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Yields of the Field Experiments 1987

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

Rothamsted Research

Rothamsted Research (1988) *87/R/RN/17 Rates of P and K to the Subsoil - S. Beans, W. Wheat, Potatoes, S. Barley ;* Yields Of The Field Experiments 1987, pp 70 - 76 **- DOI: https://doi.org/10.23637/ERADOC-1-37**

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87/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 seventh year, potatoes, s. barley, s. beans, w. wheat.

For previous years see 81-86/R/RN/17.

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

Whole plotdimensions: 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	" "	" " "	

https://doi.org/10.23637/ERADOC-1-37

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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. Weedkiller: Linuron at 1.6 kg in 500 l. Fungicides: Mancozeb at 1.4 kg in 200 l on four occasions, applied with the pirimicarb on the second occasion. Fentin hydroxide at 0.28 kg in 200 l on two occasions. Insecticide: Pirimicarb at 0.14 kg: Desiccant: Diquat at 0.80 kg ion in 300 l.
S. barley: Manures: (20:10:10) at 630 kg. Weedkillers: Clopyralid at 0.07 kg, bromoxynil at 0.34 kg and mecoprop at 2.5 kg in 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l.
S. beans: Weedkillers: Trietazine at 1.2 kg and simazine at 0.17 kg in 500 l. Insecticide: Phorate at 4.5 kg.
W. wheat: Manures: (0:18:36) at 350 kg. 'Nitram' at 590 kg. Weedkillers: Clopyralid at 0.07 kg and bromoxynil at 0.34 kg with mecoprop at 2.5 kg 200 l. Fungicide: Tridemorph at 0.52 kg in 200 l.

Seed: Potatoes: Pentland Crown.
S. barley: Klaxon, dressed triadimenol and fuberidazole, sown at 160 kg.
S. beans: Minden, sown at 260 kg.
W. wheat: Avalon, sown at 200 kg.

Cultivations, etc.:-
All crops: Treatments applied by double-digger: 29 Oct, 1986 and 30 Oct. Ploughed: 31 Oct.
Potatoes: Heavy spring-tine cultivated: 20 Feb, 1987. NPK+Mg applied: 14 Apr. Heavy spring-tine cultivated: 15 Apr. Rotary harrowed, potatoes planted: 16 Apr. Rotary ridged: 27 Apr. Linuron applied: 8 May. Mancozeb applied: 24 June, 8 July, 28 July, 10 Aug. Insecticide applied: 8 July. Fentin hydroxide applied: 28 Aug, 9 Sept. Desiccant applied: 21 Sept. Haulm mechanically destroyed: 3 Oct. Lifted: 19 Oct.
S. barley: Heavy spring-tine cultivated: 20 Feb, 1987. NPK applied, spring-tine cultivated: 16 Mar. Rotary harrowed, seed sown: 17 Mar. Weedkillers applied: 6 May. Fungicide applied: 24 June. Combine harvested: 20 Aug.
S. beans: Heavy spring-tine cultivated: 20 Feb, 1987. Phorate applied, spring-tine cultivated: 16 Mar. Rotary harrowed, seed sown: 18 Mar. Weedkillers applied: 30 Mar. Combine harvested: 18 Sept.
W. wheat: PK applied, rotary harrowed, seed sown: 7 Nov, 1986. N applied: 17 Apr, 1987. Weedkillers applied: 8 May. Fungicide applied: 24 June. Combine harvested: 31 Aug.

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87/R/RN/17

SERIES III POTATOES

TOTAL TUBERS TONNES/HECTARE

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

TREATMNT	
- - -	64.6
P6 K6 T	60.0
- - S	61.7
- - SA	62.2
- - SF	63.6
P2 - SA	62.4
P3 - SF	71.5
P4 - S	50.7
P5 - S	65.4
P5 - SF	66.9
P6 - S	68.1
- K2 SA	62.6
- K3 SF	65.0
- K4 S	68.1
- K5 S	70.1
- K5 SF	66.6
- K6 S	70.8
P1 K1 SA	61.8
P1 K3 SA	67.6
P2 K2 SA	69.5
P3 K1 SA	67.9
P3 K3 SA	65.7
P3 K4 SF	71.8
P4 K3 SF	63.0
P4 K4 S	62.3
P4 K5 S	65.0
P4 K5 SF	68.8
P4 K6 S	68.1
P5 K4 S	68.7
P5 K4 SF	67.8
P5 K5 S	70.5
P5 K6 S	64.6
P6 K4 S	67.0
P6 K5 S	67.7
P6 K6 S	69.2
Mean	65.4

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

Table	TREATMNT	
s.e.d.	7.14	min.rep
	5.83	max-min

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

Stratum	d.f.	s.e.	cv%
WP	5	5.05	7.7

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SERIES III POTATOES

PERCENTAGE WARE 3.81 CM (1.5 INCH) RIDDLE

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

TREATMNT	
- - -	97.6
P6 K6 T	98.5
- - S	98.2
- - SA	98.5
- - SF	97.6
P2 - SA	97.8
P3 - SF	98.8
P4 - S	97.7
P5 - S	98.5
P5 - SF	98.0
P6 - S	98.3
- K2 SA	98.5
- K3 SF	98.1
- K4 S	97.7
- K5 S	97.7
- K5 SF	98.3
- K6 S	98.1
P1 K1 SA	96.7
P1 K3 SA	98.4
P2 K2 SA	98.2
P3 K1 SA	99.1
P3 K3 SA	97.3
P3 K4 SF	98.8
P4 K3 SF	98.2
P4 K4 S	97.9
P4 K5 S	98.3
P4 K5 SF	97.9
P4 K6 S	98.5
P5 K4 S	97.5
P5 K4 SF	98.1
P5 K5 S	99.3
P5 K6 S	96.9
P6 K4 S	98.4
P6 K5 S	98.1
P6 K6 S	99.3
Mean	98.1

PLOT AREA HARVESTED 0.00210

* SEDs apply only to - - -, P6 K6 T, - - S and - - SA

	TREATMNT
max-min	- - S v any of remainder
min.rep	any of remainder

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SERIES IV WINTER BARLEY

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	7.02
P6 K6 T	6.92
- - S	6.95
- - SA	7.22
- - SF	6.73
P2 - SA	7.42
P3 - SF	7.12
P4 - S	6.99
P5 - S	6.98
P5 - SF	7.23
P6 - S	6.50
- K2 SA	7.28
- K3 SF	7.10
- K4 S	7.21
- K5 S	7.37
- K5 SF	7.05
- K6 S	6.92
P1 K1 SA	7.10
P1 K3 SA	6.82
P2 K2 SA	6.90
P3 K1 SA	6.82
P3 K3 SA	7.40
P3 K4 SF	7.18
P4 K3 SF	7.10
P4 K4 S	7.01
P4 K5 S	7.30
P4 K5 SF	7.33
P4 K6 S	7.12
P5 K4 S	7.09
P5 K4 SF	6.86
P5 K5 S	7.08
P5 K6 S	7.05
P6 K4 S	6.58
P6 K5 S	6.36
P6 K6 S	7.00
Mean	7.03

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

Table	TREATMNT	
s.e.d.	0.206	min.rep
	0.168	max-min

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

Stratum	d.f.	s.e.	cv%
WP	5	0.146	2.1

GRAIN MEAN DM% 86.0 PLOT AREA HARVESTED 0.00286

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SERIES I SPRING BEANS

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	4.50
P6 K6 T	4.31
- - S	4.51
- - SA	4.83
- - SF	4.14
P2 - SA	4.34
P3 - SF	4.43
P4 - S	4.07
P5 - S	4.14
P5 - SF	4.97
P6 - S	4.68
- K2 SA	4.74
- K3 SF	4.77
- K4 S	4.80
- K5 S	4.41
- K5 SF	4.81
- K6 S	4.72
P1 K1 SA	4.63
P1 K3 SA	4.53
P2 K2 SA	4.88
P3 K1 SA	4.70
P3 K3 SA	4.01
P3 K4 SF	4.75
P4 K3 SF	4.32
P4 K4 S	3.82
P4 K5 S	4.50
P4 K5 SF	4.27
P4 K6 S	4.63
P5 K4 S	5.04
P5 K4 SF	4.93
P5 K5 S	4.43
P5 K6 S	4.80
P6 K4 S	4.55
P6 K5 S	4.44
P6 K6 S	4.44
Mean	4.54

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

Table	TREATMNT	
s.e.d.	0.430	min.rep
	0.351	max-min

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

Stratum	d.f.	s.e.	cv%
WP	5	0.304	6.7

GRAIN MEAN DM% 81.9 PLOT AREA HARVESTED 0.00386

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SERIES II WINTER WHEAT

GRAIN TONNES/HECTARE

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

TREATMNT	
- - -	6.69
P6 K6 T	7.41
- - S	6.62
- - SA	6.90
- - SF	5.93
P2 - SA	7.10
P3 - SF	7.79
P4 - S	7.15
P5 - S	7.28
P5 - SF	6.99
P6 - S	6.85
- K2 SA	6.81
- K3 SF	5.53
- K4 S	7.35
- K5 S	6.74
- K5 SF	7.08
- K6 S	5.17
P1 K1 SA	7.58
P1 K3 SA	7.24
P2 K2 SA	7.49
P3 K1 SA	7.56
P3 K3 SA	7.27
P3 K4 SF	8.14
P4 K3 SF	7.24
P4 K4 S	7.29
P4 K5 S	6.65
P4 K5 SF	7.01
P4 K6 S	7.88
P5 K4 S	6.33
P5 K4 SF	7.31
P5 K5 S	6.29
P5 K6 S	6.82
P6 K4 S	6.90
P6 K5 S	6.63
P6 K6 S	7.10
Mean	6.96

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

Table	TREATMNT	
s.e.d.	0.624	min.rep
	0.510	max-min

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

Stratum	d.f.	s.e.	cv%
WP	5	0.441	6.3

GRAIN MEAN DM% 83.0 PLOT AREA HARVESTED 0.00274

https://doi.org/10.23637/ERADOC-1-37