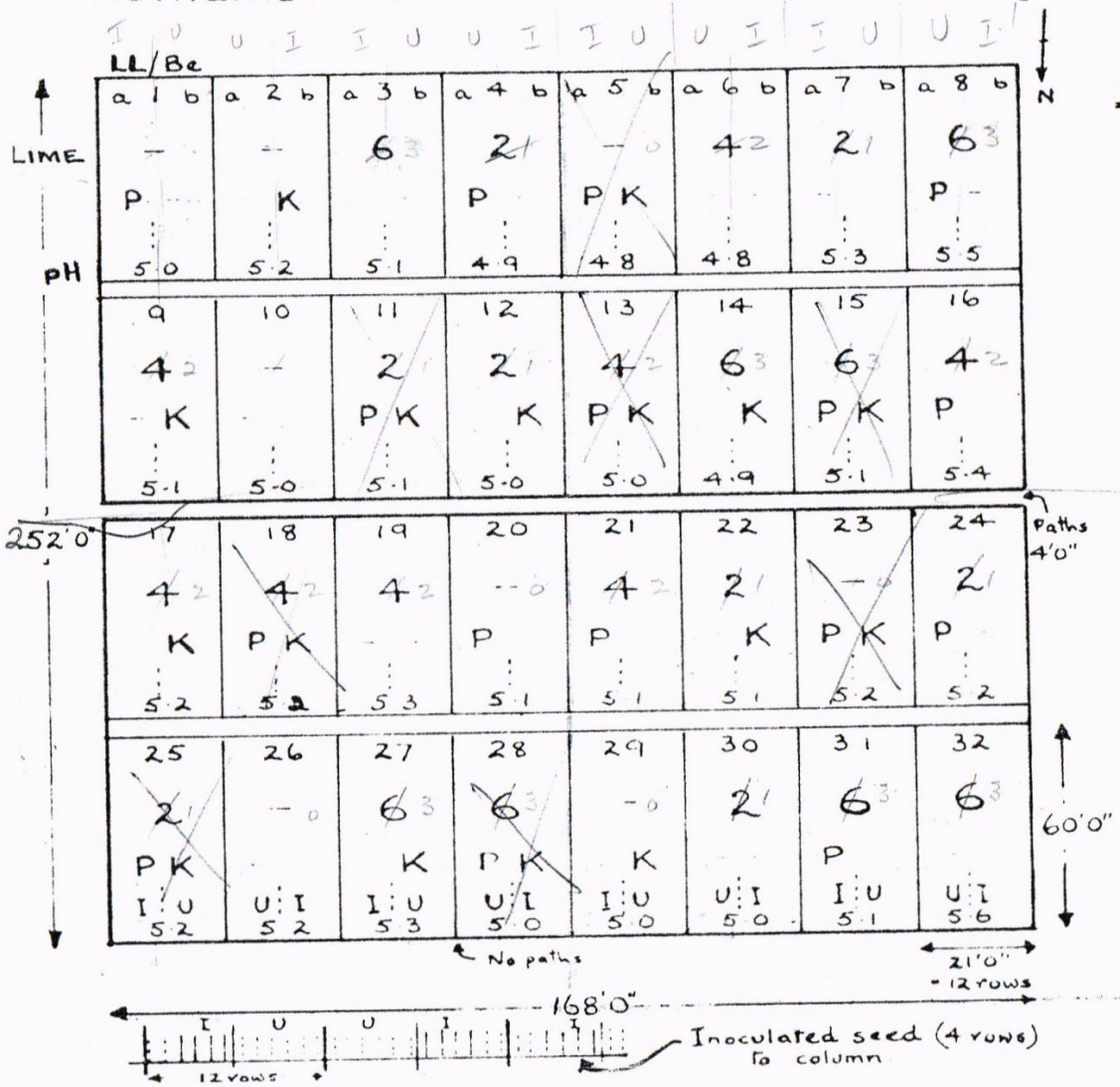
CWC

Rothamsted Long Term Liming — Spring Beans — SAWYERS I 1962

1st year.



TREATMENTS per acre

0 1 2 3

-, 2, 4, 6 None, 2, 4, 6 tons $CaCO_3$ as ground chalk.

-, P None, 0·5 cwt P_2O_5 as superphosphate.

-, K None, 1·0 cwt K_2O as muriate of potash.

U, I Uninoculated, Inoculated seed

Basal manuring: None

Variety: Spring Tick Sown: Mar 16

Design: 2 blocks of 16 plots each. (Analysis to include co-variance with pH)

Plot area: $\frac{1}{2}(21'0" \times 60'0") = 0.0289$ ~~acre~~ 0.01446

Harvested: 4 rows at 21" × 60'0" = 0·0096 acre

‖ Simazine weedkiller to be applied.

2 Bleah L. 2 x 2 S/L 2.

2 A 62

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Rothamsted Long Term Liming — Spring Beans — Sawyers I — 2nd year — 1963. 18

LL/Be.

1 V Chalk i. P pH 5·0	2 V 1 K 5·1	3 H 4 – 7·2	4 L 2 P 6·1	5 V 1 PK 4·8	6 M 3 – 6·8	7 L 2 – 6·3	8 H 4 P 7·4
9 M 3 K 6·8	10 V 1 – 5·0	11 L 2 PK 6·2	12 L 2 K 6·0	13 M 3 PK 7·0	14 H 4 K 7·1	15 H 4 PK 7·3	16 M 3 P 7·0
17 M 3 K 7·0	18 M 3 PK 7·2	19 M 3 – 7·1	20 V 1 P 5·0	21 M 3 P 7·0	22 L 2 K 6·0	23 V 1 PK 5·1	24 L 2 P 6·4
25 L 2 PK 6·3	26 V 1 – 5·2	27 H 4 K 7·3	28 H 4 PK 7·1	29 V 1 K 5·0	30 L 2 – 6·0	31 H 4 P 7·1	32 H 4 – 7·2

N

Cross paths 4'0"

252'0"

60'0"

21'0"

168'0"

TREATMENTS per acre

1 2 3 4
V, L, M, H — None, 2, 4, 8 tons $CaCO_3$ as ground chalk.

(Lime applied at –, 2, 4, 6 tons per acre in 1962. an extra 2 tons p.a to "H" in 1963)

pH — pH of soils after 1962 harvest

P — 0·5 cwt P_2O_5 as superphosphate

K — 1·0 cwt K_2O as muriate of potash.

Basal manuring: None. On Apr. 18. Crop sprayed with simazine, 1lb ai in 40gal.

Variety: Gartons 30B at 200lb per acre

Sown: April 8.

Design: 2 blocks of 16 plots each. (Analysis to include co-variance with pH.)

Symbols: V. Very low pH. L. Low M. Medium H. High pH.

Plot area: 21'0" x 60'0" = 0·0289 acre

Harvested: 5 rows @ 21" x 60'0" = 0·0121 acre.

Rothamsted LONG TERM LIMING — Barley

SAWYERS 4th year 1965
Sponsor : J. Bolton.

LL/B

1	2	3	4	5	6	7	8
O 1/	O 1/	H 4/	L 2/	O 1/	M 3/	L 2/	H 4/
P	K	–	P	PK	–	–	P
pH 4·8	5·1	7·3	5·5	4·8	6·3	6·1	7·5
9	10	11	12	13	14	15	16
M 3/	O 1/	L 2/	L 2/	M 3/	H 4/	H 4/	M 3/
K	–	PK	K	PK	K	PK	P
6·7	5·0	5·8	5·7	6·7	7·3	7·5	7·0
17	18	19	20	21	22	23	24
M 3/	M 3/	M 3/	O 1/	M 3/	L 2/	O 1/	L 2/
K	PK	–	P	P	K	PK	P
6·8	6·7	7·3	5·0	6·8	5·9	5·1	5·8
25	26	27	28	29	30	31	32
L 2/	O 1/	H 4/	H 4/	O 1/	L 2/	H 4/	H 4/
PK	–	K	PK	K	–	P	–
5·9	5·1	7·5	7·3	4·8	5·7	7·4	7·4

paths 4'0"

252'

60'

21'

168'

JW/mg

TREATMENTS per acre

O, L, M, H — None, 2, 4, 8 tons $CaCO_3$ applied as ground chalk (1962–63)

pH — pH of samples taken 14.12.64

In Seedbed – Broadcast.

P — 0·5 cwt P_2O_5, superphosphate

K — 1·0 cwt K_2O as muriate of potash

Basal manuring per acre

0·5 cwt N as 'Nitro-Chalk' 21 combine drilled.

Variety: Maris Badger Sown: March 17

Design: 2 blocks of 16 plots

Plot area: 21'0" x 60'0" = 0·0289 acre

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Rothamsted Long Term Liming — Barley

SAWYERS 5th year 1966

Sponsor : J. Bolton.

LL/B

1	2	3	4	5	6	7	8
O	O	H	L	O	M	L	H
P	K	–	P	PK	–	–	P
pH 4·8	5·1	7·3	5·5	4·8	6·3	6·1	7·5
9	10	11	12	13	14	15	16
M	O	L	L	M	H	H	M
K	–	PK	K	PK	K	PK	P
6·7	5·0	5·8	5·7	6·7	7·3	7·5	7·0
17	18	19	20	21	22	23	24
M	M	M	O	M	L	O	L
K	PK	–	P	P	K	PK	P
6·8	6·7	7·3	5·0	6·8	5·9	5·1	5·8
25	26	27	28	29	30	31	32
L	O	H	H	O	L	H	H
PK	–	K	PK	K	–	P	–
5·9	5·1	7·5	7·3	4·8	5·7	7·4	7·4

paths 4'0"

252'

252'

60'

21'

168'

TREATMENTS per acre

O, L, M, H — None, 2, 4, 8 tons $CaCO_3$ applied as ground chalk (1962–63)

pH — pH of samples taken 14·12·64

In Seedbed – Broadcast.

P — 0·5 cwt P_2O_5, superphosphate

K — 1·0 cwt K_2O as muriate of potash

Basal manuring per acre

0·5 cwt N as 'Nitro-Chalk' 21 combine drilled.

Variety: Maris Badger **Sown:** March 14 at 156 lb per acre

Design: 2 blocks of 16 plots

Plot area: 21'0" × 60'0 = 0·0289 acre

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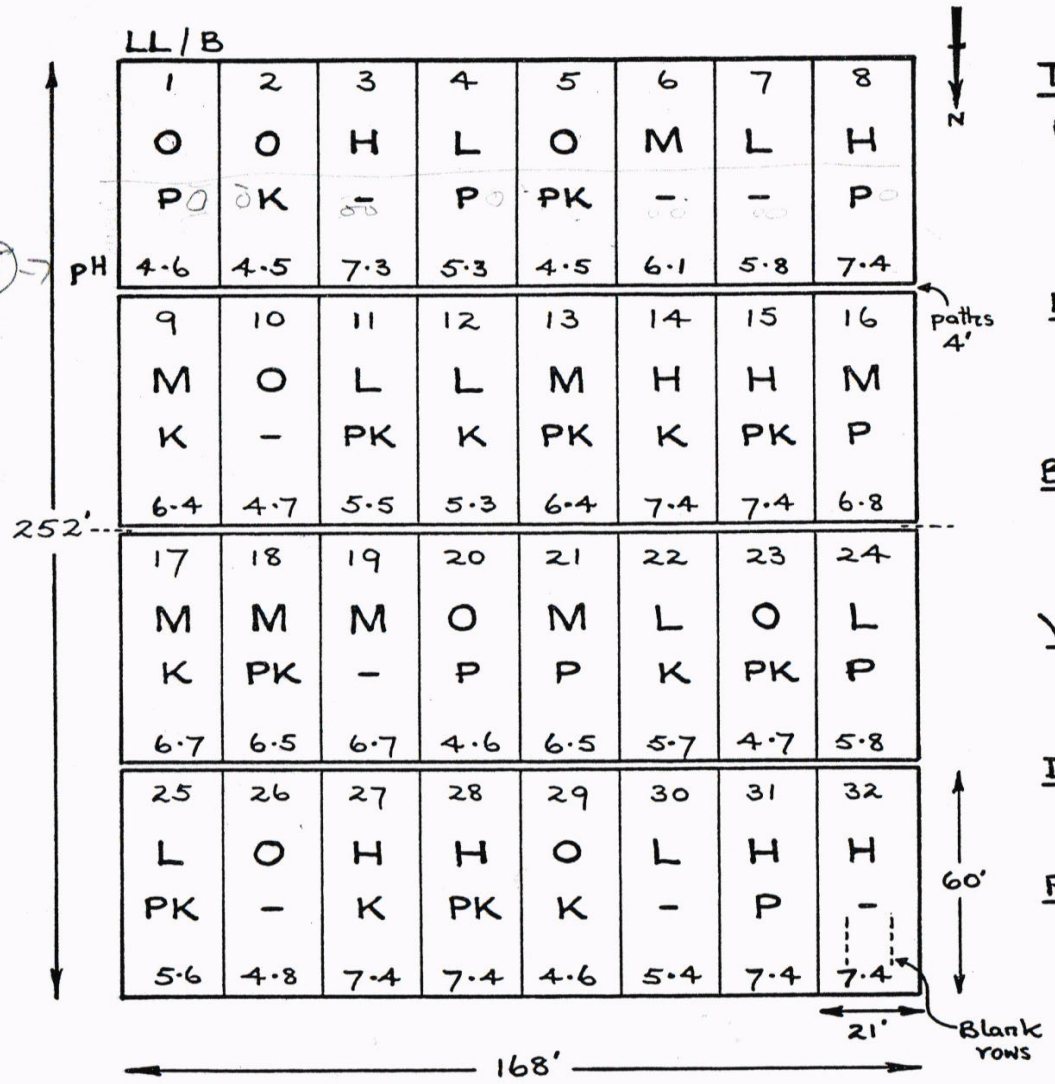
C/3

Rothamsted LONG TERM LIMING BARLEY

SAWYERS 6th year 1967
Sponsor : J. BOLTON



TREATMENTS per acre

O, L, M, H — None, 2, 4, 8 tons $CaCO_3$ applied as ground chalk (1962–63)

pH — pH of samples taken 16 Nov 1966

In Seedbed – Broadcast

P 0·5 cwt P_2O_5 as superphosphate
K 1·0 cwt K_2O as muriate of potash

Basal manuring per acre

0·75 cwt N as 'Nitro-Chalk' 21 combine drilled

Variety: Maris Badger Seedrate:
Sown:

Design: 2 blocks of 16 plots

Plot area: 21' x 60' = 0·0289

Harvested:
9'4" x 60' = 0·0129 acre

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1970 (781)

Rothamsted LONG TERM LIMING — Barley 9th year — SAWYERS I 1970 [24]

Sponsors: J. Bolton, D.B. Slope

70/R/CS/10

	01	02	03	04	05	06	07	08
	O	O	H	L	O	M	L	H
	P$\bar{O}$	$\bar{O}$K	$\bar{O}\bar{O}$	P$\bar{O}$	PK	$\bar{O}\bar{O}$	$\bar{O}\bar{O}$	P$\bar{O}$
pH	4·8	4·8	7·8	5·3	4·7	6·0	5·8	7·7
	09	10	11	12	13	14	15	16
	M	O	L	L	M	H	H	M
	$\bar{O}$K	$\bar{O}\bar{O}$	PK	$\bar{O}$K	PK	$\bar{O}$K	PK	P$\bar{O}$
	6·5	4·8	5·6	5·4	6·5	7·7	7·8	6·9
	17	18	19	20	21	22	23	24
	M	M	M	O	M	L	O	L
	$\bar{O}$K	PK	$\bar{O}\bar{O}$	P$\bar{O}$	P$\bar{O}$	$\bar{O}$K	PK	P$\bar{O}$
pH	6·9	6·8	6·6	5·0	6·5	5·7	5·1	5·9
	25	26	27	28	29	30	31	32
	L	O	H	H	O	L	H	H
	PK	$\bar{O}\bar{O}$	$\bar{O}$K	PK	$\bar{O}$K	$\bar{O}\bar{O}$	P$\bar{O}$	$\bar{O}\bar{O}$
	5·6	5·0	7·7	7·6	4·8	5·3	7·6	7·8

252′ — 168′ — 60′ — 21′ — N — paths 4′ — No paths — Blank rows

PN

TREATMENTS, per acre

O, L, M, H — None, 2, 4, 8 tons $CaCO_3$ as ground chalk (1962–63)

pH — pH of samples taken Dec. 1968

In seedbed – applied broadcast

P — 0·5 cwt P_2O_5 as superphosphate

K — 1·0 cwt K_2O as muriate of potash

Basal manuring, per acre

0·75 cwt N as 'Nitro-Chalk' 21 combine drilled.

Variety: Julia
sown at 140 lb per acre on 28 March.

Design: 2 blocks of 16 plots

Plot area: 21′ × 60′ = 0·0289 acre
Harvested: 9′4″ × 60′ = 0·0129 acre

Note: In 1969 the land was fallowed and subsoiled (5 Aug.)

Rothamsted LONG TERM LIMING — Barley 10th year — SAWYERS I 1971

Sponsors : J. Bolton, D.B. Slope

71/R/CS/10

	01	02	03	04	05	06	07	08
C	O	O	H	L	O	M	L	H
PK	+P	+K	ō ō	P ō	+PK	ō ō	ō ō	P ō
pH	4·5	4·6	7·7	4·8	4·4	5·2	5·2	7·2
	09	10	11	12	13	14	15	16
	M	+O	L	L	M	H	H	M
	ō K	ō ō	PK	ō K	PK	ō K	PK	P ō
	6·2	4·3	5·6	5·0	6·1	7·5	7·3	6·3
	17	18	19	20	21	22	23	24
	M	M	M	O	M	L	O	L
	ō K	PK	–	+P	P ō	ō K	+PK	P ō
pH	6·5	6·1	6·2	4·6	5·8	5·3	4·7	5·5
	25	26	27	28	29	30	31	32
	L	+O	H	H	O	L	H	H
	PK	–	ō K	PK	+K	ō ō	P ō	ō ō
	5·4	4·6	7·6	7·3	4·4	5·1	7·2	7·3

252′ · 168′ · 60′ · Paths 4′ · No paths · 21′ · Blank rows · N

TREATMENTS per acre (hectare)

O, L, M, H — None, 2, 4, 8 tons (none, 5, 10, 20 tonnes) $CaCO_3$ as ground chalk (1962–63)

pH — pH of soil samples taken 28 Sep 1970

In Seedbed – applied broadcast

P — 0·5 cwt (63 kg) P_2O_5 as superphosphate

K — 1·0 cwt (125 kg) K_2O as muriate of potash

Basal manuring, per acre (hectare)

0·75 cwt (94 kg) N as 'Nitro-Chalk' 21 combine drilled.

Variety : Julia

Sown at 140 lb per acre (157 kg/ha) on 10th March

Design : 2 blocks of 16 plots

Plot area : 21′ × 60′ = 0·0289 acre (0·012 ha)

Harvested : 9′4″ × 60′ = 0·0129 acre (0·0052 ha)

Previous crops: Fallow 1969, Barley 1970

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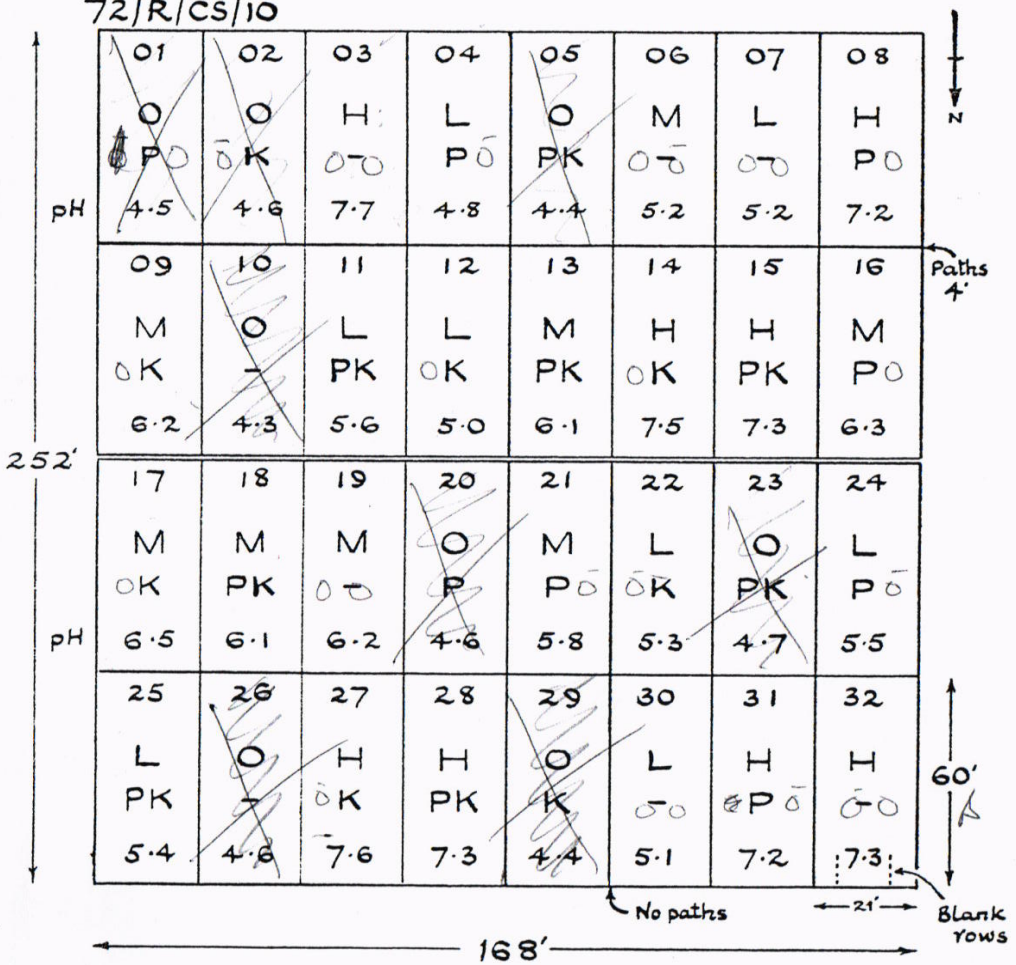
Rothamsted LONG TERM LIMING Barley

11th year

72/R/CS/10

SAWYERS I 1972

Sponsors : J. Bolton, D.B. Slope



TREATMENTS per acre (hectare)

O, L, M, H — None, 2, 4, 8 tons (none, 5, 10, 20 tonnes) $CaCO_3$ as ground chalk (1962-63)

pH — pH of soil samples taken 28 Sep 1970

In Seedbed - applied broadcast

P — 0·5 cwt (63 Kg) P_2O_5 as superphosphate

K — 1·0 cwt (125 Kg) K_2O as muriate of potash

Basal manuring. per acre (hectare)

0·75 cwt (94 Kg) N as 'Nitro-Chalk' 21 combine drilled.

Variety: Julia seed dressed with 'Milstem'.

Sown at 140 lb per acre (157 Kg/ha): 20 March

Design: 2 blocks of 16 plots

Plot area: 21' x 60' = 0·0289 acre (0·012 ha)

Harvested: 9'4" x 60' = 0·0129 acre (0·0052 ha)

Previous crops: Fallow 1969, Barley 1970, 1971

Rothamsted LONG TERM LIMING — Barley

SAWYERS 12th Year 1973
Sponsors: J. Bolton, D. B. Slope

73/R/CS/10

Lime
P_2O_5
K_2O

	01	02	03	04	05	06	07	08
	—	—	H	L	—	M	L	H
	O	O	—	P	P/K	—	—	P
	P	—/K	—	—		—	—	—
	—		—					
pH	4·5	4·4	7·5	5·1	4·5	5·5	5·4	7·4
	09	10	11	12	13	14	15	16
	M	—	L	L	M	H	H	M
	—/K	O	P/K	—/K	P/K	—/K	P/K	P/—
		—						
pH	6·0	4·4	5·2	5·0	6·0	7·0	7·0	6·4
	17	18	19	20	21	22	23	24
	M	M	M	—	M	L	—	L
	—/K	P/K	—	O	P	—/K	O	P
			—	P	—		P/K	—
pH	6·3	6·0	6·3	4·4	5·8	5·3	4·6	5·4
	25	26	27	28	29	30	31	32
	L	—	H	H	—	L	H	H
	P/K	O	—/K	P/K	O	—	P	—
		—			—/K	—	—	—
pH	5·2	4·4	7·1	7·0	4·4	4·9	7·0	7·3

252′ · 168′ · Paths 4′ · No paths · 21′ Blank rows · 60′ · N

TREATMENTS per acre (hectare)

O, L, M, H — None, 2, 4, 8 tons (–, 5, 10, 20 tonnes) $CaCO_3$ as ground chalk (1962–63)

pH — pH of soil samples taken Nov. 1972

In Seedbed – applied broadcast

P — 0·5 cwt (63 Kg) P_2O_5 as superphosphate
K — 1·0 cwt (125 Kg) K_2O as muriate of potash

Basal manuring, per acre (hectare)

0·75 cwt (94 Kg) N as 'Nitro-Chalk' 25 combine drilled

Variety: Julia – seed dressed with ethirimol
Sown at 140 lb (157 Kg/ha) on 12 Mar. 1973

Design: 2 blocks of 16 plots

Plot area: 21′ × 60′ = 0·0289 acre (0·012 ha)
Harvested: 9′4″ × 60′ = 0·0129 acre (0·0052 ha)

Previous crops: Fallow 1969, Barley 1970, 1971, 1972

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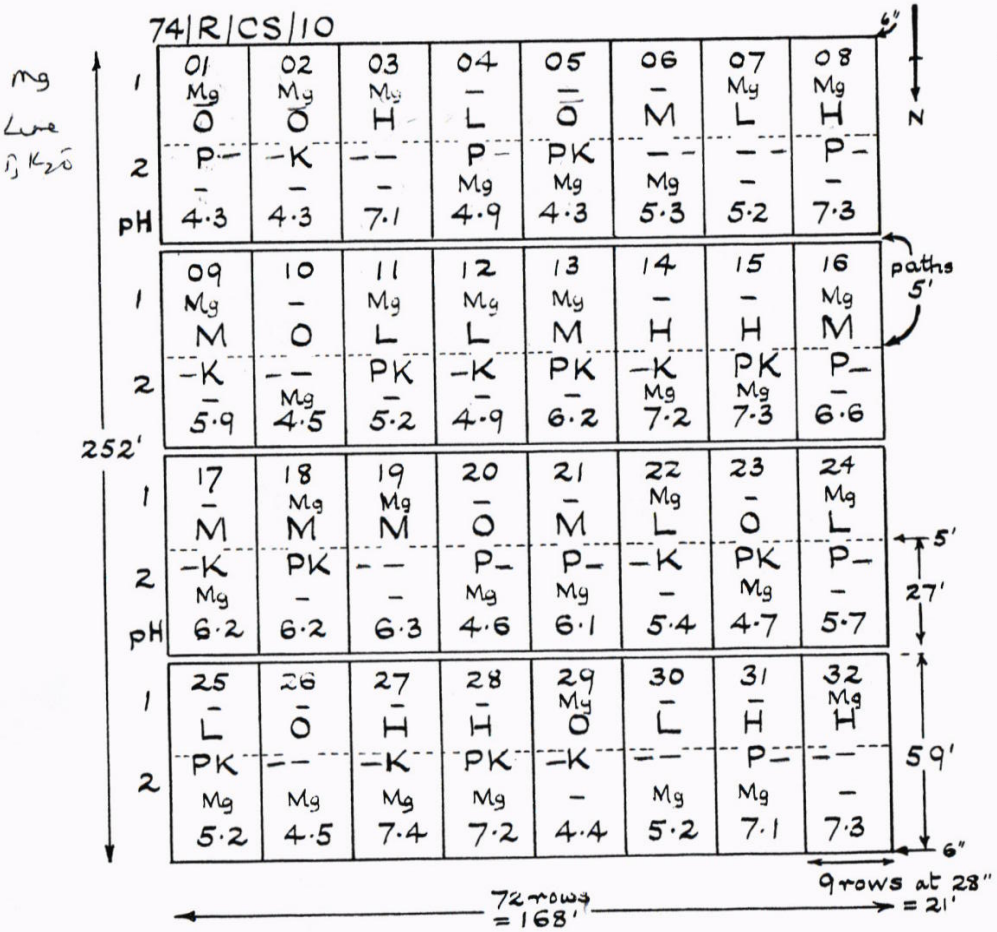
Rothamsted LONG TERM LIMING Potatoes

SAWYERS 13th Year 1974
Sponsor : J. Bolton

74/R/CS/10



TREATMENTS per acre (hectare)

Whole Plots

O, L, M, H	None, 2, 4, 8 tons (–, 5, 10, 20 tonnes) $CaCO_3$ as ground chalk (1962-63)	
pH	pH of soil samples taken Oct 1973	
P	1·0 cwt (126 Kg) P_2O_5 as superphosphate	Applied broadcast in seedbed
K	1·5 cwt (188 Kg) K_2O as muriate of potash	Applied broadcast in seedbed

Half Plots

–, Mg	None, 100 lb (112 Kg) Mg as sulphate of magnesia (10% Mg)

Basal manuring per acre (hectare)
670 lb (750 Kg) 'Nitro-Chalk' 25 broadcast before planting

Variety: Pentland Crown

Design: 2 blocks of 16 plots split into 2

Plot area: 21' x 59' = 0·0284 acre (0·0115 ha)
harvested: 4 rows x 27'
= 9'4" x 27' = 0·0058 acre (0·0023 ha)

Previous Cropping:
1962-64 Spr. beans, 1965-67 barley,
1968 potatoes, 1969 fallow, 1970-73 barley

Rothamsted LONG TERM LIMING — Spring Oats — SAWYERS I 14th Year 1975

Sponsor: J. Bolton

75/R/CS/10

01 (Mg) O P (-) pH 4.5	02 (Mg) O K (-) pH 4.3	03 (Mg) H – (-) pH 6.5	04 (-) L P (Mg) pH 5.0	05 (-) O PK (Mg) pH 4.4	06 (-) M – (Mg) pH 5.1	07 (Mg) L – (-) pH 5.1	08 (Mg) H P (-) pH 6.7
09 (Mg) M K (-) pH 5.5	10 (-) O – (Mg) pH 4.3	11 (Mg) L PK (-) pH 5.0	12 (Mg) L K (-) pH 4.8	13 (Mg) M PK (-) pH 5.6	14 (-) H K (Mg) pH 6.5	15 (-) H PK (Mg) pH 6.5	16 (Mg) M P (-) pH 6.0
17 (-) M K (Mg) pH 5.5	18 (Mg) M PK (-) pH 5.4	19 (Mg) M – (-) pH 5.7	20 (-) O P (Mg) pH 4.5	21 (-) M P (Mg) pH 5.4	22 (Mg) L K (-) pH 4.9	23 (-) O PK (Mg) pH 4.6	24 (Mg) L P (-) pH 5.1
25 (-) L PK (Mg) pH 5.0	26 (-) O – (Mg) pH 4.4	27 (-) H K (Mg) pH 6.6	28 (-) H PK (Mg) pH 6.5	29 (Mg) O K (-) pH 4.2	30 (-) L – (Mg) pH 4.7	31 (-) H P (Mg) pH 6.6	32 (Mg) H – (-) pH 6.7

N

Paths 3'

28'6" 3' 28'6"

60'

No paths

21' Blank rows

18" 252' 18"

168'

TREATMENTS per acre (hectare)

Whole Plots

O, L, M, H — None, 2, 4, 8 tons (-5, 10, 20 tonnes) $CaCO_3$ as ground chalk (1962-63)

pH — pH of soil sample taken Jan 1975

P — 0.5 cwt (63 kg) P_2O_5 as superphosphate } Broadcast in seedbed

K — 1.0 cwt (125 kg) K_2O as muriate of potash } Broadcast in seedbed

Half Plots, Mg residues.

-, Mg — None, 100 lb (112 kg) Mg to potatoes 1974

Basal manuring per acre (hectare)

280 lb (314 kg) 'Nitro-chalk' 25

Variety: Manod at 180 lb/a (202 kg/ha)

Design: 2 blocks of 16 plots split into 2

Plot area: 21' x 60' = 0.029 acre (0.0117 ha)

Sub-plot harvested: 9'4" x 28'6" = 0.0061 acre (0.00246 ha)

Previous Cropping

1962-64 Spr. beans, 1965-67 barley, 1968 potatoes
1969 fallow, 1970-73 barley 1974 potatoes

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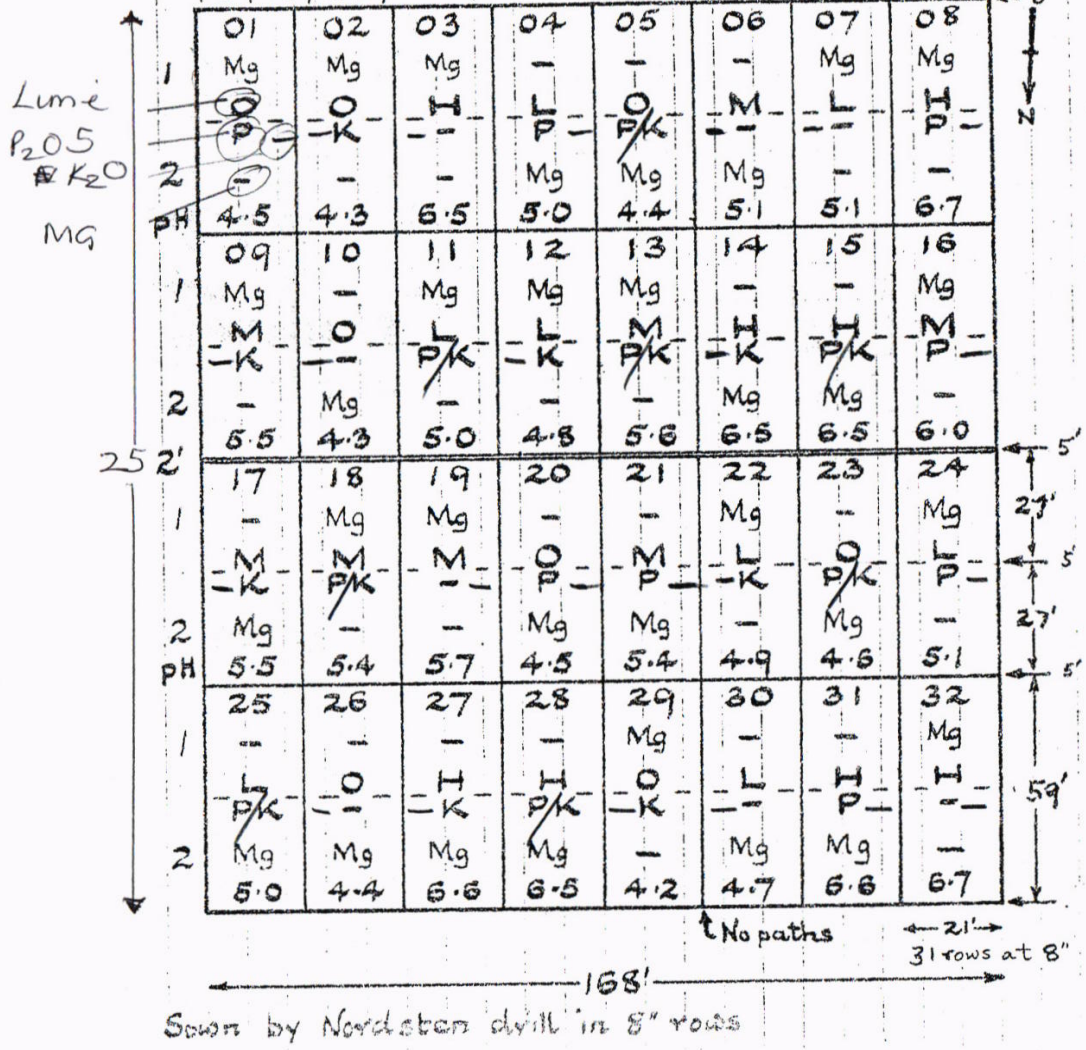
Rothamsted LONG TERM LIMING

76/R/CS/10

Spr. Oilseed Rape
15th Year

SAWYERS I 1976 [23]
Sponsor: J. Bolton



Sown by Nordsten drill in 8" rows

TREATMENTS per acre (hectare)

Whole Plots

O, L, M, H — None, 2, 4, 8 tons (-, 5, 10, 20 tonnes) $CaCO_3$ as ground chalk (1962-68)

pH — pH of soil sample taken Jan 1975

P — 0·5 cwt (63kg) P_2O_5 as soper
K — 1·0 cwt (125kg) K_2O as muriate
} Broadcast in seedbed

Half Plots

-, Mg — None, 100lb (112Kg) Mg, as Epsom salts

Note: P K Mg treatments cumulative (Mg in 1974 + 76 only)

Basal manuring per acre (hectare)
600 lb (675 Kg) 'Nitro-Chalk' 25

Variety: Maris Haploma at 5 lb/acre (6 kg/ha) sown on 26 Mar

Design: 2 blocks of 16 plots split into 2

Plot area: 21' x 60' = 0·029 acre (0·0117 ha)
Sub-plot harvested 15 rows at 8"
10' x 27' = 0·0062 acre (0·0025 ha)

Previous cropping: 1962-64 beans,
1965-67 barley, 1968 potatoes, 1969 fallow
1970-73 barley, 1974 potatoes, 1975 oats

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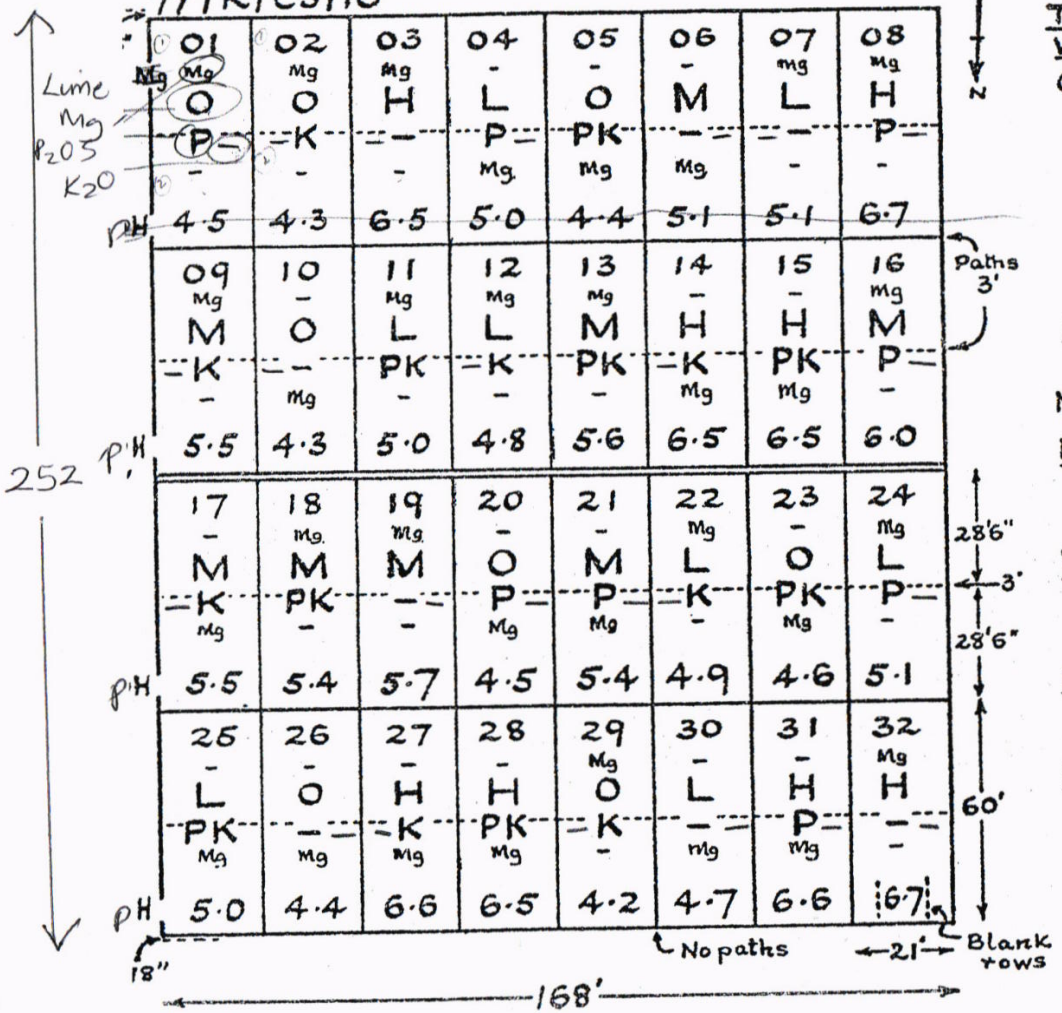
Rothamsted LONG TERM LIMING Spring Oats SAWYERS I 16th Year 1977

21

Sponsor: J. Bolton

77/R/CS/10 # revised. Includes Mg treatments



	01	02	03	04	05	06	07	08
Lime	Mg Mg	Mg	Mg	-	-	-	mg	Mg
Mg	O	O	H	L	O	M	L	H
P_2O_5	(P)	K	-	P	PK	-	-	P
K_2O	-	-	-	Mg	Mg	Mg	-	-
pH	4·5	4·3	6·5	5·0	4·4	5·1	5·1	6·7

	09	10	11	12	13	14	15	16
	Mg	-	Mg	Mg	Mg	-	-	Mg
	M	O	L	L	M	H	H	M
	K	-	PK	K	PK	K	PK	P
	-	Mg	-	-	-	Mg	Mg	-
pH	5·5	4·3	5·0	4·8	5·6	6·5	6·5	6·0

	17	18	19	20	21	22	23	24
	-	Mg	Mg	-	-	Mg	-	Mg
	M	M	M	O	M	L	O	L
	K	PK	-	P	P	K	PK	P
	Mg	-	-	Mg	Mg	-	Mg	-
pH	5·5	5·4	5·7	4·5	5·4	4·9	4·6	5·1

	25	26	27	28	29	30	31	32
	-	-	-	-	Mg	-	-	Mg
	L	O	H	H	O	L	H	H
	PK	-	K	PK	K	-	P	-
	Mg	Mg	Mg	Mg	-	Mg	Mg	-
pH	5·0	4·4	6·6	6·5	4·2	4·7	6·6	6·7

TREATMENTS per acre (hectare)

Whole Plots

O, L, M, H	None, 2, 4, 8 tons (-5, 10, 20 tonnes) $CaCO_3$ as ground chalk (1962-68)
pH	pH of soil sample taken Jan 1975
P	0·5cwt (63 kg) P_2O_5 as superphosphate } Broadcast in seedbed
K	1·0cwt (125 kg) K_2O as muriate of potash } Broadcast in seedbed

Half Plots

-, Mg	None, 100 lb (112 kg) Mg, as Epsom salts

Note: P, K, Mg treatments cumulative (Mg in 1974 & 76)

Basal manuring per acre (hectare)

SFP 'Nitro-Chalk' only @ 280 lb (314 kg)

Variety: Manod at 180 lb/acre (202 kg/ha)
Sown 4/4/77

Design: 2 blocks of 16 plots split into 2

Plot area: 21' x 60' = 0·029 acre (0·0117 ha)
Sub-plot harvested:
9'4" x 28'6" = 0·0061 acre (0·00246 ha)

Previous Cropping

1962-64 Spr. beans, 1965-67 barley, 1968 potato
1969 fallow, 1970-73 barley 1974 potatoes,
1975 oats, 1976 oilseed rape

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Rothamsted LONG-TERM LIMING. Barley SAWYERS, I 17th year, 19

78/RCS/10

Sponsor:- J Bolton

1978

	01	02	03	04	05	06	07	08
	Mg	Mg	Mg	-	-	-	Mg	Mg
	O	O	H	L	O	M	L	H
	P	K	—	P	PK	—	—	P
	-	-	-	Mg	Mg	Mg	-	-
pH	4.5	4.3	6.5	5.0	4.4	5.1	5.1	6.7
	09	10	11	12	13	14	15	16
	Mg	-	Mg	Mg	Mg	-	-	Mg
	M	O	L	L	M	H	H	M
	K	—	PK	K	PK	K	PK	P
	-	Mg	-	-	-	Mg	Mg	-
pH	5.5	4.3	5.0	4.8	5.6	6.5	6.5	6.0
	17	18	19	20	21	22	23	24
	-	Mg	Mg	-	-	Mg	-	Mg
	M	M	M	O	M	L	O	L
	K	PK	—	P	P	K	PK	P
	Mg	-	-	Mg	Mg	-	Mg	-
pH	5.5	5.4	5.7	4.5	5.4	4.9	4.6	5.1
	25	26	27	28	29	30	31	32
	-	-	-	-	Mg	-	-	Mg
	L	O	H	H	O	L	H	H
	PK	—	K	PK	K	—	P	—
	Mg	Mg	Mg	Mg	-	Mg	Mg	-
pH	5.0	4.4	6.6	6.5	4.2	4.7	6.6	6.7

18" … 252' … 18"

168'

No paths

21'

Blank rows

N

3' path

28'6"

3' path

28'6"

5' path

60'

TREATMENTS per acre (hectare)

Whole Plots

O, L, M, H — None, 2, 4, 8 tons (0, 5, 10, 20 tonnes) $CaCO_3$ as ground chalk (1962-63)

pH — pH of soil sample taken Jan 1975

P — 0·5 cwt (63 kg) P_2O_5 as superphosphate

K — 1·0 cwt (125 kg) K_2O as muriate of potash

} 1962-78

Half Plots

-, Mg — None, 100 lb (112 kg) Mg as kieserite 1974-77 (except 1975) Mg as Epsom salt

Basal manuring per acre (hectare)

Nitro-chalk only at 336 lb (377 kg)

Variety

Porthos at 140 lb/acre (157 kg/ha) sown 19 April

Design

2 blocks of 16 plots split into 2

Plot area

21" × 60' = 0·029 acre (0·0117 ha)

Sub plot harvested 9'4" × 28'6" = 0·0061 acre (0·00246 ha)

Previous cropping

1962-64 S beans, 1965-67 barley, 1968 potatoes, 1969 fallow, 1970-73 barley, 1974 potatoes, 1975 oats, 1976 oilseed rape, 1977 oats

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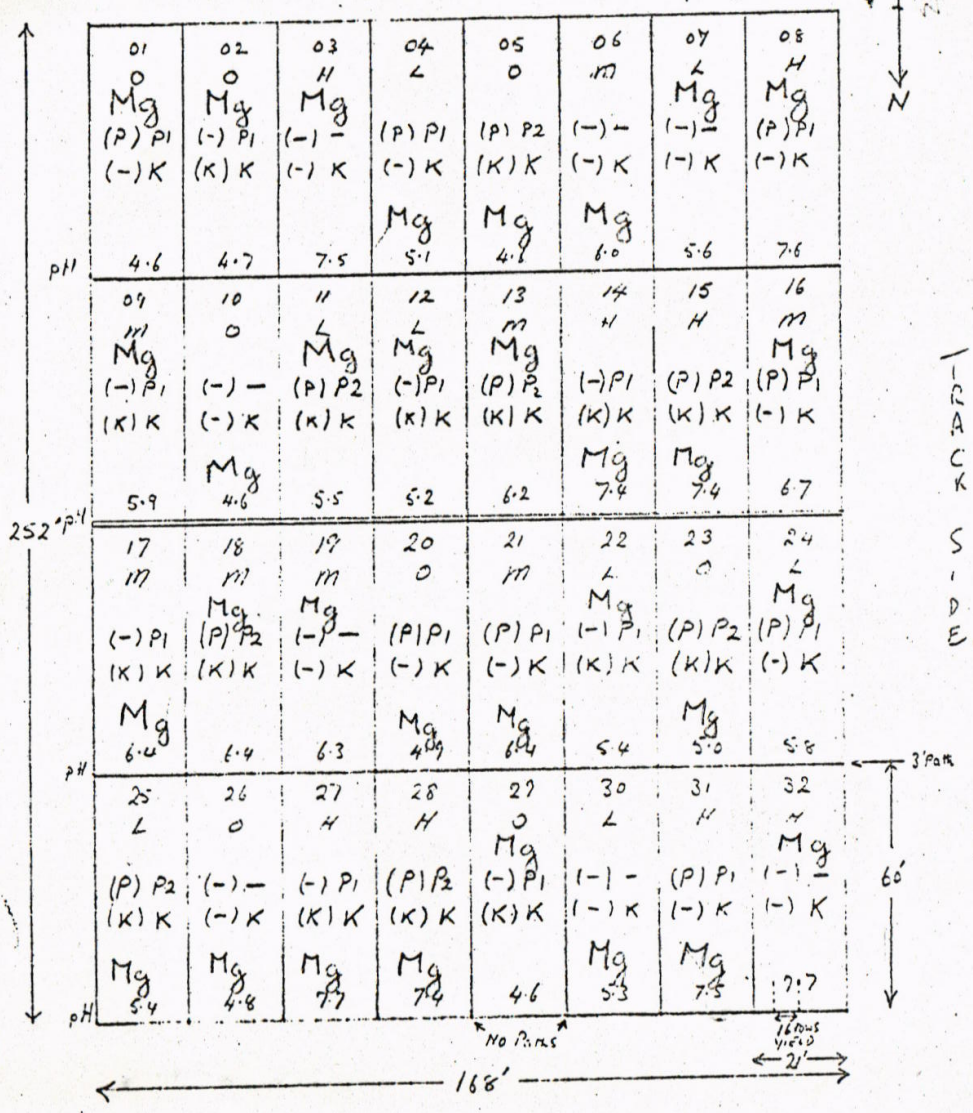
ROTHAMSTED LONG TERM LIMING S. ONTS SAWYERS I 20 R YEAR 1981

81/R/CS/10



Sponsors: S. McGrath, D.P. Stibbley

P & K TREATMENTS

	Until 1978 P	Until 1978 K	From 1981 P	From 1981 K
(-)-(-) K	-	-	-	K
(P) P1 (-) K	P	-	P1	K
(-) P1 (K) K	-	K	P1	K
(P) P2 (K) K	P	K	P2	K

LIME TREATMENTS (Total 1962-1978 t ha^{-1})

O	None
L	7
M	15
H	30

P & K until 1978 cumulative rates depended on crop.

From 1981

P1, P2 25, 75 kg P ha^{-1}

K 120 kg K ha^{-1}.

BASAL MANURING

N 'Nitrochalk' at 80 kg N ha^{-1}

Mg Epsom Salts at 120 kg Mg ha^{-1}

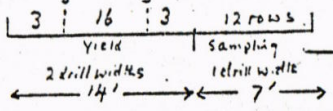
VARIETY Peniarth sown at 168 lb/ac (188 kg/ha) on 13 April

DESIGN 2 blocks of 16 plots

PLOT AREA 21' × 60' = 0.029 acre (0.0117 ha)

harvested 9'4" × 60' = 0.013 acre (0.0052 ha)

PLOT ARRANGEMENT



→ Sampling area W side of each plot.

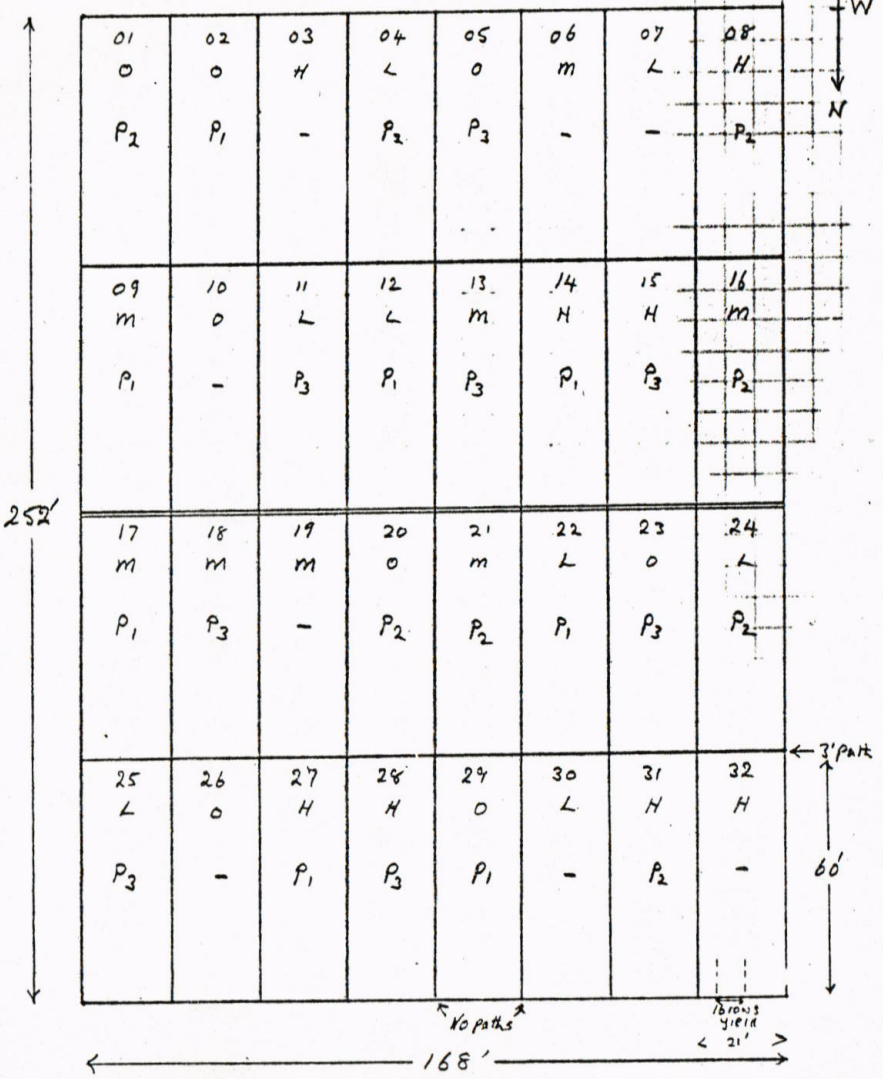
// No Weedkiller or pesticides without Sponsors Consent

// All operations by Farm.

ROTHAMSTED LONG TERM LIMING S. OATS SAWYERS I 21ST YEAR 1982

Sponsors: S. McGrath, D.P. Stribley

82/R/CS/10



TREATMENTS OF P & K

until winter 1978	1981	1982	Rate of P in 1982
– –	– K	K	None
P1 K	P1 K	P1 K	50 kg P ha^{-1}
P2 P	P1 K	– K	None
P3 PK	P3 K	P1 K	50 kg P ha^{-1}

P & K until 1978 cumulative rates dependent on crop

In 1981

P1 ; P3 25, 75 kg P ha^{-1}

K 120 kg K ha^{-1}

LIME TREATMENTS

(Total 1962 – 1978 t ha^{-1})		winter 1981/82 t ha^{-1}
0	None	none
L	7	2
m	15	5
H	30	10

BASAL MANURING

N 'Nitro chalk' at 80 kg N ha^{-1}

K muriate of potash at 120 " K "

Mg Epsom Salts at 40 " Mg "

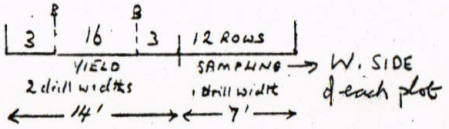
VARIETY Peniarth

DESIGN 2 blocks of 16 plots

PLOT AREA 21' x 60' = 0.029 ac (0.0117 ha)

harvested 9'4" x 60' = 0.013 ac (0.0052 ha)

PLOT ARRANGEMENT



// No weedkillers or pesticides without sponsors consent

// All operations by Farm

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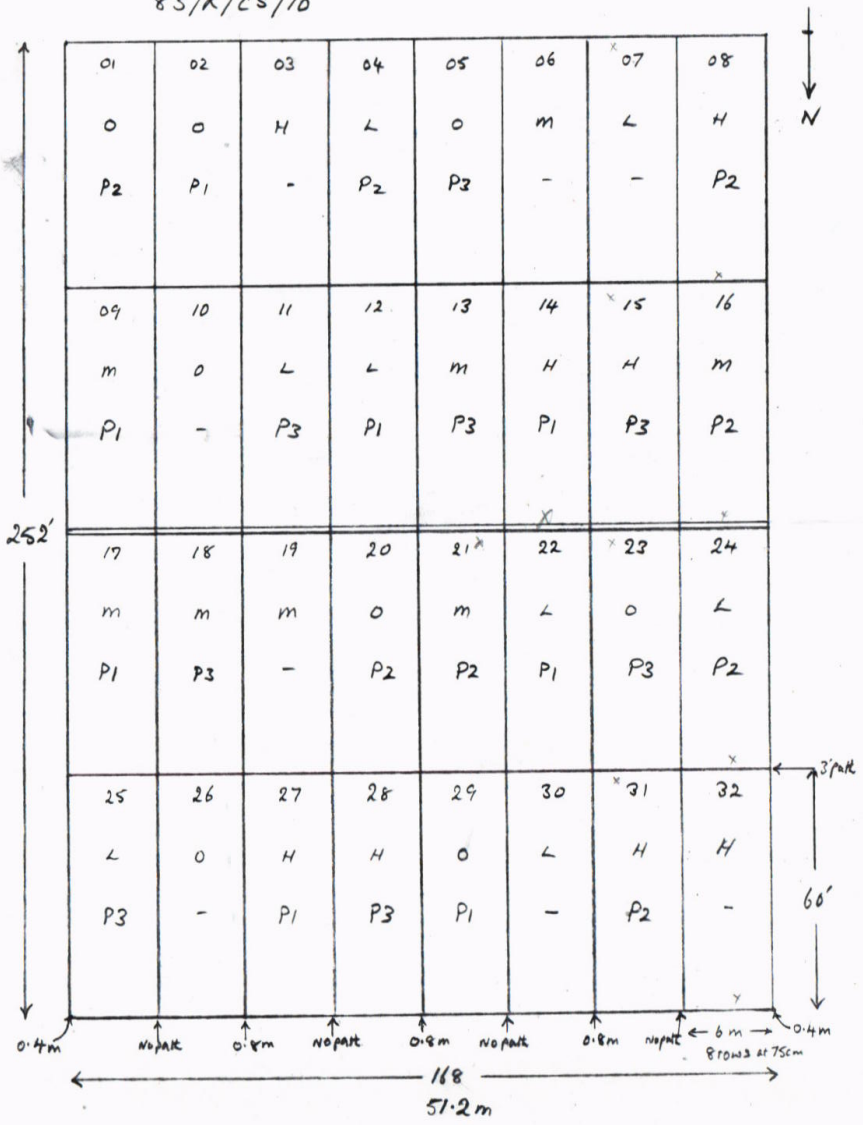
ROTHAMSTED LONG TERM LIMING POTATOES SAWYERS I 22nd YEAR 1983

Sponsors: S. McGrath, D.P. Stribley

83/R/CS/10



TREATMENTS OF P + K

until Winter 1978		1981	1982	Rate of P in 1982	1983	Rates of P in 1983
–	–	– K	K	None	– K	None
P1	K	P1 K	P1K	50 kg P ha^{-1}	– K	None
P2	P	P1 K	– K	None	P2 K	50 kg P ha^{-1}
P3	PK	P3 K	P1K	50 kg P ha^{-1}	P2 K	50 kg P ha^{-1}

P + K until 1978 Cumulative, rates depended on crop

In 1981

P1, P3 25, 75 kg P ha^{-1}

K 120 kg K ha^{-1}

LIME TREATMENTS

(Total 1962-1978 t ha^{-1})		winter 1981/82 t ha^{-1}	Winter 1982/83 t ha^{-1}
0	None	None	None
L	7	2	5
m	15	5	3
H	30	10	10

BASAL MANURING

N 250 kg N

K 250 kg K_2O

Mg 40 kg Mg (as Kieserite)

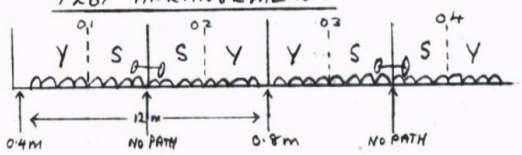
VARIETY Pentland Crown

DESIGN 2 blocks of 16 plots

PLOT AREA 21' x 60' : 0·029 ac (0·0117 ha)

harvest 2 rows x 60' : 0·0068 ac (0·0027 ha)

PLOT ARRANGEMENT



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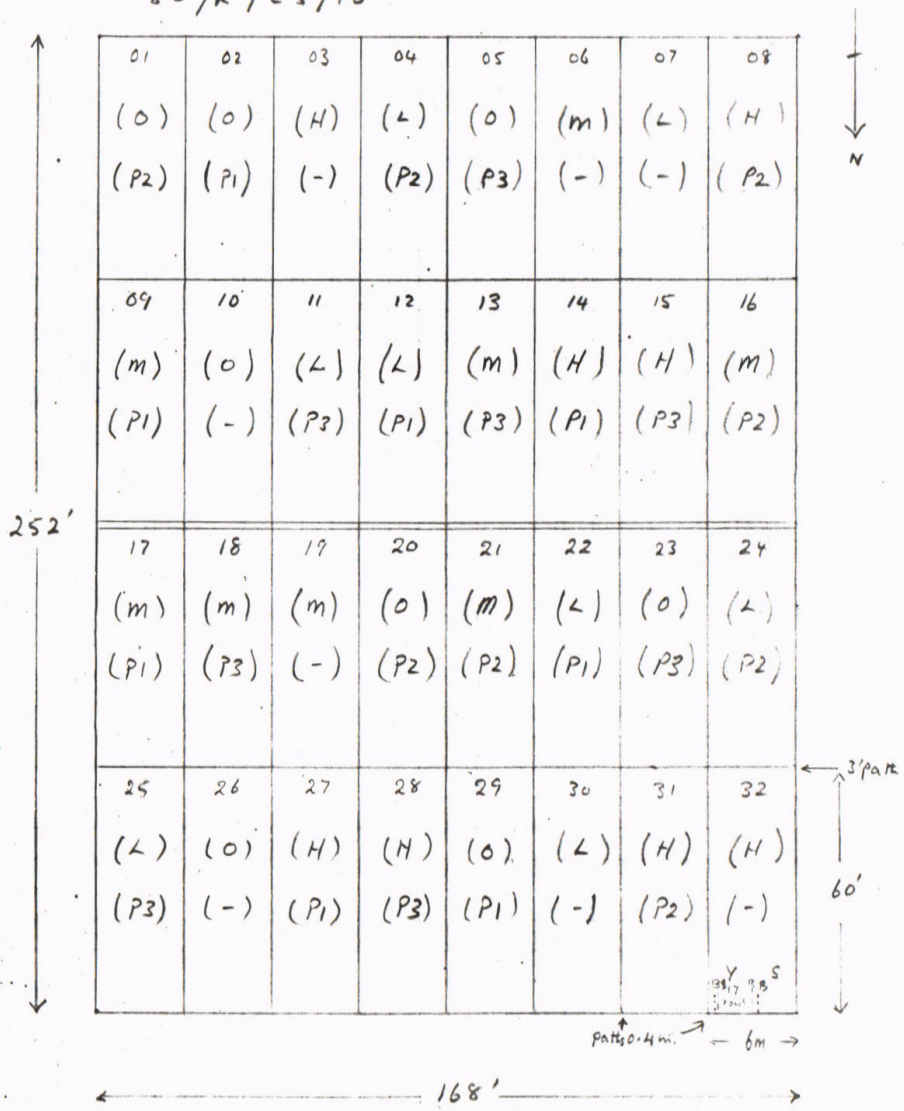
ROTHAMSTED LONG TERM LIMING S BARLEY 24th YEAR SAWYERS I 1985

85/R/CS/10

Sponsor: S.P. McGrath



TREATMENTS OF PK until 1983

until winter 1978		1981	Rates of P in 1981	1982	Rates of P in 1982	1983	Rates of P in 1983
(-)	-	- K	None	- K	None	- K	None
(P1)	K	P1 K	25 kg/ha	P2 K	50 kg P/ha	- K	None
(P2)	P	P1 K	25 "	- K	None	P2 K	50 kg P/ha
(P3)	PK	P3 K	75 "	P2 K	50 kg P/ha	P2 K	50 " "

P + K until 1978 cumulative; rates depended on crop

In 1981
K 120 kg K/ha

LIME TREATMENTS until 1983

(Total 1962-1978 t/ha)		winter 1981/82 t/ha	winter 1982/83 t/ha	Accumulated t/ha
(0)	None	None	None	= 0
(L)	7	2	5	= 14
(m)	15	5	3	= 23
(H)	30	10	10	= 50

BASAL MANURING

(25:0:16) at 448 kg/ha

VARIETY

Klaxon, sown at 157 kg/ha on 18 March

DESIGN

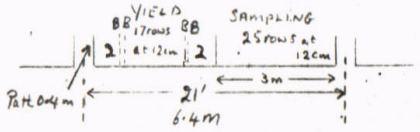
2 blocks of 16 plots.

PLOT AREA

6m x 60' = 0.0027 ac (0.011 ha)

Harvest - 17 rows @ 12cm x 60' = 0.0037 ha

PLOT ARRANGEMENT



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ROTHAMSTED. LONG TERM LIMING TRITICALE 25th YEAR SAWYERS I 1986

Sponsor : S.A. McGrath

86/R/C'S/10

01	02	03	04	05	06	07	08
(0)	(0)	(H)	(L)	(0)	(M)	(L)	(H)
(P2)	(P1)	(-)	(P2)	(P3)	(-)	(-)	(P2)
09	10	11	12	13	14	15	16
(M)	(0)	(L)	(L)	(M)	(H)	(H)	(M)
(P1)	(-)	(P3)	(P1)	(P3)	(P1)	(P3)	(P2)
17	18	19	20	21	22	23	24
(M)	(M)	(M)	(0)	(M)	(L)	(0)	(L)
(P1)	(P3)	(-)	(P2)	(P2)	(P1)	(P3)	(P2)
25	26	27	28	29	30	31	32
(L)	(0)	(H)	(H)	(0)	(L)	(H)	(H)
(P3)	(-)	(P1)	(P3)	(P1)	(-)	(P2)	(-)

N

252'

3' path

60'

Path 0.4m. ← 6m →

168'

TREATMENTS OF PK until 1983

until winter 1978		1981	Rates of P in 1981	1982	Rates of P in 1982	1983	Rates of P in 1983
(-)	-	- K	None	- K	None	- K	None
(P1)	K	P1 K	25 kg/ha	P2 K	50 kg P/ha	- K	None
(P2)	P	P1 K	25 "	- K	None	P2 K	50kgP/ha
(P3)	PK	P3 K	75 "	P2 K	50kgP/ha	P2 K	50 " "

P + K until 1978 cumulative, rates depended on crop

In 1981

K 120 kg K/ha

LIME TREATMENTS until 1983

(Total 1962-1978 t/ha)		winter 1981/82 t/ha	winter 1982/83 t/ha	Accumulated t/ha
(0)	None	None	None	= 0
(L)	7	2	5	= 14
(M)	15	5	3	= 23
(H)	30	10	10	= 50

BASAL MANURING

N in spring

VARIETY

Kasko, sown at 169 lb/ac (190 kg/ha) on 23 October

DESIGN

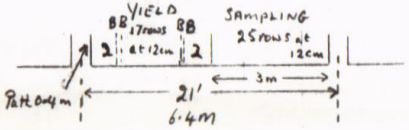
2 blocks of 16 plots

PLOT AREA

6m x 60' = 0.0027 ac (0.001 ha)

Hart - 17 rows @ 12cm x 60' = 0.0037 ha

PLOT ARRANGEMENT



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// All operations by farm

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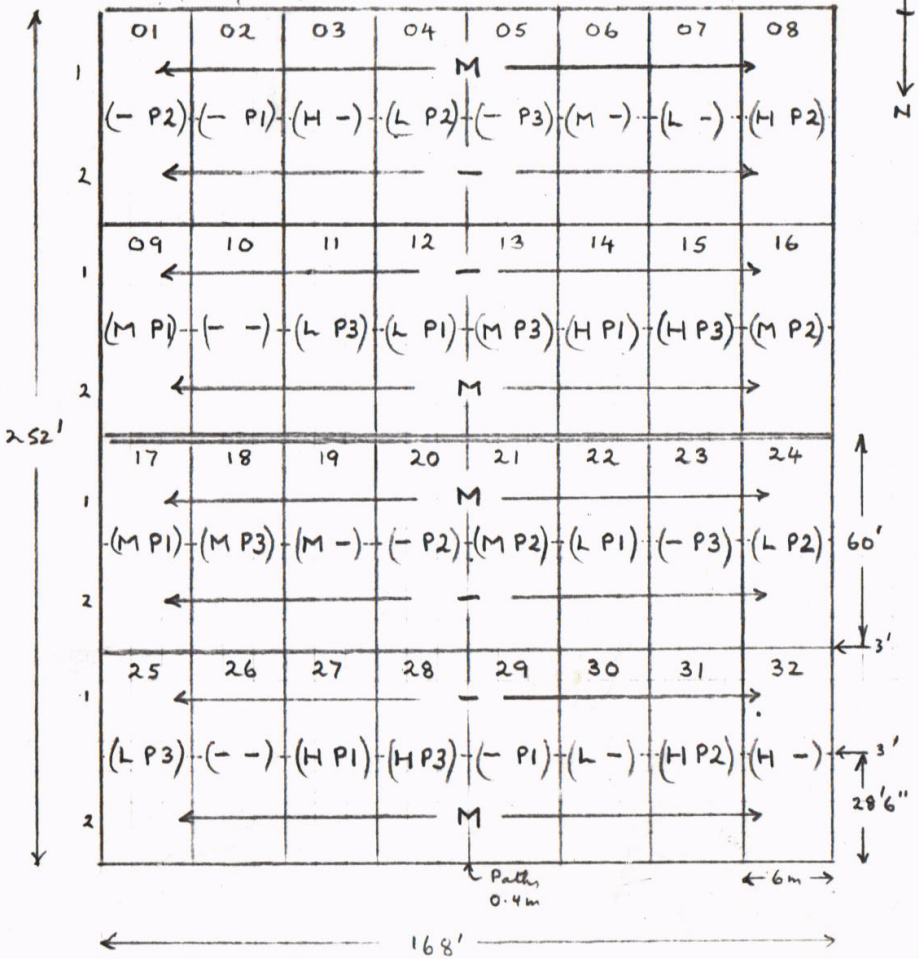
Rothamsted Long Term Liming

87/R/CS/10

S Lupins 26th Year Sawyers I 1987

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



M* applied by sprayer across strip of sub-plots, sprayer to travel over '-' sub-plot on each occasion to equalize wheelings

TREATMENTS

Residual effects of previous rates of chalk (total applied 1962-83 t/ha):

(-)	None
(L)	14
(M)	23
(H)	50

Residual effects of previous rates of P

(-)
(P1)
(P2)
(P3)

Manganese sprays in 1987

- None

M* Sprayed at rates & intervals to be advised

BASAL MANURING

None

VARIETY

Vladimir, seed to be inoculated Rhizobium

Sown @ 31 March 256 kg ha^{-1}

DESIGN

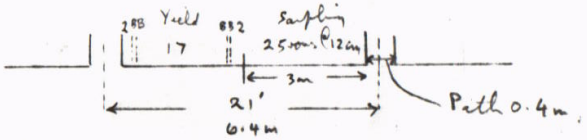
2 blocks of 16 plots split into 2

PLOT AREA

6m x 60' = 0.0110 ha

Harv: 17 rows @ 12cm x 28'6" = 0.0018 ha

DRILLING



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Rothamsted Long Term Liming — Linseed 27th Year — Saunton I — 1988

88/R/CS/10

Stewart: S.P. McGrath

01	02	03	04	05	06	07	08
(-)P2	(-)P1	(H)-	(L)P2	(-)P3	(M)-	(L)-	(H)P2
09	10	11	12	13	14	15	16
(M)P1	(-)-	(L)P3	(L)P1	(M)P3	(H)P1	(H)P3	(M)P2
17	18	19	20	21	22	23	24
(M)P1	(M)P3	(M)-	(-)P2	(M)P2	(L)P1	(-)P3	(L)P2
25	26	27	28	29	30	31	32
(L)P3	(-)-	(H)P1	(H)P3	(-)P1	(L)-	(H)P2	(H)-

252′ — 168′ — 60′ — 3′ — 29′6″ — 6m — 0.9m

TREATMENTS

Residual effects of previous rates of chalk
Total applied 1962–87 t/ha):

(-) None
(-) 15
(M) 24·5
(H) 52·5

P applied Autumn 1987 kg P/ha, cumulative to previous dressings

— None
P1 25
P2 25
P3 75

Manganese sprays in 1987

— None
M* sprayed at rates & intervals to be tabled

BASAL MANURING per ha.

K at 80 kg
Mg at 40 kg
N at 86 kg

VARIETY

Antares sown on 13 April at 87 kg/ha

DESIGN

2 blocks of 16 plots
plot size 2

PLOT AREA

6m × 60′ = 0.0119 ha
Harv: 17m (12 rows × 28′6″) = 0.0018 ha

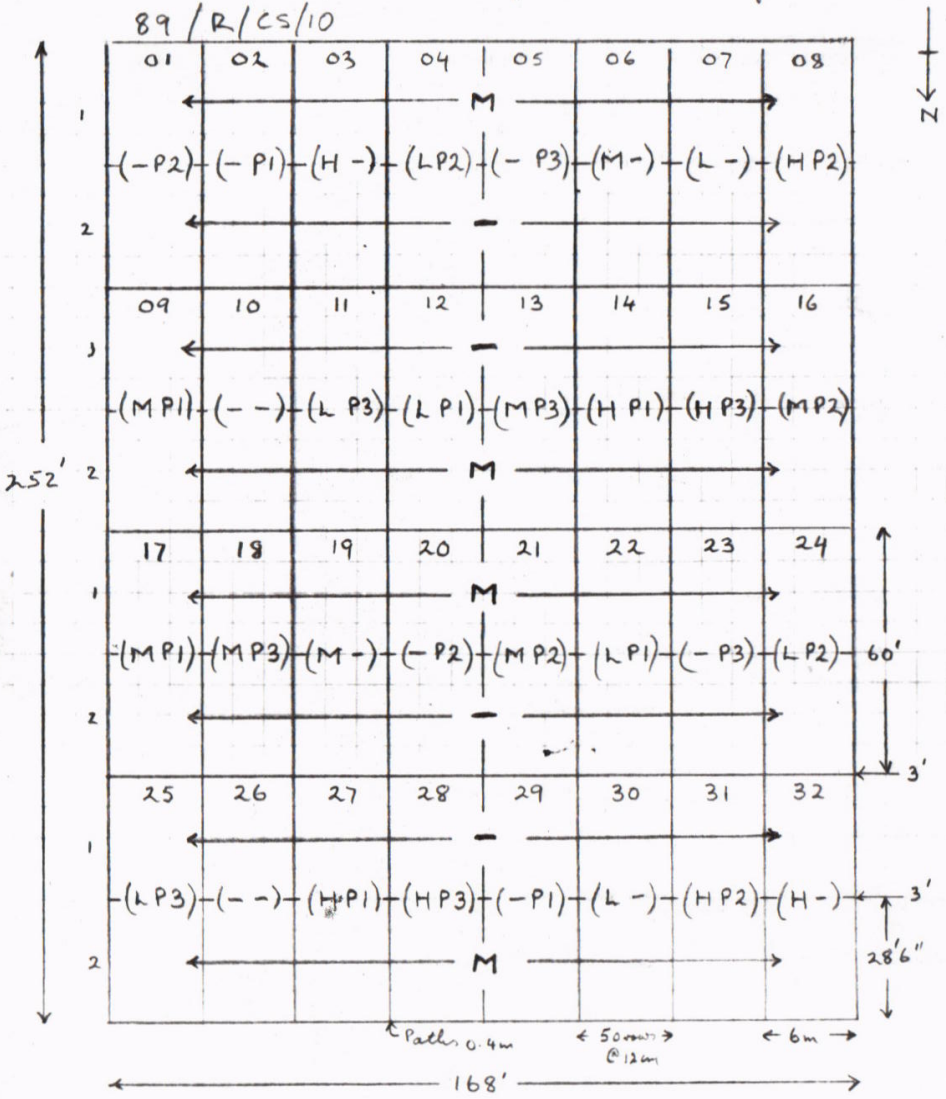
DRILLING

M* applied by knapsack sprayer to all plots, straight & Granul order, '—' sub-plots on each occasion to maximum challenge

Path 0.9m

Rothamsted Long Term Liming S Beans 28th Year Sawyers I 1989

89/R/CS/10



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

TREATMENTS

Residual effects of chalk applied 1962-87 (total t/ha):

(-) None
(L) 15
(M) 24·5
(H) 52·5

Residual effects of P applied 1962-88, rates varied with crops & years

(-)
(P1)
(P2)
(P3)

Manganese sprays in 1989, cumulative to previous applications

\- None
M* Sprayed at rates & times to be settled

BASAL MANURING

None

VARIETY

Alfred

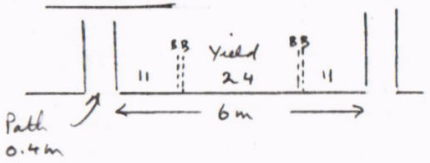
DESIGN

2 blocks of 16 split-plots 2

PLOT AREA

6m × 60' = 0·0110 ha
Harv 24 rows @ 12cm × 28'6" = 0·0025 ha

DRILLING



* Applied by sprayer across strips of sub-plots, sprayer to travel over :- sub-plots on each occasion to equalise wheelings.

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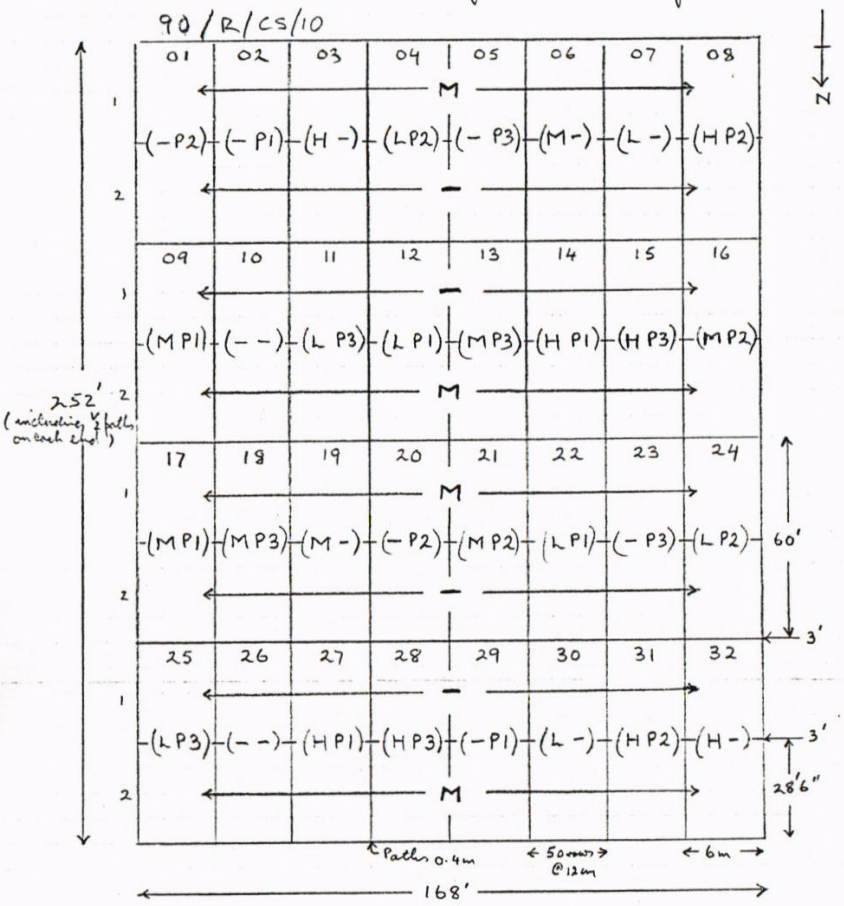
Rothamsted Long Term Liming S. Beans

29th Year Sawyers I 1990

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

90/R/CS/10



TREATMENTS

Residual effects of chalk applied 1962-87 (total t/ha):

(-) None
(L) 15
(M) 24·5
(H) 52·5

Residual effects of P applied 1962-88, rates varied with crop 4 years

(-)
(P1)
(P2)
(P3)

Manganese sprays in 1990, cumulative to previous applications, per ha

\- None
M * 'Vytel' at 3·0 l at 4-leaf stage + 1½ l just before flowering

BASAL MANURING

None

YARIETY

Alfred, sown at 260 kg/ha on 6 March

DESIGN

2 blocks of 16 plots = 32

PLOT AREA

6 m × 60' = 0·0110 ha
Harv 24 rows @ 12 cm × 28'6" = 0·0025 ha

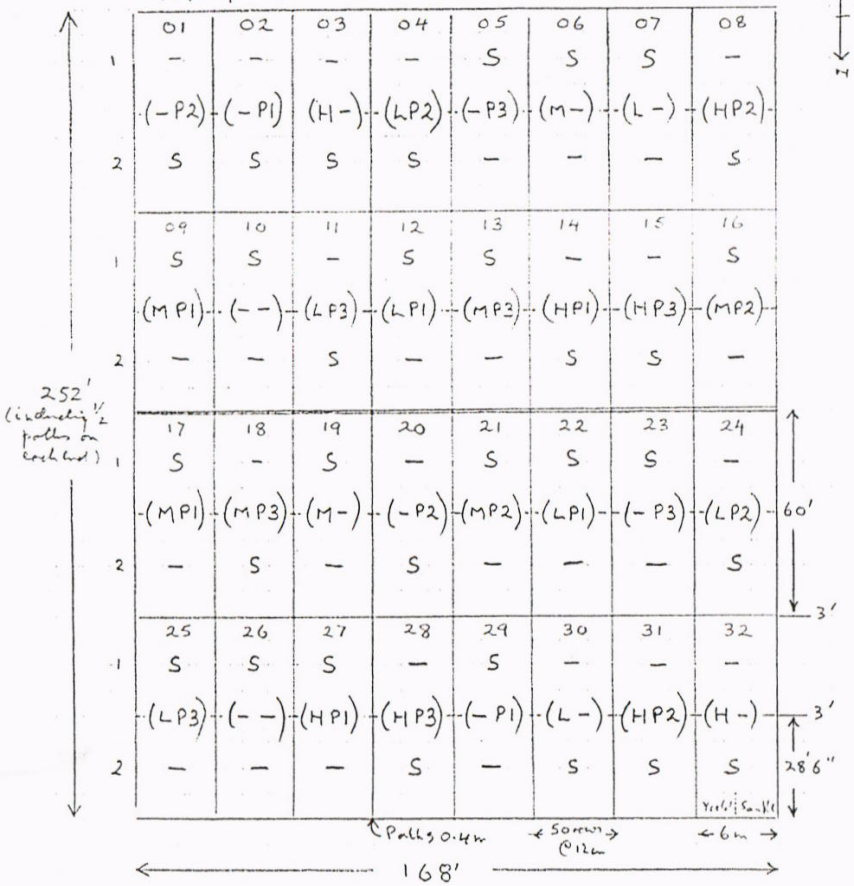
‖ 'Vytel' applied by SPM

‖ All operations by Farm

* Applied by sprayer across strips of sub-plots, sprayer to travel over '-' sub plots on each occasion to equalize wheelings.

Rothamsted Long Term Liming W. Oilseed Rape 30th Year Sample I 1991

91/R/CS/10



Sponsors: S.P. McGrath, P.B. Barraclough, G.F.J. Milford

TREATMENTS

Residual effects of chalk applied 1962-87 (total t/ha.):

(-)	None
(L)	15
(M)	24·5
(H)	52·5

Residual effects of P applied 1962-88, rates varied with crops + years:

(-)
(P1)
(P2)
(P3)

Sulphur in 1991 as calcium sulphate in spring:

–, S None, 30 kg S/ha

BASAL MANURING per ha

(25:0:16) at 200 kg to seedbed + foliar Mg spray not containing sulphate N in spring at SFP rate

VARIETY

Libravo, sown at 6kg/ha on 31 August, 1990

DESIGN

2 blocks of 4×4 split with 2

PLOT AREA

6m × 60' = 0.0110 ha

‖ All operations by Farm
‖ Refer all agrochemicals to SPM
‖ To be netted

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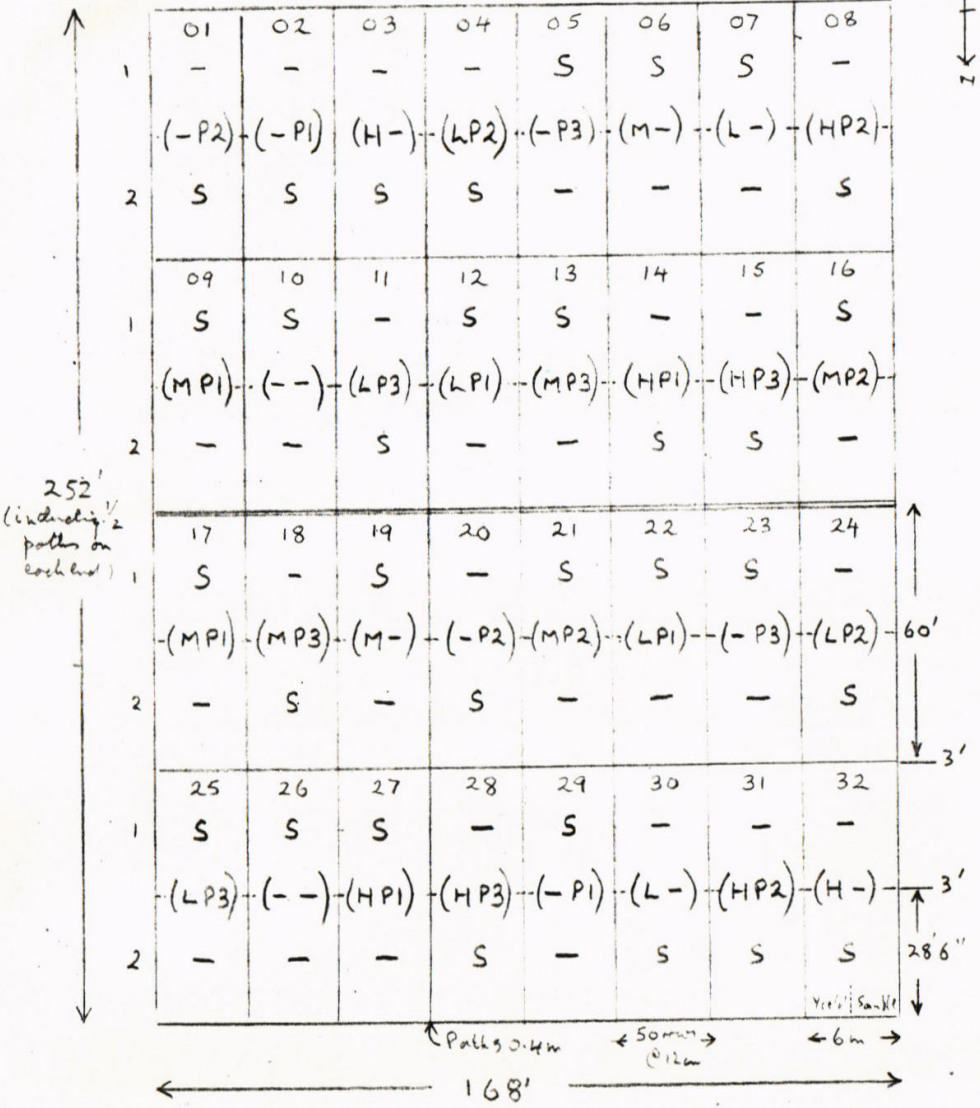
Rothamsted Long Term Liming Wolbeck Rafe 31st Year Series I 1992

92/R/CS/10



Sponsor: S.P. McGrath, P.B. Barraclough, G.F.J. Milford

TREATMENTS

Residual effects of chalk applied 1962-87 (total t/ha):

(-)	None
(L)	15
(M)	24·5
(H)	52·5

Residual effects of P applied 1962-88, rates varied with crops + years:

(-)
(P1)
(P2)
(P3)

Sulphur – 1992 as calcium sulphate in spring: (Cumulative to 1991)

–, S None, 30 kg S/ha

BASAL MANURING per ha

(25:0:16) at 200 kg to seedbed + foliar Mg spray not containing sulphate
N – spring at SFP rate

VARIETY

Libravo, sown at kg/ha on

DESIGN

2 blocks of 4×4 split with ?

PLOT AREA

6m × 60' = 0.0110 ha

All operations by Farm
Refer all agrochemicals to SPM
To be netted

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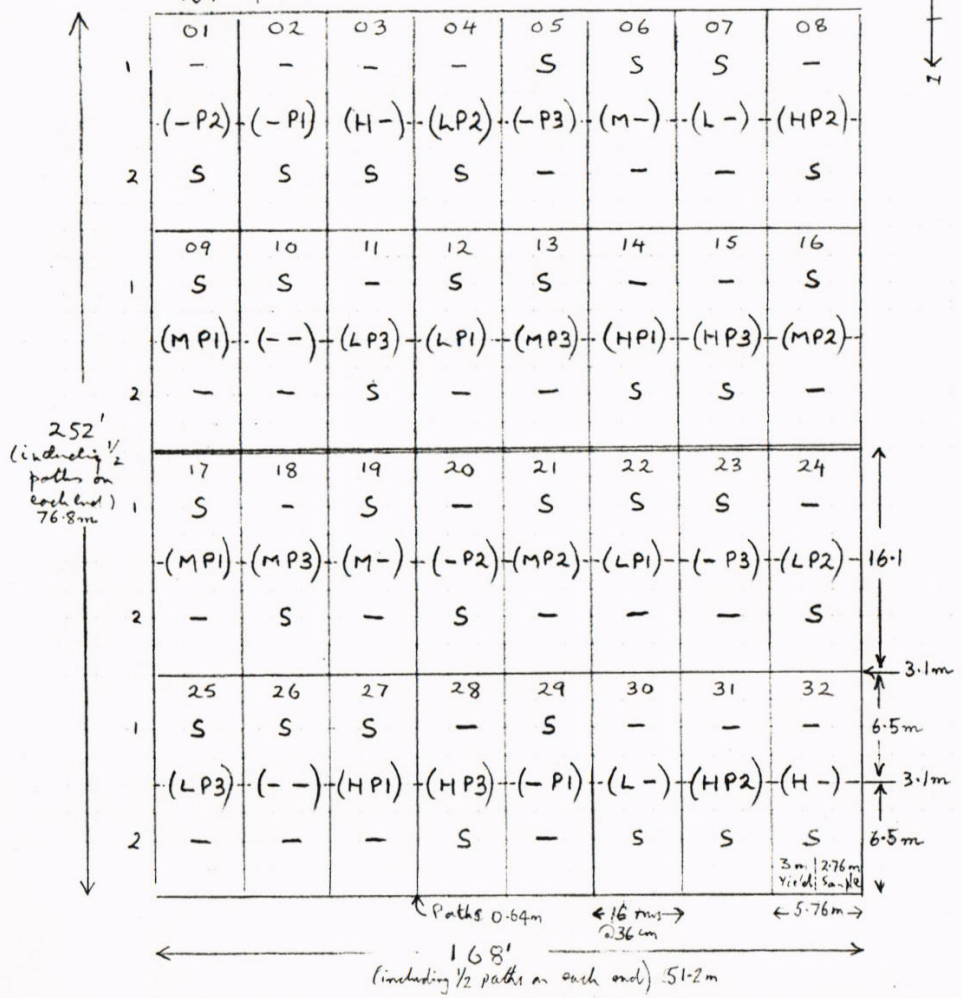
Rothamsted Long Term Liming W. Lupins 32nd Year Sample I 1993 16

93/R/CS/10



Sponsors: S.P. McGrath, P.B. Barraclough, G.F.J. Milford, J.M. Day

TREATMENTS

Residual effects of chalk applied 1962-87 (total t/ha):

(-)	None
(L)	15
(M)	24.5
(H)	52.5

Residual effects of P applied 1962-88, rates varied with crops & years:

(-)
(P1)
(P2)
(P3)

Sulphur - 1993 as calcium sulphate - spring: (cumulative to 1991+92)

-, S None, 30 kg S/ha

BASAL MANURING per ha

None

VARIETY

CH 304, sown at on

DESIGN

2 blocks of 4×4 split with ?

|| All operations by Farm
|| Refer all agrochemicals to SPM

PLOT AREA

5.76 m × 16.1m = 0.009 ha

sub plot
5.76m × 6.5 = 0.0037 ha

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Rothamsted Long Term Liming

W. Lupins 33rd Year Samples I 1994 16

94/R/CS/10

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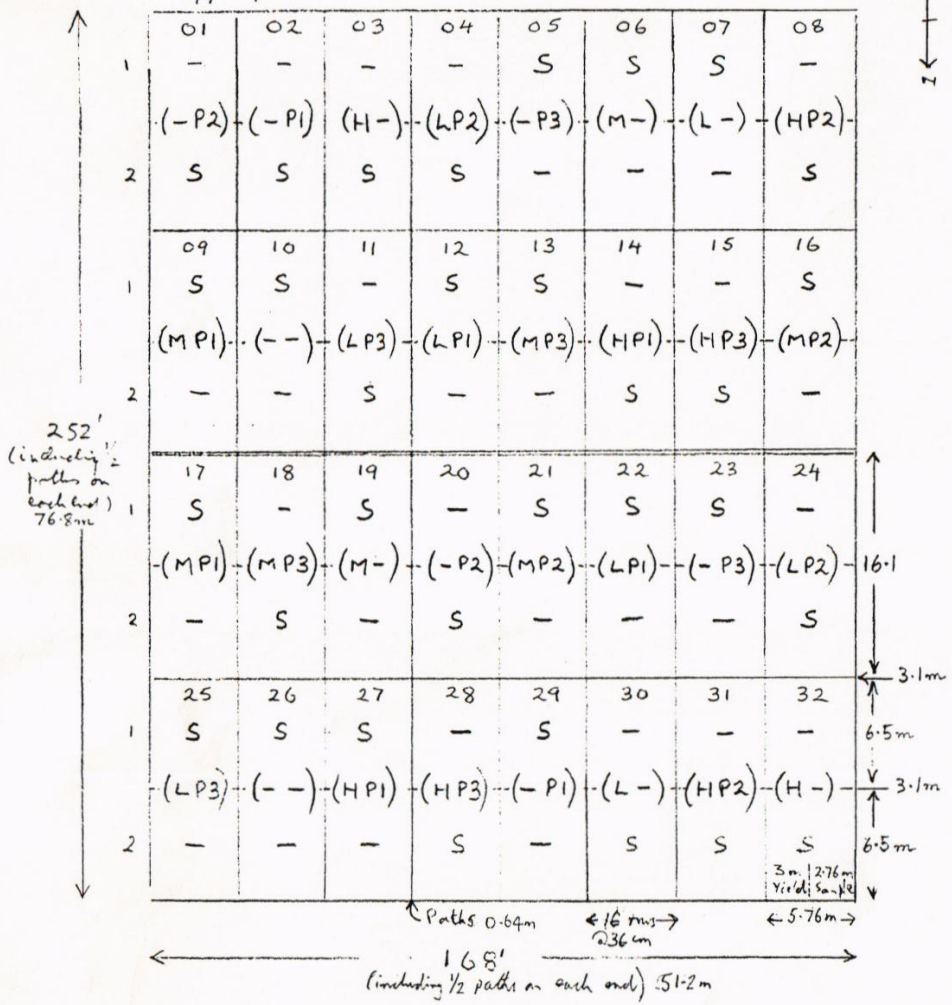

TREATMENTS

Residual effects of chalk applied 1962-87 (total t/ha):

(-)	None
(L)	15
(M)	24.5
(H)	52.5

Residual effects of P applied 1962-88, rates varied with crops + years:

(-)
(P1)
(P2)
(P3)

Sulphur – 1993 as calcium sulphate – spring: (Cumulative to 1991, 92, 93)

–, S None, 30 kg S/ha

BASAL MANURING per ha

None

VARIETY

CH 304/70 sown at 100 kg/ha on 20.10.93

DESIGN

2 blocks of 4×4 split with 2

All operations by Farm

Refer all agrochemicals to SP McGrath

PLOT AREA

5.76 m × 16.1 m = 0.009 ha

sub plot 5.76 m × 6.5 = 0.0037 ha

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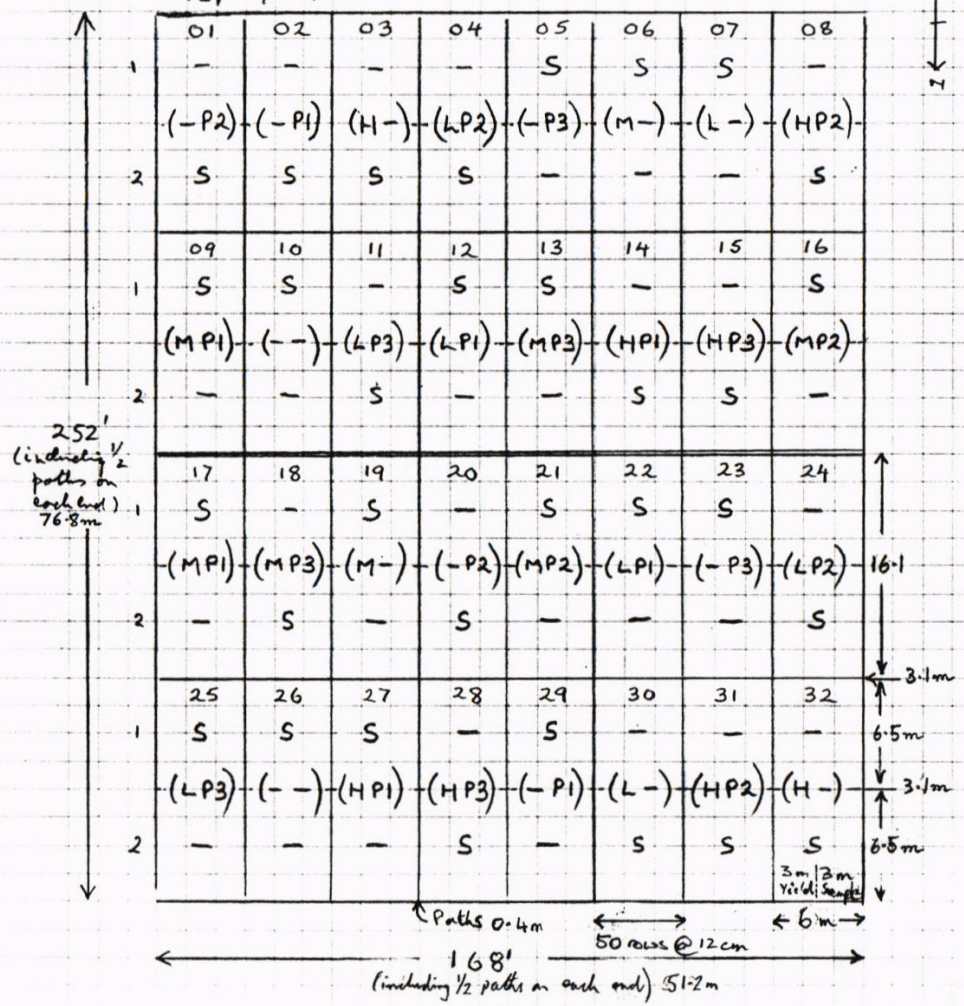
Rothamsted Long Term Liming W. Wheat 34th year Sawyers I 1995 16

95/R/CS/10



Sponsor: S.P. McGrath

TREATMENTS

Residual effects of chalk applied 1962-87 (total t/ha):

(-)	None
(L)	15
(M)	24.5
(H)	52.5

Residual effects of P applied 1962-88, rates varied with crops + years:

(-)
(P1)
(P2)
(P3)

Sulphur – 1995 as calcium sulphate – spring: (cumulative to 1991-94)

–, S None, 30 kg S/ha

BASAL MANURING per ha

No P or K
N in spring as SFP

VARIETY

Genesis, sown at on

DESIGN

2 blocks of 4x4 plots with 2

All operations by Farm

Refer all agrochemicals to SPM: Grath

PLOT AREA

6 m x 16.1m = 0.0097 ha

sub plot 6m x 6.5 = 0.0039 ha

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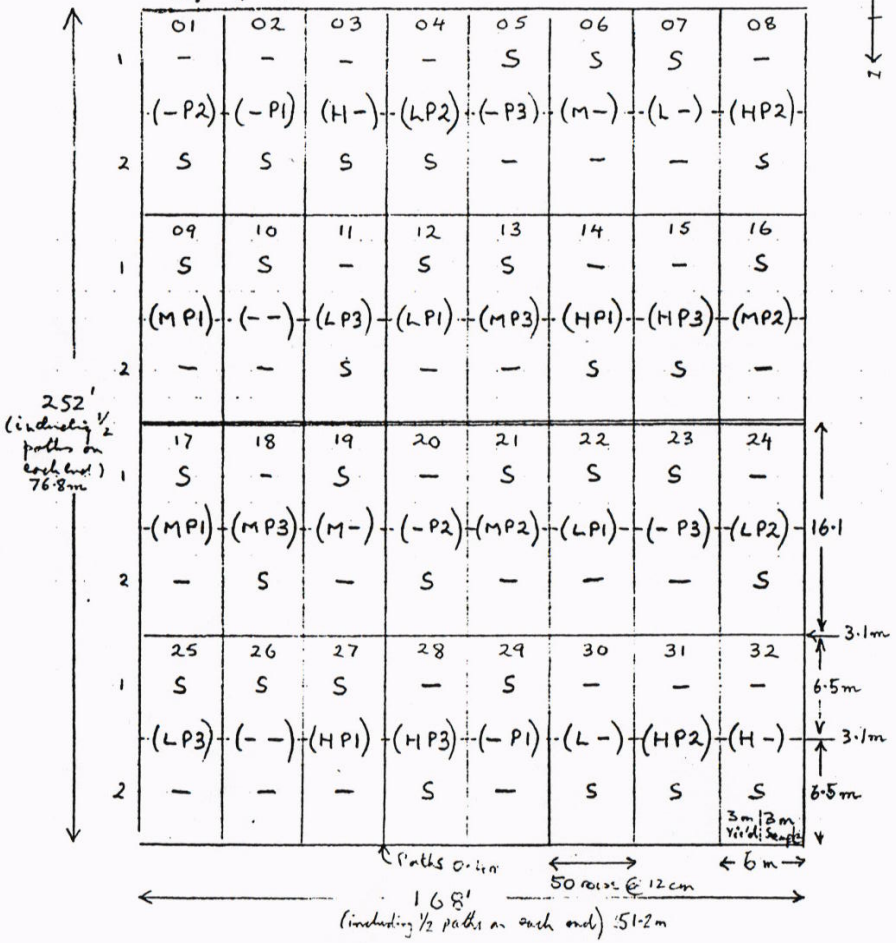
Rothamsted Long Term Liming W. Wheat 35th /2nd Sample I 1996 16

96/R/CS/10



Sponsor: S.P. McGrath

N

TREATMENTS

Residual effects of chalk applied 1962-87 (total t/ha):

(-) None
(L) 15
(M) 24.5
(H) 52.5

Residual effects of P applied 1962-88, rates varied with crops + years:

(-)
(P1)
(P2)
(P3)

Sulphur - 1996 as calcium sulphate - spring: (cumulative to 1991-95)

-, S None, 30 kg S/ha

BASAL MANURING per ha

No P or K
N in spring as SFP

VARIETY

Hereward, dr Panoctine, sown at 380 seeds/m² on 28/9/95

DESIGN

2 blocks of 4x4 plots with 2

All operations by Farm

Refer all agrochemicals to SPMcGrath

PLOT AREA

6m x 16.1m = 0.0097 ha

sub plot 6m x 6.5 = 0.0039 ha