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## Yields of the Field Experiments 1982

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### **82/R/RN/17 Rates of P and K to the Subsoil - Potatoes, S. Barley, S. Beans, W. Wheat**

#### **Rothamsted Research**

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82/R/RN/17

RATES OF P AND K TO THE SUBSOIL

Object: To study the effects of a range of rates and frequencies of application of P and K to the subsoil, singly and together, on the yields and nutrient uptakes of a rotation of crops - Meadow.

Sponsors: J. McEwen, A.E. Johnston.

The second year, potatoes, s. barley, s. beans, w. wheat.

For previous year see 81/R/RN/17.

Design: 4 series (for crops) each of 40 plots.

Whole plot dimensions: 3.0 x 14.0.

Treatments to each series:

TREATMNT Extra P and K and primary cultivation tool in autumn 1980 only except on R plots, treatments repeated in autumn 1981:

	P <sub>2</sub> O <sub>5</sub> (kg)	K <sub>2</sub> O(kg)	Tool		
- - -	0	0	Plough		(duplicated)
P6 K6 T	1000	500 to topsoil	"		( " )
- - S	0	0 " "	Wye double-digger		(four plots)
- - SR	0	0 " "	"	"	(duplicated)
P2 - SR	63	0 to subsoil	"	"	"
P3 - S	125	0 " "	"	"	"
P4 - S	250	0 " "	"	"	"
P5 - S	500	0 " "	"	"	(duplicated)
P6 - S	1000	0 " "	"	"	"
- K2 SR	0	31 " "	"	"	"
- K3 S	0	63 " "	"	"	"
- K4 S	0	125 " "	"	"	"
- K5 S	0	250 " "	"	"	(duplicated)
- K6 S	0	350 " "	"	"	"
P1 K1 SR	31	16 " "	"	"	"
P1 K3 SR	31	63 " "	"	"	"
P2 K2 SR	63	31 " "	"	"	"
P3 K1 SR	125	16 " "	"	"	"
P3 K3 SR	125	63 " "	"	"	"
P3 K4 S	125	125 " "	"	"	"
P4 K3 S	250	63 " "	"	"	"
P4 K4 S	250	125 " "	"	"	"
P4 K5 S	250	250 " "	"	"	(duplicated)
P4 K6 S	250	350 " "	"	"	"
P5 K4 S	500	125 " "	"	"	(duplicated)
P5 K5 S	500	250 " "	"	"	"
P5 K6 S	500	350 " "	"	"	"
P6 K4 S	1000	125 " "	"	"	"
P6 K5 S	1000	250 " "	"	"	"
P6 K6 S	1000	350 " "	"	"	"

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- NOTES: (1) Subsoiling was done with the Wye double-digger which turns a furrow with a conventional plough share, to a depth of 23 cm, and at the same time rotary cultivates the bottom of the adjacent furrow to a further depth of 15 cm. When applying P and K this was distributed ahead of the rotary cultivator.
- (2) The topsoil PK dressing was equally divided before and after ploughing.
- (3) All plots other than R were conventionally ploughed in autumn 1981.
- (4) The rate of 350 kg K<sub>2</sub>O applied was in error for 500 kg K<sub>2</sub>O.

Standard applications:

- Potatoes: Manures: (10:10:15 + 4.5 Mg) at 1960 kg. Weedkiller: Metribuzin at 0.98 kg in 900 l. Fungicides: Mancozeb at 1.4 kg in 250 l on four occasions, the first two with the insecticide. Ofurace at 0.12 kg and maneb at 1.2 kg in 250 l on two occasions, the first with the insecticide. Insecticide: Pirimicarb at 0.14 kg.
- S. barley: Manures: (20:10:10) at 450 kg, combine drilled. Weedkillers: Glyphosate at 1.4 kg in 250 l. Dicamba, mecoprop and MCPA (as 'Poly-Farmon' at 5.0 l) in 250 l applied with the fungicide. Fungicide: Tridemorph at 0.53 kg.
- S beans: Weedkillers: Paraquat at 0.6 kg ion in 250 l. Trietazine at 1.0 kg and simazine at 0.14 kg in 250 l. Insecticide: Phorate at 5.6 kg.
- W. wheat: Manures: (0:14:28) at 450 kg. 'Nitro-Chalk' at 480 kg. Weedkillers: Glyphosate at 1.4 kg in 250 l. Mecoprop (as 'Methoxone M' at 5.0 l) and isoproturon at 2.0 kg in 250 l. Fungicide: Propiconazole at 0.12 kg in 250 l on the first occasion at 0.25 kg in 250 l applied with the insecticide on the second occasion. Insecticide: Pirimicarb at 0.14 kg.

Seed: Potatoes: Pentland Crown.

- S. barley: Triumph, seed dressed with ethirimol, sown at 160 kg.
- S. beans: Minden, sown at 270 kg.
- W. wheat: Avalon, sown at 200 kg.

Cultivations, etc.:-

- All crops: Treatments applied by double digger: 30 Oct - 2 Nov, 1981. Ploughed: 3 - 4 Nov.
- Potatoes: Heavy spring-tine cultivated twice: 6 Nov, 1981 and 24 Mar, 1982. NPK Mg applied: 19 Apr. Spiked rotary cultivated, potatoes planted: 20 Apr. Rotary ridged: 10 May. Weedkiller applied: 8 June. Mancozeb with insecticide applied: 14 June, 30 June. Mancozeb applied: 12 July. Ofurace and maneb with insecticide applied: 26 July. Ofurace and maneb applied: 9 Aug. Mancozeb applied: 25 Aug. Haulm mechanically destroyed: 17 Sept. Lifted: 26 Oct.
- S. barley: Heavy spring-tine cultivated twice: 5 Nov, 1981 and 24 Mar, 1982. Rotary harrowed, seed sown: 31 Mar. Dicamba, mecoprop MCPA with tridemorph applied: 10 May. Glyphosate applied: 10 Aug. Combine harvested: 19 Aug.
- S. beans: Heavy spring-tine cultivated: 6 Nov, 1981. Paraquat applied: 23 Mar, 1982. Heavy spring-tine cultivated: 24 Mar. Phorate applied, rotary harrowed, seed sown: 27 Mar. Trietazine and simazine applied: 2 Apr. Combine harvested: 2 Sept.

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W. wheat: Heavy spring-tine cultivated twice, PK applied: 5 Nov, 1981. Rotary harrowed, seed sown: 6 Nov. Mecoprop and isoproturon applied: 14 Apr, 1982. N applied: 16 Apr. Propiconazole applied: 26 May. Propiconazole with the insecticide applied: 15 June. Glyphosate applied: 10 Aug. Combine harvested: 21 Aug.

82/R/RN/17 SERIES IV POTATOES

TOTAL TUBERS TONNES/HECTARE

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

TREATMNT	
- - -	53.7
P6 K6 T	52.9
- - S	56.1
- - SR	54.5
P2 - SR	48.7
P3 - S	50.2
P4 - S	58.3
P5 - S	55.0
P6 - S	50.4
- K2 SR	64.1
- K3 S	52.1
- K4 S	55.4
- K5 S	54.2
- K6 S	56.6
P1 K1 SR	59.3
P1 K3 SR	48.5
P2 K2 SR	59.7
P3 K1 SR	61.3
P3 K3 SR	47.8
P3 K4 S	47.0
P4 K3 S	51.4
P4 K4 S	46.3
P4 K5 S	58.5
P4 K6 S	53.8
P5 K4 S	50.6
P5 K5 S	48.9
P5 K6 S	51.4
P6 K4 S	50.5
P6 K5 S	50.4
P6 K6 S	52.6
MEAN	53.7

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

TABLE	TREATMNT*
-----	-----
SED	1.81 MIN REP
	1.56 MAX-MIN

\* SED APPLIES ONLY TO - - -, P6 K6 T, - - S, - - SR, P5 - S, - K5 S, P4 K5 S AND P5 K4 S

TREATMNT  
 MAX-MIN - - S V ANY OF REMAINDER  
 MIN REP ANY OF THE REMAINDER

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

STRATUM	DF	SE	CV%
WP	10	1.81	3.4

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SERIES IV POTATOES

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

TREATMNT	
- - -	98.1
P6 K6 T	97.5
- - S	97.3
- - SR	96.8
P2 - SR	96.6
P3 - S	96.8
P4 - S	97.7
P5 - S	96.8
P6 - S	96.8
- K2 SR	98.1
- K3 S	96.3
- K4 S	97.7
- K5 S	97.6
- K6 S	97.3
P1 K1 SR	97.6
P1 K3 SR	97.1
P2 K2 SR	96.1
P3 K1 SR	97.9
P3 K3 SR	96.4
P3 K4 S	96.5
P4 K3 S	97.1
P4 K4 S	96.6
P4 K5 S	96.6
P4 K6 S	97.3
P5 K4 S	97.3
P5 K5 S	96.7
P5 K6 S	96.3
P6 K4 S	96.2
P6 K5 S	97.3
P6 K6 S	94.8
MEAN	97.0

PLOT AREA HARVESTED 0.00210

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SERIES I SPRING BARLEY

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	7.47
P6 K6 T	7.36
- - S	7.37
- - SR	7.32
P2 - SR	7.82
P3 - S	7.52
P4 - S	7.49
P5 - S	7.53
P6 - S	7.61
- K2 SR	7.66
- K3 S	7.45
- K4 S	7.65
- K5 S	7.46
- K6 S	7.40
P1 K1 SR	7.34
P1 K3 SR	7.71
P2 K2 SR	7.71
P3 K1 SR	7.52
P3 K3 SR	7.70
P3 K4 S	7.68
P4 K3 S	7.58
P4 K4 S	7.69
P4 K5 S	7.62
P4 K6 S	7.23
P5 K4 S	7.72
P5 K5 S	7.49
P5 K6 S	7.50
P6 K4 S	7.62
P6 K5 S	7.90
P6 K6 S	7.69
MEAN	7.54

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

TABLE	TREATMNT*
-----	-----
SED	0.195 MIN REP
	0.169 MAX-MIN

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

STRATUM	DF	SE	CV%
WP	10	0.195	2.6

GRAIN MEAN DM% 82.7

PLOT AREA HARVESTED 0.00286

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SERIES II SPRING BEANS

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	5.07
P6 K6 T	5.23
- - S	5.48
- - SR	5.22
P2 - SR	5.39
P3 - S	5.09
P4 - S	4.74
P5 - S	4.94
P6 - S	5.27
- K2 SR	5.10
- K3 S	4.79
- K4 S	5.02
- K5 S	5.04
- K6 S	5.36
P1 K1 SR	4.73
P1 K3 SR	5.47
P2 K2 SR	5.33
P3 K1 SR	4.86
P3 K3 SR	5.17
P3 K4 S	5.33
P4 K3 S	4.63
P4 K4 S	5.33
P4 K5 S	4.94
P4 K6 S	4.99
P5 K4 S	5.11
P5 K5 S	5.19
P5 K6 S	5.12
P6 K4 S	5.47
P6 K5 S	5.82
P6 K6 S	5.42
MEAN	5.17

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

TABL	TREATMNT*
-----	-----
SED	0.432 MIN REP
	0.374 MAX-MIN

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

STRATUM	DF	SE	CV%
WP	10	0.432	8.4

GRAIN MEAN DM% 74.8

PLOT AREA HARVESTED 0.00386



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SERIES III WINTER WHEAT

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	8.79
P6 K6 T	8.66
- - S	8.64
- - SR	8.75
P2 - SR	8.83
P3 - S	9.03
P4 - S	8.97
P5 - S	8.94
P6 - S	9.28
- K2 SR	9.02
- K3 S	9.09
- K4 S	8.89
- K5 S	8.86
- K6 S	8.70
P1 K1 SR	8.74
P1 K3 SR	8.82
P2 K2 SR	8.97
P3 K1 SR	8.90
P3 K3 SR	8.76
P3 K4 S	8.74
P4 K3 S	8.77
P4 K4 S	8.90
P4 K5 S	8.96
P4 K6 S	8.96
P5 K4 S	8.93
P5 K5 S	9.23
P5 K6 S	9.10
P6 K4 S	8.84
P6 K5 S	8.96
P6 K6 S	8.81
MEAN	8.87

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

TABLE	TREATMNT*
-----	-----
SED	0.226 MIN REP
	0.196 MAX-MIN

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

STRATUM	DF	SE	CV%
WP	10	0.226	2.6

GRAIN MEAN DM% 85.2

PLOT AREA HARVESTED 0.00286