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96/R/BK/1 Broadbalk - W. Wheat, W. Oats, Potatoes

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96/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.

The 153rd year, w. wheat, w.oats and potatoes.

For previous years see 'Details' 1967 and 1973, Station Report for 1966, pp. 229-231, Station Report for 1968, Part 2, Station Report for 1982, Part 2, pp. 5-44 and 74-95/R/BK/1.

Areas harvested:

Wheat:	Section	
	0	0.00351
	1	0.00645
	2, 4, 6 and 7	0.00533
	8 and 9	0.00561
Oats:	3	0.00533
Potatoes:	5	0.00348

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
17N1+3FH	17	N2 (A)	N2 1/2 (P K (Na) Mg)	N1+3 1/2 (PK Mg) +
18N0+3FH	18	P K Na Mg (A)	N2 1/2 (P K (Na) Mg)	N0+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. Potatoes receive N3 1/2 (PK Mg) on both Plots 17 and 18.

W. oats; N and D were not applied.

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 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 96 kg N until 1988, none since

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. From 1968, ten strips of sub-plots (sections) were started with the following cropping:-

SECTION	1/W30	9/W38	0/W45	8/W2	6/W19	5/P	3/O	7/W2	4/W1	
2/W3										
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/W30	9/W38	0/W45	8/W2	6/W19	5/P	3/O	7/W2	4/W1	2/W3
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

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

* 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:

- 18-Sep-95 : T : P applied.
- 21-Sep-95 : T : Mg and Na applied.
- 22-Sep-95 : T : K applied.
- 29-Sep-95 : B : Ploughed and furrow pressed.
- 09-Oct-95 : B : Spring-tine cultivated.

Cropped sections:

W. wheat:

- 11-Aug-95 : T : Straw chopped (section 0 only), straw baled (sections 1, 2, 6, 7, 8 and 9).
- 22-Sep-95 : T : Autumn N treatment applied.
- 26-Sep-95 : T : Farmyard manure applied.
- 11-Oct-95 : T : Rotary harrowed, Hereward, dressed Fonofos Seed Treatment, drilled at 380 seeds per m².
- 12-Oct-95 : T : Rolled.
- 17-Apr-96 : T : Spring N treatments applied.
- 26-Apr-96 : T : Ally at 30 g with Cheetah Super at 1.25 l in 200 l (except section 8).
- : T : Barclay Eytak at 0.9 l in 200 l (except section 6).
- 29-Apr-96 : T : Barclay Holdup at 2.3 l in 200 l (except section 6).
- 07-Jun-96 : T : Alto 100 SL at 0.6 l with Mallard 750 EC at 0.4 l in 320 l (except section 6).
- 16-Aug-96 : T : Combine harvested.

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Experimental diary:

Potatoes:

- 26-Sep-95 : T : Farmyard manure applied.
- 17-Apr-96 : T : Spring N treatments applied.
- 24-Apr-96 : T : Heavy spring-tine cultivated.
- 30-Apr-96 : T : Heavy spring-tine cultivated.
- 01-May-96 : T : Rotary harrowed, planted Estima, dressed Fungazil 100 SL.
- 31-May-96 : T : Rotary ridged.
- 04-Jun-96 : T : Campbell's Linuron 45% Flowable at 5.0 l in 320 l.
- 05-Jul-96 : T : Clayton Turret at 2.0 l in 260 l.
- 22-Jul-96 : T : Clayton Turret at 2.0 l in 300 l.
- 02-Aug-96 : T : Clayton Turret at 2.0 l in 400 l.
- 15-Aug-96 : T : Shirlan at 0.3 l in 390 l.
- 02-Sep-96 : T : Shirlan at 0.3 l in 260 l.
- 12-Sep-96 : T : Haulm pulverised.
- 24-Sep-96 : T : Potatoes lifted.

W. oats:

- 11-Aug-95 : T : Straw baled.
- 12-Oct-95 : T : Rotary harrowed, Image, dressed Vitaflo Extra, drilled at 350 seeds per m², rolled.
- 13-Oct-95 : T : Tribunil at 2.25 kg in 200 l.
- 30-May-96 : T : Tilt 250 EC at 0.5 l with Barclay Holdup at 2.3 l and Vassgro Spreader 200 ml in 200 l.
- 05-Aug-96 : T : Combine harvested.

NOTE: Samples of wheat grain and straw from sections 1, 4, 6 and 9, samples of oat grain and straw and samples of potato tubers were taken for chemical analysis. Unground grain and straw samples were taken from selected plots and archived.

96/R/BK/1 W. WHEAT

GRAIN TONNES/HECTARE

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

SECTION	4/W1	7/W2	8/W2	2/W3	6/W19	1/W30	9/W38	0/W45
PLOT								
01DN4PK	9.20	9.49	*	8.50	9.11	*	*	*
21DN2	9.16	8.65	5.49	7.60	8.18	8.53	7.81	7.29
22D	7.77	5.43	5.72	5.61	6.66	7.45	5.42	6.34
030	3.61	1.03	2.85	1.22	1.56	1.93	0.95	1.83
05F	3.03	1.08	2.97	1.45	2.05	1.77	1.62	1.40
06N1F	6.11	3.67	4.60	3.05	4.37	3.66	3.95	3.89
07N2F	7.74	5.70	5.56	5.03	6.27	6.27	5.83	6.53
08N3F	8.50	7.43	6.76	6.73	7.94	7.48	7.11	7.45
09N4F	8.82	8.31	7.01	7.35	8.13	8.04	8.02	8.23
10N2	6.11	4.54	4.63	4.38	4.17	3.80	3.58	4.20
11N2P	6.51	5.21	4.39	4.78	4.35	4.02	3.64	4.51
12N2PNA	6.67	5.59	4.80	4.84	5.67	4.61	4.21	5.21
13N2PK	7.52	5.84	5.56	5.33	6.41	5.46	5.78	6.46
14N2PKMG	7.76	5.99	6.31	5.23	6.48	5.83	5.61	6.35
15N5F	8.98	8.93	7.35	8.06	7.99	8.24	7.89	8.30
16N6F	8.59	8.51	6.65	7.94	7.84	7.97	8.50	8.33
17N1+3FH	8.75	8.78	6.84	7.97	8.38	7.73	8.20	7.60
18N0+3FH	8.59	7.92	6.15	6.78	8.18	7.23	7.36	7.53
19 (C)	4.19	1.15	2.58	1.74	1.46	2.53	2.23	2.16
20NKMG	*	*	*	*	*	3.71	*	4.11

GRAIN MEAN DM% 86.0

96/R/BK/1 W. WHEAT

STRAW TONNES/HECTARE

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

SECTION	4/W1	6/W19	1/W30	9/W38
PLOT				
01DN4PK	6.23	*	*	*
21DN2	5.50	5.31	6.20	3.74
22D	4.27	3.67	4.66	2.15
030	1.29	0.61	0.68	0.08
05F	0.92	0.67	0.58	0.52
06N1F	2.33	1.45	1.27	1.69
07N2F	3.57	2.68	2.79	2.40
08N3F	4.57	3.93	3.98	2.83
09N4F	4.89	4.36	4.69	3.21
10N2	1.95	*	1.41	*
11N2P	2.56	*	1.32	*
12N2PNA	2.62	*	1.92	*
13N2PK	3.18	*	2.41	*
14N2PKMG	3.54	*	2.46	*
15N5F	5.14	4.23	4.92	3.68
16N6F	4.90	4.69	4.95	4.19
17N1+3FH	4.79	*	4.18	*
18N0+3FH	4.58	*	3.58	*
19(C)	1.61	*	0.76	*
20NKM	*	*	1.75	*

STRAW MEAN DM% 94.4

96/R/BK/1 W. OATS

TONNES/HECTARE

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

PLOT	GRAIN	STRAW
01DN4PK	8.31	4.10
21DN2	7.61	3.16
22D	7.49	2.98
030	2.05	0.59
05F	2.27	0.69
06N1F	2.36	0.73
07N2F	3.07	1.13
08N3F	3.70	1.24
09N4F	4.45	1.54
10N2	3.41	1.10
11N2P	3.34	0.87
12N2PNA	3.68	0.98
13N2PK	2.97	1.02
14N2PKMG	2.93	0.95
15N5F	6.94	2.82
16N6F	7.78	3.56
17N3FH	3.72	1.24
18N3FH	3.30	0.93
19 (C)	2.17	0.49

GRAIN MEAN DM% 89.3

STRAW MEAN DM% 59.9

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

96/R/BK/1 POTATOES

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

PLOT	TOTAL TUBERS	% WARE
	TONNES/ HECTARE	3.81 CM (1.5 INCH) RIDDLE
01DN4PK	35.1	94.1
21DN2	40.9	95.4
22D	38.5	96.6
030	6.3	78.1
05F	11.0	88.8
06N1F	18.2	91.7
07N2F	23.7	94.4
08N3F	26.8	94.6
09N4F	24.0	95.1
10N2	5.2	68.3
11N2P	6.8	68.9
12N2PNA	9.0	68.5
13N2PK	11.4	90.2
14N2PKMG	28.3	94.5
15N5F	28.5	95.8
16N6F	23.6	94.3
17N3FH	15.5	91.1
18N3FH	18.3	93.2
19 (C)	9.8	85.6