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# Yields of the Field Experiments 1981

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## 81/R/BK/1 Broadbalk - W. Wheat, Fallow, Potatoes

### Rothamsted Research

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81/R/BK/1

# BROADBALK

Object: To study the effects of organic and inorganic manures on continuous w. wheat. From 1968 two three-year rotations were included: potatoes, beans, w. wheat and fallow, w. wheat, w. wheat. In 1979 the first rotation was changed to fallow, potatoes, w. wheat. In 1980 the second rotation reverted to continuous w. wheat.

The 138th year, w. wheat, fallow, potatoes. The 14th year of the rotations.

For previous years see 'Details' 1967 & 1973, Station Report for 1966, pp. 229-231, Station Report for 1968, Part 2, and 74-80/R/BK/1.

Areas harvested:

|           |           |         |
|-----------|-----------|---------|
| Wheat:    | Section   |         |
|           | 0         | 0.00434 |
|           | 1         | 0.00798 |
|           | 2,3,5 & 6 | 0.00659 |
|           | 9         | 0.00694 |
| Potatoes: | 7         | 0.00659 |

Treatments:

Whole plots

| PLOT     | Fertilisers and organic manures:- |                               |                         |                       |
|----------|-----------------------------------|-------------------------------|-------------------------|-----------------------|
|          |                                   | Treatments<br>Plot until 1967 | Treatments<br>from 1968 | Changes<br>from 1980  |
| 01DN2PK  | 01                                | -                             | D N2 P K                | -                     |
| 21DN2    | 21                                | D                             | D N2                    | -                     |
| 22D      | 22                                | D                             | D                       | -                     |
| 030      | 03                                | None                          | None                    | -                     |
| 05F      | 05                                | P K Na Mg                     | P K (Na) Mg             | -                     |
| 06N1F    | 06                                | N1 P K Na Mg                  | N1 P K (Na) Mg          | -                     |
| 07N2F    | 07                                | N2 P K Na Mg                  | N2 P K (Na) Mg          | -                     |
| 08N3F    | 08                                | N3 P K Na Mg                  | N3 P K (Na) Mg          | -                     |
| 09N4F    | 09                                | N*1 P K Na Mg                 | N4 P K (Na) Mg          | -                     |
| 10N2     | 10                                | N2                            | N2                      | -                     |
| 11N2P    | 11                                | N2 P                          | N2 P                    | -                     |
| 12N2PNA  | 12                                | N2 P Na                       | N2 P Na                 | -                     |
| 13N2PK   | 13                                | N2 P K                        | N2 P K                  | -                     |
| 14N2PKMG | 14                                | N2 P Mg                       | N2 P K Mg               | -                     |
| 15N3F    | 15                                | N2 P K Na Mg                  | N3 P K (Na) Mg          | -                     |
| 16N2F    | 16                                | N*2 P K Na Mg                 | N2 P K (Na) Mg          | -                     |
| 17N0+3FH | 17                                | N2(A)                         | N2 1/2(P K (Na) Mg)     | N0+3 1/2(PK (Na) Mg)+ |
| 18N1+3FH | 18                                | P K Na Mg(A)                  | N2 1/2(P K (Na) Mg)     | N1+3 1/2(PK (Na) Mg)+ |
| 19C      | 19                                | C                             | C                       | -                     |
| 20NKMG   | 20                                | N2 K Na Mg                    | N2 K (Na) Mg            | -                     |

(A) Alternating

+ To w. wheat only; autumn N alternates. Potatoes receive N3 1/2(PK (Na) Mg) on both plots 17 & 18.

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N1,N2,N3,N4: 48, 96, 144, 192 kg N (as sulphate of ammonia until 1967, except N\* which was nitrate of soda. All as 'Nitro-Chalk' in spring from 1968).  
 NO+3; N1+3: None in autumn + 144 kg N in spring; 48 kg N in autumn combine drilled + 144 kg N in spring.  
 P: 35 kg P as single superphosphate (triple superphosphate in 1974)  
 K: 90 kg K as sulphate of potash  
 Na: 55 kg Na as sulphate of soda  
 (Na): 16 kg Na as sulphate of soda until 1973  
 Mg: 30 kg Mg annually to Plot 14, 35 kg Mg every third year to other plots since 1974. All as kieserite since 1974, previously as sulphate of magnesia annually  
 D: Farmyard manure at 35 tonnes  
 C: Castor meal to supply 96 kg N  
 F: P K (Na) Mg H: Half rate

Strips of sub-plots: Until 1967 wheat alone was grown on the experiment, with some bare fallowing on strips of sub-plots. From 1968, ten sub-plots were started with the following cropping:-

| SECTION  |            | 1968 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 |
|----------|------------|------|----|----|----|----|----|----|----|----|----|----|----|----|----|
| SC0/W30  | Section 0  | W    | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  |
| SC1/W15  | Section 1  | W    | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  |
| SC2/W1   | Section 2  | BE   | W  | P  | BE | W  | P  | BE | W  | P  | BE | W  | F  | P  | W  |
| SC3/W2   | Section 3  | W    | W  | F  | W  | W  | F  | W  | W  | F  | W  | W  | F  | W  | W  |
| -        | Section 4  | W    | P  | BE | W  | P  | BE | W  | P  | BE | W  | P  | P  | W  | F  |
| SC5/W3   | Section 5  | W    | F  | W  | W  | F  | W  | W  | F  | W  | W  | F  | W  | W  | W  |
| SC6/W4   | Section 6  | F    | W  | W  | F  | W  | W  | F  | W  | W  | F  | W  | W  | W  | W  |
| POTATOES | Section 7  | P    | BE | W  | P  | BE | W  | P  | BE | W  | P  | BE | W  | F  | P  |
| -        | Section 8* | W    | W  | W  | W  | F  | W  | W  | W  | W  | W  | W  | W  | W  | F  |
| SC9/W23  | Section 9  | W    | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  |

W = w. wheat, P = potatoes, BE = s. beans, F = fallow

\* No weedkillers

NOTES: (1) For a fuller record of treatments see 'Details' etc.  
 (2) Since autumn 1975 chalk is applied at 2.9 t each autumn to sets of Sections on a three-year cycle.  
 Year 1: Sections 1,2,3. Year 2: Sections 6,7,8 & 9.  
 Year 3: Sections 0,4,5. Chalk is applied to all plots of each section.

Standard applications:

W. wheat: Manures: Sections 0 and 5 only: Chalk at 2.9 t. Weedkillers: (Not applied to section 8): Chlortoluron at 5.6 l in 250 l. Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 3.7 l) in 250 l. Section 9 only: Glyphosate at 1.5 l in 250 l. Fungicides: Prochloraz at 0.4 l in 250 l. Prochloraz at 0.4 l with maneb at 1.2 kg and zineb at 0.13 kg in 250 l applied on two occasions; to sections 0,1,2,3 and plots 01,21,22 and 03 of sections 5 and 6 on the first and second occasions and to remaining wheat on the second occasion only. (Rain was believed to have washed off the first application).

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Potatoes: Weedkillers: Linuron at 1.1 kg and paraquat at 0.6 kg ion in 250 l. Fungicide: Mancozeb at 1.4 kg in 250 l applied on five occasions, with pirimicarb. Insecticides: Phorate at 1.7 kg at planting. Pirimicarb at 0.14 kg. Desiccant: BOV at 170 l.  
Fallow: Manures: Chalk at 2.9 t to section 4 only.

Seed: W. wheat: Flanders dressed chlorfenvinphos, sown at 200 kg.  
Potatoes: Pentland Crown.

Cultivations, etc.:-

ALL SECTIONS: Superphosphate, sulphate of potash, sulphate of soda, kieserite, and castor meal applied: 8 Sept, 1980. FYM applied: 10 Sept. Ploughed: 11 Sept. Rolled: 15 Sept.

CROPPED SECTIONS: W. wheat: Glyphosate applied: 2 Sept, 1980. Rotary harrowed: 30 Sept. Seed sown: 1 Oct. Chlortoluron applied: 3 Oct. N applied: 15 Apr, 1981. 'Brittox' applied: 21 Apr. Prochloraz applied alone: 5 May. Prochloraz, maneb, and zineb applied: 19 June, 22 June. Combine harvested: 19 Aug.

potatoes: Chisel ploughed: 16 Jan, 1981. Spring-tine cultivated: 16 Apr. N applied: 17 Apr. Spike rotary cultivated, potatoes planted: 13 May. Weedkillers applied: 1 June. Fungicide applied with pirimicarb: 23 June, 1 July, 13 July, 27 July, and 11 Aug. Ridged: 9 July. Haulm mechanically destroyed: 24 Aug. Desiccant applied: 25 Aug. Lifted: 14 Sept.

FALLOW: Chalk applied: 4 Sept, 1980. Chisel ploughed section 4 only: 6 Jan, 1981. Chisel ploughed section 8 only: 16 Jan. Spring-tine cultivated four times: 16 Apr, 30 June, 20 July, 11 Aug. Rotary harrowed: 15 May. Ploughed twice: 16 June, 16 July. Heavy spring-tine cultivated: 19 June.

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GRAIN TONNES/HECTARE

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

| SECTION<br>PLOT | SC2/W1 | SC3/W2 | SC5/W3 | SC6/W4 | SC1/W15 | SC9/W23 | SC0/W30 | MEAN |
|-----------------|--------|--------|--------|--------|---------|---------|---------|------|
| 01DN2PK         | 8.03   | 8.53   | 8.62   | 8.46   | *       | *       | *       | 8.41 |
| 21DN2           | 8.50   | 8.64   | 10.13  | 8.71   | 8.57    | 8.95    | 8.47    | 8.85 |
| 22D             | 8.70   | 6.56   | 7.68   | 5.91   | 7.71    | 7.99    | 7.29    | 7.41 |
| 030             | 3.81   | 1.29   | 1.27   | 1.12   | 1.66    | 1.49    | 1.71    | 1.76 |
| 05F             | 4.01   | 1.33   | 1.09   | 1.20   | 1.62    | 1.74    | 1.41    | 1.77 |
| 06N1F           | 6.54   | 4.47   | 4.17   | 3.33   | 4.28    | 4.69    | 4.45    | 4.56 |
| 07N2F           | 8.16   | 6.36   | 6.12   | 4.91   | 6.39    | 6.45    | 5.81    | 6.32 |
| 08N3F           | 8.55   | 7.45   | 6.01   | 6.24   | 6.36    | 6.77    | 6.14    | 6.79 |
| 09N4F           | 8.37   | 7.78   | 7.59   | 7.35   | 6.96    | 7.29    | 6.55    | 7.41 |
| 10N2            | 5.39   | 5.01   | 3.43   | 3.81   | 3.72    | 2.79    | 3.54    | 3.96 |
| 11N2P           | 6.34   | 5.77   | 5.19   | 4.30   | 3.58    | 3.14    | 3.31    | 4.52 |
| 12N2PNA         | 6.18   | 5.80   | 5.58   | 4.40   | 4.58    | 3.98    | 4.47    | 5.00 |
| 13N2PK          | 7.76   | 6.39   | 6.06   | 5.08   | 6.20    | 6.88    | 5.64    | 6.29 |
| 14N2PKMG        | 7.58   | 6.00   | 5.83   | 5.23   | 6.28    | 6.08    | 5.76    | 6.11 |
| 15N3F           | 8.09   | 7.17   | 6.95   | 6.40   | 6.71    | 6.71    | 6.52    | 6.94 |
| 16N2F           | 7.49   | 6.16   | 5.82   | 5.62   | 5.93    | 6.25    | 5.69    | 6.14 |
| 17N0+3FH        | 7.86   | 6.84   | 6.58   | 6.36   | 6.50    | 6.71    | 6.20    | 6.72 |
| 18N1+3FH        | 8.29   | 6.72   | 7.27   | 6.98   | 6.72    | 6.74    | 6.94    | 7.09 |
| 19C             | 6.67   | 3.76   | 4.06   | 3.09   | 4.25    | 4.84    | 4.09    | 4.40 |
| 20NKMG          | *      | *      | *      | *      | 3.07    | *       | 3.78    | 3.43 |

GRAIN MEAN DM% 83.9

STRAW TONNES/HECTARE

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

| SECTION<br>PLOT | SC2/W1 | SC1/W15 | MEAN |
|-----------------|--------|---------|------|
| 01DN2PK         | 7.68   | *       | 7.68 |
| 21DN2           | 9.39   | 7.60    | 8.50 |
| 22D             | 8.64   | 5.96    | 7.30 |
| 030             | 2.35   | 1.00    | 1.68 |
| 05F             | 2.81   | 0.89    | 1.85 |
| 06N1F           | 5.21   | 2.83    | 4.02 |
| 07N2F           | 6.11   | 3.76    | 4.94 |
| 08N3F           | 6.52   | 3.85    | 5.19 |
| 09N4F           | 6.97   | 3.96    | 5.46 |
| 10N2            | 2.44   | 2.38    | 2.41 |
| 11N2P           | 3.84   | 1.97    | 2.90 |
| 12N2PNA         | 3.92   | 2.84    | 3.38 |
| 13N2PK          | 6.15   | 4.01    | 5.08 |
| 14N2PKMG        | 5.11   | 4.39    | 4.75 |
| 15N3F           | 6.02   | 4.43    | 5.23 |
| 16N2F           | 5.40   | 3.74    | 4.57 |
| 17N0+3FH        | 5.55   | 4.25    | 4.90 |
| 18N1+3FH        | 6.00   | 4.33    | 5.17 |
| 19C             | 4.07   | 2.76    | 3.42 |
| 20NKMG          | *      | 1.93    | 1.93 |

STRAW MEAN DM% 90.8

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POTATOES

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

|          | TOTAL TUBERS<br>TONNES/<br>HECTARE | % WARE<br>3.81 CM(1.5<br>INCH) RIDDLE |
|----------|------------------------------------|---------------------------------------|
| 01DN2PK  | 27.7                               | 95.4                                  |
| 21DN2    | 29.9                               | 92.3                                  |
| 22D      | 21.9                               | 93.5                                  |
| 030      | 5.4                                | 82.5                                  |
| 05F      | 10.4                               | 87.5                                  |
| 06N1F    | 13.9                               | 90.2                                  |
| 07N2F    | 17.0                               | 89.2                                  |
| 08N3F    | 22.6                               | 91.6                                  |
| 09N4F    | 25.4                               | 88.9                                  |
| 10N2     | 5.6                                | 75.4                                  |
| 11N2P    | 8.0                                | 71.7                                  |
| 12N2PNA  | 10.1                               | 75.3                                  |
| 13N2PK   | 14.4                               | 86.6                                  |
| 14N2PKMG | 18.0                               | 88.0                                  |
| 15N3F    | 21.6                               | 90.7                                  |
| 16N2F    | 20.3                               | 91.4                                  |
| 17N3FH   | 19.0                               | 89.5                                  |
| 18N3FH   | 19.3                               | 91.5                                  |
| 19C      | 13.1                               | 87.4                                  |