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# Yields of the Field Experiments 1983

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

### Rothamsted Research

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83/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 third year, potatoes, s. barley, s. beans, w. wheat.

For previous years see 81-82/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 each autumn:

	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 and 1982.
- (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. Weedkillers: Paraquat at 0.56 kg ion with linuron at 1.0 l in 500 l. Fungicides: Mancozeb at 1.4 kg in 250 l on three occasions. Fentin hydroxide at 0.28 kg in 250 l on five occasions, with the insecticide on the first four. Insecticide: Pirimicarb at 0.14 kg. Haulm desiccant: BOV at 170 l.
- S. barley: Manures: (20:10:10) at 450 kg. 'Nitro-Chalk' at 250 kg. Weedkillers: Dicamba, mecoprop and MCPA (as 'Herrisol' at 5.0 l) in 250 l. Fungicide: Prochloraz at 0.40 kg in 250 l.
- S. beans: Weedkillers: Trietazine and simazine (as 'Aventox' at 2.4 l) in 250 l. Insecticides: Pirimicarb at 0.14 kg in 250 l. Phorate at 5.6 kg.
- W. wheat: Manures: (0:18:36) at 350 kg combine drilled. 'Nitro-Chalk' at 750 kg. Weedkillers: Dicamba, mecoprop and MCPA (as 'Herrisol' at 5.0 l) in 250 l. Fungicide: Propiconazole at 0.12 kg in 250 l.

Seed: Potatoes: Pentland Crown.

- S. barley: Triumph, seed dressed with ethirimol, sown at 160 kg.
- S. beans: Minden, sown at 280 kg.
- W. wheat: Avalon, sown at 210 kg.

Cultivations, etc.:-

All crops: Treatments applied by double digger: 15-17 Nov, 1982.  
Ploughed: 18 Nov.

- Potatoes: Spring-tine cultivated twice: 7 Mar, 1983. NPK Mg applied: 28 Apr. Spiked rotary cultivated, potatoes planted: 29 Apr. Rotary ridged: 6 May. Weedkillers applied: 24 May. Mancozeb applied: 22 June. Fentin hydroxide with insecticide applied: 1 July, 8 July, 18 July and 28 July. Fentin hydroxide applied: 11 Aug. Mancozeb applied: 25 Aug, 9 Sept. Haulm mechanically destroyed: 11 Oct. BOV applied: 19 Oct. Lifted: 27 Oct.
- S. barley: Spring-tine cultivated, NPK applied, spring-tine cultivated a second time: 7 Mar, 1983. Rotary harrowed, seed sown: 8 Mar. 'Herrisol' applied: 23 May. N applied: 26 May. Fungicide applied: 23 June. Combine harvested: 3 Aug.
- S. beans: Spring-tine cultivated, phorate applied, spring-tine cultivated a second time, rotary harrowed, seed sown: 7 Mar, 1983. Weedkillers applied: 12 Mar. Pirimicarb applied: 16 June. Combine harvested: 12 Aug.
- W. wheat: Heavy spring-tine cultivated twice, spring-tine cultivated twice, seed sown: 18 Jan, 1983. N applied: 16 Apr. Weedkillers applied: 28 Apr. Fungicide applied: 17 June. Combine harvested: 12 Aug.

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SERIES III POTATOES

TOTAL TUBERS TONNES/HECTARE

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

TREATMNT	
- - -	43.6
P6 K6 T	45.4
- - S	41.5
- - SR	38.8
P2 - SR	36.1
P3 - S	45.8
P4 - S	45.3
P5 - S	42.1
P6 - S	46.4
- K2 SR	39.8
- K3 S	44.6
- K4 S	45.2
- K5 S	41.8
- K6 S	46.5
P1 K1 SR	39.2
P1 K3 SR	45.2
P2 K2 SR	36.4
P3 K1 SR	43.1
P3 K3 SR	39.3
P3 K4 S	41.0
P4 K3 S	42.4
P4 K4 S	39.7
P4 K5 S	44.2
P4 K6 S	46.9
P5 K4 S	43.1
P5 K5 S	43.9
P5 K6 S	47.6
P6 K4 S	47.5
P6 K5 S	45.3
P6 K6 S	43.5
MEAN	42.9

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

TABLE	TREATMNT*
-----	-----
SED	4.73 MIN REP
	3.74 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	3.34	7.8

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SERIES III POTATOES

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

TREATMNT	
- - -	93.8
P6 K6 T	94.7
- - S	93.5
- - SR	95.2
P2 - SR	93.9
P3 - S	93.5
P4 - S	93.4
P5 - S	94.1
P6 - S	96.2
- K2 SR	92.6
- K3 S	94.6
- K4 S	93.9
- K5 S	95.1
- K6 S	95.5
P1 K1 SR	93.5
P1 K3 SR	95.9
P2 K2 SR	93.7
P3 K1 SR	95.2
P3 K3 SR	93.3
P3 K4 S	95.5
P4 K3 S	94.8
P4 K4 S	93.7
P4 K5 S	95.3
P4 K6 S	96.9
P5 K4 S	94.1
P5 K5 S	94.7
P5 K6 S	95.0
P6 K4 S	94.5
P6 K5 S	94.4
P6 K6 S	93.6
MEAN	94.4

PLOT AREA HARVESTED 0.00210

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SERIES IV SPRING BARLEY

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	7.30
P6 K6 T	7.43
- - S	6.82
- - SR	6.42
P2 - SR	6.35
P3 - S	6.66
P4 - S	6.98
P5 - S	7.09
P6 - S	7.05
- K2 SR	6.87
- K3 S	7.24
- K4 S	7.37
- K5 S	6.94
- K6 S	7.56
P1 K1 SR	6.81
P1 K3 SR	7.33
P2 K2 SR	5.68
P3 K1 SR	7.13
P3 K3 SR	6.77
P3 K4 S	7.51
P4 K3 S	7.42
P4 K4 S	7.37
P4 K5 S	6.93
P4 K6 S	7.39
P5 K4 S	6.98
P5 K5 S	7.24
P5 K6 S	7.10
P6 K4 S	7.51
P6 K5 S	7.40
P6 K6 S	6.34
MEAN	7.01

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

TABLE	TREATMNT*
-----	-----
SED	0.336 MIN REP
	0.266 MAX-MIN

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

STRATUM	DF	SE	CV%
WP	10	0.238	3.4
GRAIN MEAN DM%	85.7		
PLOT AREA HARVESTED	0.00286		

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SERIES I SPRING BEANS

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	4.17
P6 K6 T	4.49
- - S	4.32
- - SR	4.61
P2 - SR	4.72
P3 - S	4.82
P4 - S	4.48
P5 - S	4.44
P6 - S	4.46
- K2 SR	4.34
- K3 S	4.28
- K4 S	4.01
- K5 S	4.28
- K6 S	4.41
P1 K1 SR	4.53
P1 K3 SR	4.24
P2 K2 SR	4.13
P3 K1 SR	4.34
P3 K3 SR	4.69
P3 K4 S	4.16
P4 K3 S	4.39
P4 K4 S	4.73
P4 K5 S	4.37
P4 K6 S	4.08
P5 K4 S	4.66
P5 K5 S	4.44
P5 K6 S	4.82
P6 K4 S	4.39
P6 K5 S	4.58
P6 K6 S	4.57
MEAN	4.42

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

TABLE	TREATMNT*
-----	-----
SED	0.324 MIN REP
	0.257 MAX-MIN

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

STRATUM	DF	SE	CV%
WP	10	0.229	5.2

GRAIN MEAN DM% 85.5

PLOT AREA HARVESTED 0.00386

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SERIES II WINTER WHEAT

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	6.52
P6 K6 T	7.40
- - S	6.81
- - SR	6.06
P2 - SR	6.45
P3 - S	6.72
P4 - S	6.98
P5 - S	7.06
P6 - S	6.70
- K2 SR	5.65
- K3 S	7.04
- K4 S	6.78
- K5 S	6.44
- K6 S	5.42
P1 K1 SR	5.62
P1 K3 SR	6.14
P2 K2 SR	6.04
P3 K1 SR	6.54
P3 K3 SR	6.51
P3 K4 S	6.61
P4 K3 S	7.23
P4 K4 S	7.33
P4 K5 S	6.66
P4 K6 S	6.69
P5 K4 S	6.76
P5 K5 S	7.16
P5 K6 S	6.44
P6 K4 S	7.51
P6 K5 S	5.57
P6 K6 S	7.41
MEAN	6.64

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

TABLE	TREATMNT*
-----	-----
SED	0.362 MIN REP
	0.286 MAX-MIN

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

STRATUM	DF	SE	CV%
WP	10	0.256	3.9

GRAIN MEAN DM% 85.7

PLOT AREA HARVESTED 0.00286