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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

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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 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. 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 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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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 |