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Yields of the Field Experiments 1997

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97/R/BK/1 Broadbalk - W. Wheat, W. Oats, Forage Maize

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97/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. Since 1985 part of the second rotation has been added to the first to extend the rotation to fallow, potatoes, w. wheat, w. wheat, w. wheat, in 1996 the fallow was replaced by w.oats and potatoes replaced by maize in 1997.

The 154th year, w. wheat, w.oats and forage maize.

For previous years see 'Details' 1967 and 1973, Station Report for 1966, pp. 229-231, Station Report for 1978, Part 2, Station Report for 1982, Part 2, pp. 5-44 and 74-96/R/BK/1.

Areas harvested:

| | | |
|--------|-------------|---------|
| Wheat: | Section | |
| | 0 | 0.00351 |
| | 1 | 0.00645 |
| | 4,5,6 and 7 | 0.00533 |
| | 8 and 9 | 0.00561 |
| Oats: | 2 | 0.00533 |
| Maize: | 3 | 0.00162 |

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)+ |
| 19(C) | 19 | C | C | (C) (since 1989) |
| 20N2KMG | 20 | N2 K Na Mg | N2 K (Na) Mg | N2 K Mg |

(A) Alternating

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

W. oats; Nitrogen and dung were not applied.

N1,N2,N3,N4,N5,N6: 48, 97, 144, 192, 240, 288 kg N as sulphate of ammonia until 1977, except N* which was nitrate of soda. All as 'Nitro-Chalk' in spring from 1978 to 1985, as 34.5% N since 1986.

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 triple superphosphate in 1974 and since 1988, single superphosphate in other years

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 t

(C): Castor meal to supply 97 kg N until 1988, none since

F: P K (Na) Mg H: Half rate

Strips of sub-plots: Until 1977 wheat alone was grown on the experiment, with some bare fallowing. From 1978, ten strips of sub-plots (sections) were started with the following cropping:-

| SECTION | 1/W31 | 9/W39 | 0/W46 | 8/W3 | 6/W20 | 5/W1 | 3/M | 7/W3 | 4/W2 | 2/O |
|---------|-------|-------|-------|------|-------|------|-----|------|------|-----|
| Section | 1 | 9 | 0* | 8+ | 6** | 5 | 3 | 7 | 4 | 2 |
| Year | | | | | | | | | | |
| 1968 | W | W | W | W | F | W | W | P | W | BE |
| 1969 | W | W | W | W | W | F | W | BE | P | W |
| 1970 | W | W | W | W | W | W | F | W | BE | P |
| 1971 | W | W | W | W | F | W | W | P | W | BE |
| 1972 | W | W | W | W | W | F | W | BE | P | W |
| 1973 | W | W | W | W | W | W | F | W | BE | P |
| 1974 | W | W | W | W | F | W | W | P | W | BE |
| 1975 | W | W | W | W | W | F | W | BE | P | W |
| 1976 | W | W | W | W | W | W | F | W | BE | P |
| 1977 | W | W | W | W | F | W | W | P | W | BE |
| 1978 | W | W | W | W | W | F | W | BE | P | W |
| 1979 | W | W | W | W | W | W | F | W | P | F |
| 1980 | W | W | W | W | W | W | W | F | W | P |
| 1981 | W | W | W | F | W | W | W | P | F | W |
| 1982 | W | W | W | W | W | W | W | W | P | F |
| 1983 | W | W | W | W | W | W | W | F | W | P |
| 1984 | W | W | W | W | W | W | W | P | F | W |
| 1985 | W | W | W | W | W | F | W | W | P | W |
| 1986 | W | W | W | W | W | P | F | W | W | W |
| 1987 | W | W | W | W | W | W | P | W | W | F |
| 1988 | W | W | W | F | W | W | W | F | W | P |

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| SECTION | 1/W31 | 9/W39 | 0/W46 | 8/W3 | 6/W20 | 5/W1 | 3/M | 7/W3 | 4/W2 | 2/O |
|---------|-------|-------|-------|------|-------|------|-----|------|------|-----|
| Section | 1 | 9 | 0* | 8+ | 6** | 5 | 3 | 7 | 4 | 2 |
| Year | | | | | | | | | | |
| 1989 | W | W | W | W | W | W | W | P | F | W |
| 1990 | W | W | W | W | W | F | W | W | P | W |
| 1991 | W | W | W | W | W | P | F | W | W | W |
| 1992 | W | W | W | W | W | W | P | W | W | F |
| 1993 | W | W | W | W | W | W | W | F | W | P |
| 1994 | W | W | W | F | W | W | W | P | F | W |
| 1995 | W | W | W | W | W | F | W | W | P | W |
| 1996 | W | W | W | W | W | P | O | W | W | W |
| 1997 | W | W | W | W | W | W | M | W | W | O |

W = w. wheat, O = w. oats, P = potatoes, BE = s. beans, F = fallow,
M = forage maize

* Straw incorporated since autumn 1986. ** No sprays except weedkillers since 1985. + No weedkillers.

- NOTES:** (1) For a fuller record of treatments see 'Details' etc.
(2) From autumn 1975 to autumn 1986, chalk was applied at 2.9 t each autumn to all plots in 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. From autumn 1988 until autumn 1992 a five-year cycle was used. Year 1: Sections 1,3. Year 2: Sections 2,8. Year 3: Sections 7,9. Year 4: Sections 4,6. Year 5: Sections 0,5. None applied since autumn 1991.

Experimental diary:

All sections:

- 25-Sep-96 : T : PK Na and Mg applied.
- 28-Sep-96 : B : Ploughed and furrow pressed.
- 14-Oct-96 : B : Rotary harrowed.

Cropped sections:

W. wheat:

- 20-Aug-96 : T : Straw chopped (section 0 only), straw baled (sections 1, 2, 3, 4, 6, 7, 8 and 9).
- 26-Sep-96 : T : Autumn N treatment applied.
- 27-Sep-96 : T : Farmyard manure applied.
- 15-Oct-96 : T : Rotary harrowed, Hereward, dressed Beret Gold and Fonophos Seed Treatment at 380 seeds per m².
- 02-Apr-97 : T : Topik at 125 ml with Sprayprover at 1.0 l in 200 l (except section 8).
- 10-Apr-97 : T : MSS Optica at 2.5 l in 300 l (except section 8).
: T : Barclay Holdup at 2.3 l in 300 l (except section 6).
- 11-Apr-97 : T : Spring N treatments applied.
- 01-May-97 : T : Barclay Eytak at 0.9 l in 200 l (except section 6).
- 29-May-97 : T : Starane 2 at 0.5 l in 300 l (except section 8).
- 30-May-97 : T : Folicur at 0.5 l with Pointer at 0.5 l in 300 l (except section 6).
- 09-Jul-97 : T : Hand rogued wild oats.
- 01-Sep-97 : T : Combine harvested.

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Experimental diary:

W. oats:

- 20-Aug-96 : T : Wheat straw baled.
- 16-Oct-96 : T : Rotary harrowed, Image, dressed Anchor, drilled at 350 seeds per m².
- 17-Oct-96 : T : Tribunil at 2.25 kg in 200 l.
- 22-May-97 : T : Radar at 0.5 l with Stefes CCC 700 at 2.3 l in 300 l.
- 20-Aug-97 : T : Combine harvested.

Forage Maize:

- 20-Aug-96 : T : Oat straw baled.
- 27-Sep-96 : T : Farmyard manure applied.
- 16-Apr-97 : T : Scythe LC at 3.0 l with Vassgro Non-ionic at 200 ml in 200 l.
- 23-Apr-97 : T : Spring N treatments applied, heavy spring-tine cultivated, rotary harrowed, Hudson, dressed Mesurol, drilled at 11 seeds per m².
- 09-Jun-97 : T : Barclay Mutiny at 1.5 l in 300 l.
- 17-Sep-97 : T : Hand harvested.

NOTE: Samples of wheat grain and straw from sections 1, 5, 6 and 9, samples of oat grain and straw and whole crop maize were taken for chemical analysis. Unground grain and straw and maize samples from selected treatments were archived.

W. WHEAT

GRAIN TONNES/HECTARE

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

| SECTION PLOT | 5/W1 | 4/W2 | 7/W3 | 8/W3 | 6/W20 | 1/W31 | 9/W39 | 0/W46 |
|-----------------|------|------|------|------|-------|-------|-------|-------|
| 01DN4PK | 9.18 | 9.56 | 9.27 | * | 8.21 | * | * | * |
| 21DN2 | 9.57 | 8.38 | 8.04 | 5.67 | 7.44 | 7.88 | 7.82 | 6.70 |
| 22D | 9.44 | 5.65 | 5.14 | 4.18 | 5.73 | 5.61 | 4.47 | 4.30 |
| 030 | 4.52 | 0.71 | 0.63 | 1.31 | 0.91 | 1.03 | 0.77 | 1.06 |
| 05F | 2.59 | 0.67 | 0.68 | 2.17 | 0.99 | 1.01 | 0.91 | 0.96 |
| 06N1F | 6.17 | 3.05 | 2.65 | 2.47 | 3.07 | 2.95 | 3.11 | 2.77 |
| 07N2F | 8.62 | 5.76 | 4.95 | 3.77 | 5.11 | 5.63 | 5.17 | 5.17 |
| 08N3F | 9.56 | 6.89 | 6.76 | 5.00 | 6.74 | 6.96 | 6.59 | 6.58 |
| 09N4F | 9.61 | 7.89 | 7.72 | 6.02 | 6.91 | 7.12 | 7.37 | 7.61 |
| 10N2 | 7.82 | 4.19 | 2.56 | 2.09 | 2.25 | 2.59 | 2.54 | 2.68 |
| 11N2P | 7.43 | 5.20 | 5.22 | 1.53 | 2.54 | 3.07 | 2.66 | 4.41 |
| 12N2PNA | 7.77 | 5.49 | 5.20 | 3.32 | 4.33 | 3.71 | 3.61 | 5.06 |
| 13N2PK | 8.46 | 5.59 | 5.30 | 3.96 | 5.07 | 5.29 | 5.62 | 5.34 |
| 14N2PKMG | 7.99 | 5.39 | 5.25 | 4.19 | 5.39 | 5.31 | 5.81 | 5.34 |
| 15N5F | 9.40 | 8.87 | 8.98 | 3.79 | 8.30 | 8.47 | 7.83 | 8.12 |
| 16N6F | 9.23 | 8.91 | 8.97 | 3.97 | 8.03 | 8.46 | 8.83 | 8.28 |
| 17N0+3FH | 9.12 | 8.06 | 7.65 | 4.64 | 7.77 | 7.70 | 7.31 | 7.67 |
| 18N1+3FH | 9.41 | 8.06 | 7.76 | 5.13 | 8.02 | 7.61 | 7.33 | 7.68 |
| 19(C) | 4.68 | 0.99 | 0.58 | 2.09 | 1.12 | 1.93 | 1.29 | 1.67 |
| 20N2KMG | * | * | * | * | * | 1.87 | * | 2.10 |

GRAIN MEAN DM% 83.2

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STRAW TONNES/HECTARE

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

| SECTION PLOT | 5/W1 | 6/W20 | 1/W31 | 9/W39 |
|-----------------|------|-------|-------|-------|
| 01DN4PK | 3.88 | * | * | * |
| 21DN2 | 4.40 | 3.95 | 4.84 | 3.07 |
| 22D | 5.33 | 3.47 | 3.53 | 2.67 |
| 030 | 2.07 | 0.60 | 0.49 | 0.14 |
| 05F | 1.54 | 0.57 | 0.69 | 0.37 |
| 06N1F | 3.17 | 1.36 | 1.33 | 1.31 |
| 07N2F | 3.81 | 1.89 | 2.26 | 1.73 |
| 08N3F | 4.08 | 2.23 | 2.86 | 1.87 |
| 09N4F | 3.78 | 2.29 | 2.72 | 2.28 |
| 10N2 | 2.91 | * | 1.16 | * |
| 11N2P | 2.42 | * | 1.00 | * |
| 12N2PNA | 2.91 | * | 1.00 | * |
| 13N2PK | 3.13 | * | 1.87 | * |
| 14N2PKMG | 3.30 | * | 1.63 | * |
| 15N5F | 4.37 | 2.89 | 3.22 | 2.44 |
| 16N6F | 4.19 | 2.85 | 3.80 | 3.16 |
| 17N0+3FH | 4.29 | * | 3.09 | * |
| 18N1+3FH | 4.21 | * | 2.82 | * |
| 19 (C) | 2.32 | * | 0.82 | * |
| 20N2KMG | * | * | 1.08 | * |

STRAW MEAN DM% 87.3

97/R/BK/1 W. OATS

GRAIN TONNES/HECTARE

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

| PLOT | GRAIN | STRAW |
|----------|-------|-------|
| 01DN4PK | 7.53 | 6.18 |
| 21DN2 | 7.14 | 4.76 |
| 22D | 7.24 | 5.12 |
| 030 | 1.32 | 0.43 |
| 05F | 1.80 | 0.74 |
| 06N1F | 1.81 | 0.65 |
| 07N2F | 2.23 | 0.94 |
| 08N3F | 2.73 | 1.19 |
| 09N4F | 2.79 | 1.37 |
| 10N2 | 2.24 | 1.04 |
| 11N2P | 2.44 | 0.98 |
| 12N2PNA | 2.34 | 0.84 |
| 13N2PK | 1.97 | 0.93 |
| 14N2PKMG | 1.86 | 0.71 |
| 15N5F | 5.14 | 2.94 |
| 16N6F | 6.71 | 3.62 |
| 17N0+3FH | 3.70 | 2.19 |
| 18N1+3FH | 2.18 | 0.89 |
| 19(C) | 1.85 | 0.84 |

GRAIN MEAN DM% 86.8

STRAW MEAN DM% 77.5

NOTE: Dung and nitrogen treatments are residual from previous wheat.

97/R/BK/1 MAIZE

WHOLE CROP (100% DM) TONNES/HECTARE

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

| PLOT | WHOLE CROP |
|---------------|------------|
| 01DN4PK | 16.36 |
| 21DN2 | 17.45 |
| 22D | 17.53 |
| 030 | 3.64 |
| 05F | 4.79 |
| 06N1F | 11.85 |
| 07N2F | 14.86 |
| 08N3F | 18.62 |
| 09N4F | 18.50 |
| 10N2 | 5.77 |
| 11N2P | 6.46 |
| 12N2PNA | 8.73 |
| 13N2PK | 15.52 |
| 14N2PKMG | 14.97 |
| 15N5F | 15.85 |
| 16N6F | 18.72 |
| 17N0+3FH | 15.81 |
| 18N1+3FH | 16.35 |
| 19 (C) | 5.44 |
| CROP MEAN DM% | 36.1 |