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# Yields of the Field Experiments 1985

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

### Rothamsted Research

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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. In 1985 part of the second rotation was added to the first to extend the rotation to fallow, potatoes, w. wheat, w. wheat, w. wheat.

The 142nd year, w. wheat, fallow, potatoes.

For previous years see 'Details' 1967 and 1973, Station Report for 1966, pp. 229-231, Station Report for 1968, Part 2, 74-84/R/BK/1.

Areas harvested:

|           |             |         |
|-----------|-------------|---------|
| Wheat:    | Section     |         |
|           | 0           | 0.00434 |
|           | 1           | 0.00798 |
|           | 2,3,6,and 7 | 0.00659 |
|           | 8 and 9     | 0.00694 |
| Potatoes: | 4           | 0.00659 |

Treatments:

Whole plots

| PLOT     | Fertilizers and organic manures:- |                       |                      |                      |
|----------|-----------------------------------|-----------------------|----------------------|----------------------|
|          | Plot                              | Treatments until 1967 | Treatments from 1968 | Treatments from 1985 |
| 01DN4PK  | 01                                | -                     | D N2 P K             | D N4 P K             |
| 21DN2    | 21                                | D                     | D N2                 | D N2                 |
| 22D      | 22                                | D                     | D                    | D                    |
| 030      | 03                                | None                  | None                 | None                 |
| 05F      | 05                                | P K Na Mg             | P K (Na) Mg          | PK Mg                |
| 06N1F    | 06                                | N1 P K Na Mg          | N1 P K (Na) Mg       | N1 P K Mg            |
| 07N2F    | 07                                | N2 P K Na Mg          | N2 P K (Na) Mg       | N2 P K Mg            |
| 08N3F    | 08                                | N3 P K Na Mg          | N3 P K (Na) Mg       | N3 P K Mg            |
| 09N4F    | 09                                | N*1 P K Na Mg         | N4 P K (Na) Mg       | N4 P K Mg            |
| 10N2     | 10                                | N2                    | N2                   | N2                   |
| 11N2P    | 11                                | N2 P                  | N2 P                 | N2 P                 |
| 12N2PNA  | 12                                | N2 P Na               | N2 P Na              | N2 P Na              |
| 13N2PK   | 13                                | N2 P K                | N2 P K               | N2 P K               |
| 14N2PKMG | 14                                | N2 P Mg               | N2 P K Mg            | N2 P K Mg            |
| 15N5F    | 15                                | N2 P K Na Mg          | N3 P K (Na) Mg       | N5 P K Mg            |
| 16N6F    | 16                                | N*2 P K Na Mg         | N2 P K (Na) Mg       | N6 P K Mg            |
| 17N0+3FH | 17                                | N2(A)                 | N2 1/2(P K (Na) Mg)  | N0+3 1/2(PK Mg)+     |
| 18N1+3FH | 18                                | P K Na Mg(A)          | N2 1/2(P K (Na) Mg)  | N1+3 1/2(PK Mg)+     |
| 19C      | 19                                | C                     | C                    | C                    |
| 20NKMG   | 20                                | N2 K Na Mg            | N2 K (Na) Mg         | N2 K Mg              |

(A) Alternating

+ This change since 1980. Treatments shown are those to w. wheat; autumn N alternates. Potatoes receive N3 1/2 (PK Mg) on both Plots 17 and 18.

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N1,N2,N3,N4,N5,N6: 48, 96, 144, 192, 240, 288 kg N (as sulphate of ammonia until 1967, except N\* which was nitrate of soda. All as 'Nitro-Chalk' in spring from 1968)  
 N0+3; N1+3: None in autumn + 144 kg N in spring; 48 kg N in autumn + 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  | Section | 70, 71, 72,<br>73, 74, 75,<br>and and and |    |    |    |    |    |    |    |    |    |    |    |  |
|----------|---------|---|----|----|----|----|----|----|----|----|----|----|----|--|
|          |         | 68  | 69 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 |  |
| SC0/W34  | 0       | W   | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  |  |
| SC1/W19  | 1       | W   | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  |  |
| SC2/W2P  | 2       | BE  | W  | P  | BE | W  | F  | P  | W  | F  | P  | W  | W  |  |
| SC3/W6   | 3       | W   | W  | F  | W  | W  | F  | W  | W  | W  | W  | W  | W  |  |
| POTATOES | 4       | W   | P  | BE | W  | P  | P  | W  | F  | P  | W  | F  | P  |  |
| -        | 5       | W   | F  | W  | W  | F  | W  | W  | W  | W  | W  | W  | F  |  |
| SC6/W8   | 6+      | F   | W  | W  | F  | W  | W  | W  | W  | W  | W  | W  | W  |  |
| SC7/W1P  | 7       | P   | BE | W  | P  | BE | W  | F  | P  | W  | F  | P  | W  |  |
| SC8/W4   | 8*      | W   | W  | W  | W  | W  | W  | W  | F  | W  | W  | W  | W  |  |
| SC9/W27  | 9       | W   | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  | W  |  |

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

+ No sprays, except weedkillers, since 1985      \* 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 and 9.  
 Year 3: Sections 0,4,5. Chalk is applied to all plots of each section.  
 (3) 'Nitro-Chalk' (26% N) was used for Plot 18 in autumn 1984; 'Nitro-Chalk' (27.5% N) for all spring applications.

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Standard applications:

W. wheat: Manures: Sections 1, 2 and 3 only: Chalk at 2.9 t.  
Weedkillers (not applied to section 8): Isoproturon at 2.0 kg with mecoprop at 1.6 kg, bromoxynil at 0.20 kg and ioxynil at 0.20 kg in 200 l. Fungicides (not applied to section 6): Prochloraz at 0.40 kg and carbendazim at 0.15 kg in 200 l applied with the growth regulator. Fenpropimorph at 0.75 kg with captafol at 1.3 kg in 200 l. Propiconazole at 0.12 kg with carbendazim and maneb (as 'Septal' at 2.5 kg) in 200 l. Insecticide (not applied to section 6): Pirimicarb at 0.14 kg in 200 l. Growth regulator (not applied to section 6): Chlormequat at 1.3 kg.

Potatoes: Weedkillers: Linuron at 1.3 kg with paraquat at 0.50 kg ion in 500 l. Fungicides: Mancozeb at 1.4 kg in 200 l on four occasions, with the insecticide on the second and third occasions. Fentin hydroxide at 0.28 kg in 200 l. Insecticide: Pirimicarb at 0.14 kg on two occasions. Haulm desiccant: Diquat at 0.80 kg ion in 500 l.

Seed: W. wheat: Brimstone, sown at 190 kg.  
Potatoes: Pentland Crown.

Cultivations, etc.:-

All sections: Sulphate of soda, kieserite and castor meal applied: 18 Sept, 1984. Sulphate of potash, superphosphate applied: 28 Sept. FYM applied, ploughed: 1 Oct. Spring-tine cultivated: 16 Oct.

Cropped Sections:

W. wheat: Chalk to sections 1, 2 and 3: 8 Sept, 1984. Autumn N treatment applied: 28 Sept. Rotary harrowed, seed sown: 31 Oct. Weedkillers applied (except section 8): 10 Apr, 1985. Spring N treatments applied: 18 Apr. Prochloraz, carbendazim and the growth regulator applied (except section 6): 19 Apr. Fenpropimorph and captafol applied (except section 6): 14 June. Propiconazole and 'Septal' applied (except section 6): 2 July. Insecticide applied (except section 6): 17 July. Combine harvested: 6 Sept.

Potatoes: N treatments applied: 19 Apr, 1985. Rotary harrowed, potatoes planted: 24 Apr. Weedkillers applied: 17 May. Mancozeb applied: 20 June, 6 Aug. Mancozeb with the insecticide applied: 3 July, 23 July. Fentin hydroxide applied: 21 Aug. Haulm mechanically destroyed: 3 Sept. Haulm desiccant applied: 5 Sept. Lifted: 17 Sept.

Fallow: Ploughed: 2 May, 15 July, 1985. Spring-tine cultivated: 16 May, 2 Aug.

NOTE: The percentage weights of weed seeds in the recorded grain yields of plots in section 8 were measured. On five plots these exceeded 3% (Plot 22 6%; Plot 03 5%; Plots 05 and 06 20% and Plot 9 16%). No adjustments to yields have been made.

85/R/BK/1 W.WHEAT

GRAIN TONNES/HECTARE

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

| SECTION<br>PLOT | SC7/W1P | SC2/W2P | SC8/W4 | SC3/W6 | SC6/W8 | SC1/W19 | SC9/W27 | SC0/W34 | MEAN |
|-----------------|---------|---------|--------|--------|--------|---------|---------|---------|------|
| 01DN4PK         | 9.28    | 8.86    | *      | 8.22   | 7.20   | *       | *       | *       | 8.39 |
| 21DN2           | 9.83    | 9.91    | 8.88   | 9.12   | 8.43   | 8.64    | 9.37    | 9.48    | 9.21 |
| 22D             | 8.27    | 7.42    | 7.10   | 7.37   | 6.91   | 7.58    | 7.98    | 7.66    | 7.54 |
| 030             | 2.99    | 1.95    | 1.93   | 1.80   | 1.47   | 1.77    | 1.78    | 2.41    | 2.01 |
| 05F             | 3.57    | 2.00    | 3.69   | 1.88   | 1.58   | 1.54    | 1.67    | 1.62    | 2.19 |
| 06N1F           | 5.82    | 4.93    | 4.44   | 4.99   | 4.14   | 4.57    | 4.97    | 5.02    | 4.86 |
| 07N2F           | 7.30    | 6.97    | 5.60   | 6.56   | 6.24   | 7.54    | 6.92    | 7.52    | 6.83 |
| 08N3F           | 7.69    | 8.58    | 6.53   | 8.06   | 6.40   | 8.12    | 8.19    | 7.79    | 7.67 |
| 09N4F           | 8.51    | 8.41    | 7.46   | 8.04   | 6.56   | 8.21    | 7.89    | 7.09    | 7.77 |
| 10N2            | 3.19    | 6.10    | 4.73   | 4.40   | 4.19   | 3.46    | 3.58    | 4.06    | 4.21 |
| 11N2P           | 4.36    | 6.62    | 3.73   | 4.33   | 3.84   | 5.76    | 3.55    | 5.62    | 4.73 |
| 12N2PNA         | 4.77    | 6.59    | 4.55   | 5.60   | 4.98   | 5.65    | 3.75    | 6.06    | 5.24 |
| 13N2PK          | 6.51    | 6.65    | 5.06   | 6.29   | 5.68   | 6.81    | 6.79    | 6.38    | 6.27 |
| 14N2PKMG        | 7.24    | 6.87    | 5.33   | 6.71   | 6.18   | 6.87    | 6.90    | 7.08    | 6.65 |
| 15N5F           | 7.92    | 8.87    | 6.46   | 7.74   | 6.48   | 8.34    | 7.42    | 7.85    | 7.64 |
| 16N6F           | 8.44    | 8.72    | 7.15   | 8.58   | 6.64   | 8.23    | 7.45    | 7.53    | 7.84 |
| 17N0+3FH        | 8.85    | 8.10    | 6.49   | 7.66   | 7.26   | 8.06    | 7.40    | 7.68    | 7.69 |
| 18N1+3FH        | 9.47    | 8.65    | 7.68   | 7.95   | 7.31   | 8.10    | 7.21    | 7.54    | 7.99 |
| 19C             | 4.95    | 3.14    | 4.39   | 3.32   | 2.54   | 3.50    | 3.93    | 2.74    | 3.57 |
| 20NKMG          | *       | *       | *      | *      | *      | 3.05    | *       | 3.31    | 3.18 |

GRAIN MEAN DM% 77.7

STRAW TONNES/HECTARE

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

| SECTION<br>PLOT | SC7/W1P | SC1/W19 | MEAN |
|-----------------|---------|---------|------|
| 01DN4PK         | 6.91    | *       | 6.91 |
| 21DN2           | 6.49    | 6.25    | 6.37 |
| 22D             | 4.83    | 4.79    | 4.81 |
| 030             | 1.24    | 0.84    | 1.04 |
| 05F             | 1.37    | 0.84    | 1.10 |
| 06N1F           | 2.78    | 3.15    | 2.97 |
| 07N2F           | 3.89    | 3.57    | 3.73 |
| 08N3F           | 4.44    | 4.27    | 4.35 |
| 09N4F           | 5.46    | 4.78    | 5.12 |
| 10N2            | 0.99    | 2.98    | 1.98 |
| 11N2P           | 1.88    | 2.25    | 2.06 |
| 12N2PNA         | 2.14    | 2.31    | 2.23 |
| 13N2PK          | 3.42    | 3.39    | 3.41 |
| 14N2PKMG        | 4.01    | 3.42    | 3.71 |
| 15N5F           | 5.61    | 5.41    | 5.51 |
| 16N6F           | 6.56    | 5.59    | 6.07 |
| 17N0+3FH        | 5.39    | 4.45    | 4.92 |
| 18N1+3FH        | 6.39    | 4.60    | 5.50 |
| 19C             | 2.06    | 2.10    | 2.08 |
| 20NKMG          | *       | 1.60    | 1.60 |

STRAW MEAN DM% 74.3

85/R/BK/1 POTATOES

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

| PLOT     | TOTAL TUBERS       | % WARE                      |
|----------|--------------------|-----------------------------|
|          | TONNES/<br>HECTARE | 3.81 CM(1.5<br>INCH) RIDDLE |
| 01DN2PK  | 44.6               | 96.7                        |
| 21DN2    | 48.8               | 93.7                        |
| 22D      | 41.1               | 95.3                        |
| 030      | 6.4                | 71.3                        |
| 05F      | 12.4               | 80.0                        |
| 06N1F    | 21.0               | 78.0                        |
| 07N2F    | 19.7               | 82.7                        |
| 08N3F    | 37.8               | 94.7                        |
| 09N4F    | 43.4               | 95.7                        |
| 10N2     | 10.4               | 89.7                        |
| 11N2P    | 13.0               | 75.2                        |
| 12N2PNA  | 14.1               | 77.0                        |
| 13N2PK   | 19.8               | 79.6                        |
| 14N2PKMG | 37.5               | 93.6                        |
| 15N5F    | 43.2               | 95.7                        |
| 16N6F    | 48.5               | 96.2                        |
| 17N3FH   | 24.1               | 91.5                        |
| 18N3FH   | 29.5               | 94.9                        |
| 19C      | 14.2               | 86.1                        |