ROTHAMSTED RESEARCH

Yields of the Field Experiments 1986

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

Rothamsted Research

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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 sixth year, potatoes, s. barley, s. beans, w. wheat.

For previous years see 81-85/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 A plots, treatments repeated annually, and F plots treatments repeated four yearly:

	P205(kg)	K20(kg)	Tool	
- - -	0	0	Plough	(duplicated)
P6 K6 T	1000	500 to topsoil	"	(")
- - S	0	0	Wye double-digger	(triplicated)
- - SA	0	0	" " "	(duplicated)
- - SF	0	0	" " "	
P2 - SA	63	0 to subsoil	" " "	
P3 - SF	125	0 " "	" " "	
P4 - S	250	0 " "	" " "	
P5 - S	500	0 " "	" " "	
P5 - SF	500	0 " "	" " "	
P6 - S	1000	0 " "	" " "	
- K2 SA	0	31 " "	" " "	
- K3 SF	0	63 " "	" " "	
- K4 S	0	125 " "	" " "	
- K5 S	0	250 " "	" " "	
- K5 SF	0	250 " "	" " "	
- K6 S	0	350 " "	" " "	
P1 K1 SA	31	16 " "	" " "	
P1 K3 SA	31	63 " "	" " "	
P2 K2 SA	63	31 " "	" " "	
P3 K1 SA	125	16 " "	" " "	
P3 K3 SA	125	63 " "	" " "	
P3 K4 SF	125	125 " "	" " "	
P4 K3 SF	250	63 " "	" " "	
P4 K4 S	250	125 " "	" " "	
P4 K5 S	250	250 " "	" " "	
P4 K5 SF	250	250 " "	" " "	
P4 K6 S	250	350 " "	" " "	
P5 K4 S	500	125 " "	" " "	
P5 K4 SF	500	125 " "	" " "	
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 were conventionally ploughed each autumn unless the Wye double-digging treatment was due.
(4) The rate of 350 kg K20 applied was in error for 500 kg K20.

Standard applications:
Potatoes: Manures: (10:10:15+4.5 Mg) at 1960 kg. Weedkillers: Paraquat at 0.60 kg ion in 200 l. Linuron at 1.3 kg in 500 l. Fungicide: Mancozeb at 1.4 kg in 200 l on four occasions, applied with the pirimicarb on the third and fourth. Fentin hydroxide at 0.28 kg in 200 l on two occasions, with the pirimicarb on the first. Insecticide: Pirimicarb at 0.14 kg on three occasions with the fungicides. Desiccant: Diquat at 0.60 kg ion in 200 l.
S. barley: Manures: (20:10:10) at 630 kg. Weedkillers: Clopyralid at 0.07 kg, bromoxynil octanoate at 0.34 kg and mecoprop at 2.5 kg in 200 l applied with the tridemorph. Fungicides: Tridemorph at 0.52 kg. Propiconazole at 0.12 kg in 200 l. Desiccant: Glyphosate at 1.4 kg in 200 l.
S. beans: Weedkillers: Paraquat at 0.60 kg ion in 200 l. Simazine at 1.2 kg with paraquat at 0.50 kg ion in 200 l. Insecticides: Phorate at 4.5 kg. Pirimicarb at 0.14 kg in 200 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Agral' at 0.075 l) in 500 l.
W. wheat: Manures: (0:18:36) at 350 kg. 'Nitram' at 520 kg. Weedkillers: Clopyralid at 0.07 kg, bromoxynil octanoate at 0.34 kg, mecoprop at 2.5 kg and isoproturon at 2.1 kg in 200 l. Fungicide: Propiconazole at 0.12 kg in 200 l. Desiccant: Glyphosate at 1.4 kg in 200 l.

Seed: Potatoes: Pentland Crown.
S. barley: Klaxon, sown at 160 kg.
S. beans: Minden, sown at 300 kg.
W. wheat: Avalon, sown at 190 kg.

Cultivations, etc.:-
All crops: Treatments applied by double-digger: 4 Nov, 1985 and 5 Nov. Ploughed: 6 Nov. Heavy spring-tine cultivated: 7 Nov, 8 Nov.
Potatoes: Paraquat applied: 23 Sept, 1985. NPK Mg applied: 12 May, 1986. Rotary harrowed, potatoes planted: 13 May. Rotary ridged: 19 May. Linuron applied: 30 May. Mancozeb applied: 30 June, 14 July. Mancozeb with pirimicarb applied: 28 July, 12 Aug. Fentin hydroxide with pirimicarb applied: 29 Aug. Fentin hydroxide applied: 11 Sept. Haulm mechanically destroyed: 19 Sept. Desiccant applied: 27 Sept. Lifted: 15 Oct.
S. barley: NPK applied, spring-tine cultivated, rotary harrowed, seed sown: 17 Mar, 1986. Weedkillers with tridemorph applied: 16 May. Propiconazole applied: 25 June. Desiccant applied: 12 Aug. Combine harvested: 29 Aug.

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S. beans: Paraquat alone applied: 23 Sept, 1985. Phorate applied, spring-tine cultivated, rotary harrowed, seed sown: 11 Apr, 1986. Simazine with paraquat applied: 25 Apr. Pirimicarb applied: 16 July. Desiccant with wetting agent applied: 17 Sept. Combine harvested: 23 Sept.

W. wheat: PK applied, rotary harrowed, seed sown: 8 Nov, 1985. N applied: 24 Apr, 1986. Weedkillers applied: 30 Apr. Fungicide applied: 25 June. Desiccant applied: 12 Aug. Combine harvested: 30 Aug.

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SERIES IV POTATOES

TOTAL TUBERS TONNES/HECTARE

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

TREATMNT	
- - -	46.0
P6 K6 T	40.6
- - S	40.9
- - SA	44.2
- - SF	45.9
P2 - SA	48.7
P3 - SF	46.2
P4 - S	45.6
P5 - S	49.4
P5 - SF	47.4
P6 - S	44.2
- K2 SA	46.2
- K3 SF	48.3
- K4 S	46.9
- K5 S	43.5
- K5 SF	45.2
- K6 S	46.2
P1 K1 SA	43.1
P1 K3 SA	43.8
P2 K2 SA	45.0
P3 K1 SA	45.6
P3 K3 SA	43.6
P3 K4 SF	50.3
P4 K3 SF	39.7
P4 K4 S	39.5
P4 K5 S	47.2
P4 K5 SF	47.7
P4 K6 S	44.3
P5 K4 S	39.6
P5 K4 SF	45.0
P5 K5 S	37.4
P5 K6 S	41.8
P6 K4 S	43.2
P6 K5 S	39.3
P6 K6 S	47.5
MEAN	44.3

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

TABLE	TREATMNT	
SED	3.08	MIN REP
	2.51	MAX-MIN

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

STRATUM	DF	SE	CV%
WP	5	2.18	4.9

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SERIES IV POTATOES

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

TREATMNT	
- - -	98.3
P6 K6 T	97.8
- - S	97.7
- - SA	98.4
- - SF	98.1
P2 - SA	98.3
P3 - SF	98.1
P4 - S	97.4
P5 - S	98.3
P5 - SF	98.8
P6 - S	97.2
- K2 SA	97.9
- K3 SF	98.4
- K4 S	98.3
- K5 S	98.7
- K5 SF	98.4
- K6 S	97.3
P1 K1 SA	97.4
P1 K3 SA	96.7
P2 K2 SA	97.3
P3 K1 SA	98.6
P3 K3 SA	98.3
P3 K4 SF	98.3
P4 K3 SF	97.5
P4 K4 S	96.9
P4 K5 S	98.0
P4 K5 SF	97.7
P4 K6 S	98.2
P5 K4 S	98.1
P5 K4 SF	97.1
P5 K5 S	97.7
P5 K6 S	96.9
P6 K4 S	97.7
P6 K5 S	97.5
P6 K6 S	97.5
MEAN	97.9

PLOT AREA HARVESTED 0.00210

* SEDs APPLY 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 REMAINDER

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SERIES I SPRING BARLEY

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	7.71
P6 K6 T	7.61
- - S	7.91
- - SA	7.85
- - SF	8.01
P2 - SA	8.01
P3 - SF	7.82
P4 - S	7.90
P5 - S	7.96
P5 - SF	7.87
P6 - S	8.05
- K2 SA	7.81
- K3 SF	7.34
- K4 S	7.80
- K5 S	7.80
- K5 SF	8.11
- K6 S	7.76
P1 K1 SA	7.92
P1 K3 SA	7.80
P2 K2 SA	7.72
P3 K1 SA	8.05
P3 K3 SA	7.63
P3 K4 SF	8.37
P4 K3 SF	7.90
P4 K4 S	8.10
P4 K5 S	7.66
P4 K5 SF	7.72
P4 K6 S	7.45
P5 K4 S	7.98
P5 K4 SF	7.85
P5 K5 S	8.15
P5 K6 S	7.74
P6 K4 S	7.86
P6 K5 S	7.87
P6 K6 S	7.51
MEAN	7.84

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

TABLE	TREATMNT	
SED	0.301	MIN REP
	0.246	MAX-MIN

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

STRATUM	DF	SE	CV%
WP	5	0.213	2.7

GRAIN MEAN DM% 80.4 PLOT AREA HARVESTED 0.00286

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SERIES II SPRING BEANS

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	4.86
P6 K6 T	5.75
- - S	5.19
- - SA	5.37
- - SF	5.41
P2 - SA	5.13
P3 - SF	4.74
P4 - S	4.92
P5 - S	5.12
P5 - SF	4.98
P6 - S	4.84
- K2 SA	5.16
- K3 SF	5.18
- K4 S	5.05
- K5 S	4.50
- K5 SF	5.36
- K6 S	4.74
P1 K1 SA	5.15
P1 K3 SA	5.38
P2 K2 SA	5.13
P3 K1 SA	4.98
P3 K3 SA	5.61
P3 K4 SF	5.69
P4 K3 SF	5.40
P4 K4 S	5.19
P4 K5 S	4.91
P4 K5 SF	4.96
P4 K6 S	5.22
P5 K4 S	4.99
P5 K4 SF	4.50
P5 K5 S	4.82
P5 K6 S	5.43
P6 K4 S	5.39
P6 K5 S	5.22
P6 K6 S	5.22
MEAN	5.15

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

TABLE	TREATMNT	
SED	0.386	MIN REP
	0.315	MAX-MIN

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

STRATUM	DF	SE	CV%
WP	5	0.273	5.3

GRAIN MEAN DM% 84.5 PLOT AREA HARVESTED 0.00386

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SERIES III WINTER WHEAT

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	8.95
P6 K6 T	9.60
- - S	8.84
- - SA	9.56
- - SF	8.50
P2 - SA	8.90
P3 - SF	9.34
P4 - S	9.80
P5 - S	8.95
P5 - SF	9.12
P6 - S	10.37
- K2 SA	8.67
- K3 SF	9.38
- K4 S	8.13
- K5 S	9.16
- K5 SF	9.09
- K6 S	8.84
P1 K1 SA	8.53
P1 K3 SA	9.78
P2 K2 SA	8.93
P3 K1 SA	9.42
P3 K3 SA	8.86
P3 K4 SF	8.38
P4 K3 SF	8.52
P4 K4 S	8.68
P4 K5 S	9.66
P4 K5 SF	9.36
P4 K6 S	9.44
P5 K4 S	9.75
P5 K4 SF	9.60
P5 K5 S	9.50
P5 K6 S	9.35
P6 K4 S	8.88
P6 K5 S	9.50
P6 K6 S	8.81
MEAN	9.15

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

TABLE	TREATMNT	
SED	0.968	MIN REP
	0.790	MAX-MIN

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

STRATUM	DF	SE	CV%
WP	5	0.684	7.5

GRAIN MEAN DM% 80.4 PLOT AREA HARVESTED 0.00286

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