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Yields of the Field Experiments 1973

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73/S/RN/2 - Rotation II - Potatoes, Barley, Sugar Beet

Rothamsted Research

Rothamsted Research (1974) *73/S/RN/2 - Rotation II - Potatoes, Barley, Sugar Beet* ; Yields Of The Field Experiments 1973, pp 58 - 65 - DOI: <https://doi.org/10.23637/ERADOC-1-98>

73/S/RN/2

ROTATION II

Object: To measure, by crop yields and soil analysis, the residual value of P applied as FYM or superphosphate in the periods 1899-1964 and 1965-1967 - Saxmundham.

Sponsors: G.E.G. Mattingly, A.E. Johnston.

The fifth year of revised scheme, potatoes, barley, sugar beet.

For previous years see 'Details' 1967, 68/A/10(t), 69/S/RN/2(t) and 70-72/S/RN/2.

Treatments: From 1899-1964 the experiment tested farmyard manure and nitrogen and phosphate fertilisers applied to a rotation of crops. Since 1965 the treatments have been changed to evaluate old residues of P (from FYM and superphosphate) and new residues from treatments applied 1965-1967. The experiment now tests all combinations of:-

Half blocks: 1. Crops (in rotation potatoes, barley, sugar beet, barley):- CROP

| | |
|------------|----------|
| Potatoes | Potatoes |
| Barley | BafterP |
| Sugar beet | SugrBeet |
| Barley | BafterSB |

Whole plots: 2. Residues of previous treatments:- RESIDUE

| | Approximate total dressing 1899-1964 | Total dressing 1965-1967 | |
|--------|---|----------------------------------|----------|
| Plot 1 | None | None | (O)O |
| Plot 2 | 400 tonnes FYM | None | (D)O |
| Plot 3 | 400 tonnes FYM, 2.7 tonnes P2O5 | None | (DP)O |
| Plot 4 | 400 tonnes FYM, 2.7 tonnes P2O5 | 100 tonnes FYM | (DP)D2 |
| Plot 5 | 400 tonnes FYM, 2.7 tonnes P2O5 | 100 tonnes FYM, 0.56 tonnes P2O5 | (DP)D2P1 |
| Plot 6 | 400 tonnes FYM, 2.7 tonnes P2O5 | 0.56 tonnes P2O5 | (DP)P1 |
| Plot 7 | 400 tonnes FYM, 2.7 tonnes P2O5 | 1.13 tonnes P2O5 | (DP)P2 |
| Plot 8 | 326 tonnes FYM, 4.3 tonnes P2O5 (until 1952 only) | None | (DP52)O |

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| | | |
|------------|--|---------|
| Sub plots: | 3. Phosphate residues 1970-1972 (total P2O5 applied, kg) | P2O5RES |
| | None (2 sub plots/plot) | (0) |
| | 126 | (126) |
| | 252 | (252) |
| | 378 | (378) |

Potatoes and sugar beet test in addition some of the combinations of 3 with

| | | |
|--|--------------------------------|--------|
| | 4. Phosphate in 1973 (kg P2O5) | P2O573 |
| | None | 0 |
| | 63 | 63 |
| | 189 | 189 |

Whole plot dimensions: 3.56 x 5.49. Sub plot area harvested:
 Potatoes: 0.00078, barley: 0.00056, sugar beet: 0.00100.

Standard applications:

Potatoes: Manures: K2O at 380 kg as muriate of potash before ploughing: (25:0:16) at 1000 kg to seedbed. Weedkiller: Linuron at 0.84 kg plus paraquat at 0.42 kg ion in 340 l. Insecticide: Menazon ('Saphi-Col' at 0.7 l in 340 l) on 3 occasions. Fungicide: Mancozeb at 1.4 kg in 340 l on 4 occasions.
 Barley: Manures: (25:0:16) at 400 kg. Weedkiller: Dichlorprop plus MCPA ('Mephetol Plus' at 5.6 l in 340 l). Fungicide: Tridemorph at 5.3 kg applied with the weedkiller.
 Sugar beet: Manures: K2O at 380 kg as muriate of potash before ploughing: (25:0:16) at 750 kg to seedbed. Insecticide: Menazon ('Saphi-Col' at 0.7 l in 340 l) on 5 occasions.

Seed: Potatoes: King Edward

Barley: Julia, dressed with ethirimol, sown at 170 kg.

Sugar beet: Klein E rubbed and graded, sown at 18 kg.

Cultivations, etc.:-

Potatoes: Autumn K applied: 22 Sept, 1972. Ploughed: 25 Oct. Basal NK and test P applied: 27 Mar, 1973. Potatoes planted: 16 Apr. Weedkiller applied: 15 May. Insecticide applied: 13 June, 28 June, 10 and 26 July. Fungicide applied: 28 June, 10 and 26 July, 8 and 16 Aug. Harvested by hand: 18 Sept.

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Barley: Ploughed: 25 Oct, 1972. Seed sown and basal NK applied:
20 Mar, 1973. Weedkiller and fungicide applied: 20 May.
Harvested by hand: 14 Aug.
Sugar beet: Autumn K applied: 22 Sept, 1972. Ploughed: 25 Oct.
Basal NK and test P applied, seed sown: 27 Mar, 1973. Singled:
15 May. Insecticide applied: 13 and 28 June, 10 and 26 July,
8 Aug. Lifted: 15 Oct.

Standard errors per plot.

Barley: After potatoes: Grain, tonnes/hectare: 0.586 or 12.8%
(8 d.f.)
After sugar beet: Grain, tonnes/hectare: 0.250 or
5.0% (8 d.f.)

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TABLES OF MEANS

ROTATION 2

POTATOES

TOTAL TUBERS: TONNES/HECTARE

| P205RES P20573 | (0) 0 | (0) 63 | (0) 189 | (126) 63 | (126) 189 | (252) 63 | (252) 189 | (378) 63 | (378) 189 |
|-------------------|----------|-----------|------------|-------------|--------------|-------------|--------------|-------------|--------------|
| RESIDUE | | | | | | | | | |
| (0)0 | 26.2 | 33.7 | | | 45.3 | 45.9 | | | 46.8 |
| (D)0 | 38.1 | | 51.1 | 45.6 | | | 43.6 | 42.4 | |
| (DP)0 | 41.8 | | 47.4 | 42.4 | | | 47.4 | 46.5 | |
| (DP)D2 | 38.1 | 46.2 | | | 46.2 | 43.6 | | | 47.1 |
| (DP)D2P1 | 45.6 | | 50.3 | 49.4 | | | 48.8 | 46.5 | |
| (DP)P1 | 46.8 | | 49.4 | 43.3 | | | 48.5 | 47.4 | |
| (DP)P2 | 42.1 | 44.8 | | | 47.1 | 47.1 | | | 48.2 |
| (DP52)0 | 37.5 | 48.0 | | | 41.0 | 41.8 | | | 50.0 |

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SUGAR BEET

P205RES (0) (0) (0) (126) (252) (378)
 P20573 0 63 189 63 189 63 189 63 189

| RESIDUE | ROOTS(WASHED): TONNES/HECTARE | | | | | | | | | |
|----------|-------------------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
| | (0) | (0) | (0) | (126) | (126) | (252) | (252) | (378) | (378) | (378) |
| (O)O | 7.2 | | 43.6 | 38.4 | | | 47.3 | 44.9 | | |
| (D)O | 30.9 | 49.4 | | | 49.1 | 44.2 | | | | 42.3 |
| (DP)O | 45.3 | 48.5 | | | 43.0 | 51.4 | | | | 43.3 |
| (DP)D2 | 50.0 | | 48.4 | 48.6 | | | 47.5 | 50.8 | | |
| (DP)D2P1 | 52.3 | 50.9 | | | 48.4 | 45.5 | | | | 51.0 |
| (DP)P1 | 49.2 | 49.3 | | | 48.4 | 53.8 | | | | 49.4 |
| (DP)P2 | 46.8 | | 53.6 | 45.9 | | | 49.0 | 47.6 | | |
| (DP52)O | 49.3 | | 55.0 | 47.0 | | | 51.0 | 47.4 | | |
| | SUGAR PERCENTAGE | | | | | | | | | |
| (O)O | 13.5 | | 16.7 | 17.0 | | | 17.1 | 16.9 | | |
| (D)O | 15.4 | 17.4 | | | 17.3 | 17.0 | | | | 17.1 |
| (DP)O | 17.3 | 17.8 | | | 17.3 | 17.0 | | | | 17.3 |
| (DP)D2 | 17.2 | | 17.8 | 17.4 | | | 17.3 | 17.5 | | |
| (DP)D2P1 | 16.8 | 16.8 | | | 17.2 | 16.6 | | | | 17.2 |
| (DP)P1 | 16.9 | 17.4 | | | 17.4 | 16.5 | | | | 17.2 |
| (DP)P2 | 17.0 | | 16.8 | 16.4 | | | 16.8 | 17.0 | | |
| (DP52)O | 16.8 | | 17.2 | 16.9 | | | 16.7 | 16.0 | | |
| | TOTAL SUGAR: TONNES/HECTARE | | | | | | | | | |
| (O)O | 0.97 | | 7.28 | 6.51 | | | 8.12 | 7.58 | | |
| (D)O | 4.76 | 8.61 | | | 8.49 | 7.49 | | | | 7.22 |
| (DP)O | 7.35 | 8.63 | | | 7.42 | 8.73 | | | | 7.49 |
| (DP)D2 | 8.63 | | 8.60 | 8.45 | | | 8.22 | 8.88 | | |
| (DP)D2P1 | 8.80 | 8.57 | | | 8.34 | 7.58 | | | | 8.78 |
| (DP)P1 | 8.33 | 8.59 | | | 8.44 | 8.87 | | | | 8.48 |
| (DP)P2 | 7.97 | | 9.03 | 7.54 | | | 8.22 | 8.09 | | |
| (DP52)O | 8.28 | | 9.46 | 7.96 | | | 8.54 | 7.58 | | |

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SUGAR BEET

| | | | | | | |
|---------|-----|-----|-----|--------|--------|--------|
| P205RES | (0) | (0) | (0) | (126) | (252) | (378) |
| P20573 | 0 | 63 | 189 | 63 189 | 63 189 | 63 189 |

TOPS: TONNES/HECTARE

RESIDUE

| | | | | | | | | |
|----------|------|------|------|------|------|------|------|------|
| (O)O | 10.5 | | 27.8 | 29.0 | | | 31.1 | 23.8 |
| (D)O | 25.8 | 33.1 | | | 25.4 | 33.5 | | 30.2 |
| (DP)O | 30.7 | 29.4 | | | 27.8 | 33.1 | | 25.8 |
| (DP)D2 | 32.7 | | 30.7 | 31.9 | | | 29.8 | 24.2 |
| (DP)D2P1 | 28.6 | 32.3 | | | 34.7 | 28.6 | | 35.1 |
| (DP)P1 | 35.1 | 32.7 | | | 32.7 | 39.1 | | 34.3 |
| (DP)P2 | 33.9 | | 29.8 | 35.1 | | | 35.5 | 31.5 |
| (DP52)O | 39.5 | | 35.1 | 36.7 | | | 33.1 | 41.1 |

PLANT NUMBER: THOUSANDS/HECTARE

| | | | | | | | | |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|
| (O)O | 84.7 | | 117.6 | 111.6 | | | 106.6 | 101.7 |
| (D)O | 120.6 | 113.6 | | | 102.7 | 128.6 | | 108.6 |
| (DP)O | 106.6 | 113.6 | | | 113.6 | 111.6 | | 117.6 |
| (DP)D2 | 110.6 | | 111.6 | 117.6 | | | 107.6 | 105.6 |
| (DP)D2P1 | 110.6 | 116.6 | | | 110.6 | 107.6 | | 96.7 |
| (DP)P1 | 116.6 | 110.6 | | | 116.6 | 119.6 | | 112.6 |
| (DP)P2 | 94.7 | | 98.7 | 113.6 | | | 120.6 | 98.7 |
| (DP52)O | 125.6 | | 115.6 | 104.6 | | | 117.6 | 109.6 |

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BARLEY AFTER POTATOES

P205RES

| | (0) | (126) | (252) | (378) | Mean |
|-----------------------|------|-------|-------|-------|------|
| GRAIN: TONNES/HECTARE | | | | | |
| RESIDUE | | | | | |
| (0)0 | 4.51 | 5.15 | 5.47 | 6.01 | 5.13 |
| (D)0 | 4.50 | 3.85 | 4.50 | 5.22 | 4.51 |
| (DP)0 | 4.40 | 3.50 | 4.44 | 4.41 | 4.23 |
| (DP)D2 | 4.67 | 5.11 | 4.32 | 4.40 | 4.63 |
| (DP)D2P1 | 4.63 | 5.23 | 4.68 | 4.71 | 4.78 |
| (DP)P1 | 4.37 | 4.02 | 4.01 | 4.04 | 4.16 |
| (DP)P2 | 5.51 | 4.28 | 3.80 | 5.27 | 4.87 |
| (DP52)0 | 4.14 | 4.44 | 3.73 | 5.22 | 4.33 |
| Mean | 4.59 | 4.45 | 4.37 | 4.91 | 4.58 |

Mean D.M. % 86.8

STANDARD ERRORS OF DIFFERENCES

| | P205RES | RESIDUE* P205RES |
|--------------------------|---------|---------------------|
| 0 v any of remainder | 0.256 | 0.718 |
| Between any of remainder | 0.293 | 0.829 |

* Within the same level of RESIDUE only

STRAW: TONNES/HECTARE

| | | | | | |
|----------|------|------|------|------|------|
| (0)0 | 3.92 | 4.59 | 4.97 | 5.50 | 4.58 |
| (D)0 | 4.88 | 5.30 | 5.91 | 6.04 | 5.40 |
| (DP)0 | 4.98 | 4.73 | 5.60 | 5.19 | 5.10 |
| (DP)D2 | 5.68 | 5.24 | 4.85 | 5.05 | 5.30 |
| (DP)D2P1 | 5.30 | 5.77 | 6.10 | 5.10 | 5.51 |
| (DP)P1 | 4.88 | 4.96 | 5.58 | 5.43 | 5.14 |
| (DP)P2 | 4.34 | 4.76 | 5.17 | 5.14 | 4.75 |
| (DP52)0 | 5.17 | 5.18 | 5.15 | 5.23 | 5.18 |
| Mean | 4.89 | 5.07 | 5.41 | 5.34 | 5.12 |

Mean D.M. % 73.6

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 BARLEY AFTER SUGAR BEET
 P205RES

| | (0) | (126) | (252) | (378) | Mean |
|------------------------------|------|-------|-------|-------|------|
| GRAIN: TONNES/HECTARE | | | | | |
| RESIDUE | | | | | |
| (O)O | 2.15 | 4.89 | 5.28 | 6.19 | 4.13 |
| (D)O | 5.02 | 4.94 | 5.55 | 4.72 | 5.05 |
| (DP)O | 5.47 | 5.45 | 4.44 | 5.62 | 5.29 |
| (DP)D2 | 5.33 | 5.83 | 5.26 | 5.82 | 5.51 |
| (DP)D2P1 | 5.21 | 5.27 | 5.14 | 5.50 | 5.26 |
| (DP)P1 | 5.04 | 5.60 | 5.05 | 4.62 | 5.07 |
| (DP)P2 | 4.90 | 5.54 | 4.87 | 4.65 | 4.97 |
| (DP52)O | 5.34 | 5.44 | 5.01 | 4.60 | 5.14 |
| Mean | 4.81 | 5.37 | 5.07 | 5.21 | 5.05 |

Mean D.M.% 86.3

STANDARD ERRORS OF DIFFERENCES

| | P205RES | RESIDUE* P205RES |
|--------------------------|---------|---------------------|
| O v any of remainder | 0.108 | 0.306 |
| Between any of remainder | 0.125 | 0.354 |

* Within the same level of RESIDUE only

| STRAW: TONNES/HECTARE | | | | | |
|------------------------------|------|------|------|------|------|
| (O)O | 2.79 | 4.65 | 5.39 | 5.92 | 4.31 |
| (D)O | 4.67 | 4.71 | 5.89 | 5.79 | 5.15 |
| (DP)O | 5.14 | 5.33 | 5.53 | 6.11 | 5.45 |
| (DP)D2 | 5.76 | 6.64 | 5.89 | 6.41 | 6.09 |
| (DP)D2P1 | 6.07 | 5.78 | 6.79 | 5.90 | 6.12 |
| (DP)P1 | 6.05 | 6.77 | 5.91 | 5.69 | 6.09 |
| (DP)P2 | 5.91 | 6.10 | 5.72 | 5.89 | 5.91 |
| (DP52)O | 5.93 | 5.91 | 5.38 | 5.65 | 5.76 |
| Mean | 5.29 | 5.74 | 5.81 | 5.92 | 5.61 |

Mean D.M. % 77.5