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83/R/BK/1 Broadbalk - W. Wheat, Potatoes

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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.

The 140th year, w. wheat, fallow, potatoes. The 16th year of the rotations.

For previous years see 'Details' 1967 and 1973, Station Report for 1966, pp. 229-231, Station Report for 1968, Part 2, and 74-82/R/BK/1.

Areas harvested:

Wheat:	Section	
	0	0.00434
	1	0.00798
	3,4,5,and 6	0.00659
Potatoes:	8 and 9	0.00694
	2	0.00659

Treatments:

Whole plots

PLOT		Fertilizers and organic manures:-		
	Plot	Treatments until 1967	Treatments from 1968	Changes 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 and 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 + 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	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
SC0/W32	0	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
SC1/W17	1	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
POTATOES	2	BE	W	P	BE	W	P	BE	W	P	BE	W	F	P	W	F	P
SC3/W4	3	W	W	F	W	W	F	W	W	F	W	W	F	W	W	W	W
SC4/W1P	4	W	P	BE	W	P	BE	W	P	BE	W	P	P	W	F	P	W
SC5/W5	5	W	F	W	W	F	W	W	F	W	W	F	W	W	W	W	W
SC6/W6	6	F	W	W	F	W	W	F	W	W	F	W	W	W	W	W	W
-/	7	P	BE	W	P	BE	W	P	BE	W	P	BE	W	F	P	W	F
SC8/W2F	8*	W	W	W	W	F	W	W	W	W	W	W	W	W	F	W	W
SC9/W25	9	W	W	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 and 9.
 Year 3: Sections 0,4,5. Chalk is applied to all plots of each section.

Standard applications:

W. wheat: Manures: Sections 6, 8 and 9 only: Chalk at 2.9 t.
 Weedkillers: (not applied to section 8): Mecoprop, bromoxynil and ioxynil (as 'Brittox' at 3.5 l) with isoproturon at 2.1 kg in 250 l.
 Fungicide: Propiconazole at 0.12 kg on two occasions, in 500 l on the first and in 250 l on the second.
 Potatoes: Weedkillers: Linuron at 1.6 l and paraquat at 0.56 kg ion in 500 l. Fungicides: Mancozeb at 1.4 kg in 250 l. Fentin hydroxide at 0.28 kg in 250 l on five occasions with the insecticide on the first four. Insecticide: Pirimicarb at 0.14 kg.
 Fallow: Manures: Chalk at 2.9 t.

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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: 16 Sept, 1982. FYM applied, ploughed: 20 Sept. Spring-tine cultivated: 28 Oct.
Cropped Sections: W. wheat: Chalk to sections 6, 8 and 9: 2 Sept, 1982. Autumn N applied to plot 18: 16 Sept. Rotary harrowed, seed sown: 4 Nov. Spring N applied: 15 Apr, 1983. Weedkillers applied: 16 Apr. Propiconazole applied: 26 May, 30 June. Combine harvested: 10 Aug.
Potatoes: Chisel ploughed: 10 Feb, 1983. N applied, heavy spring-tine cultivated: 5 May. Rotary harrowed, potatoes planted: 10 May. Rotary ridged: 26 May. Weedkillers applied: 3 June. Mancozeb applied: 22 June. Fentin hydroxide with the insecticide applied: 1 July, 8 July, 18 July, 28 July. Fentin hydroxide applied: 11 Aug. Haulm mechanically destroyed: 30 Aug. Lifted: 1 Sept.
Fallow: Chalk applied: 2 Sept, 1982. Chisel ploughed: 10 Feb, 1983. Heavy spring-tine cultivated: 27 May. Ploughed: 17 June. Spring-tine cultivated: 23 June. Ploughed: 13 July. Spring-tine cultivated: 21 July.

NOTE: The percentage weights of weed seeds in the recorded grain yields of plots in Section 8 were measured. As the maximum was only 3% (Plot 05) no adjustments have been made and the figures are not separately presented.

POTATOES

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

PLOT	TOTAL TUBERS TONNES/ HECTARE	% WARE 3.81 CM(1.5 INCH) RIDDLE
01DN2PK	16.9	91.5
21DN2	20.3	92.8
22D	15.7	96.3
030	4.4	89.0
05F	8.4	93.5
06N1F	13.0	94.2
07N2F	15.4	93.7
08N3F	16.5	92.9
09N4F	14.8	90.6
10N2	4.6	81.1
11N2P	4.8	78.7
12N2PNA	6.2	81.2
13N2PK	9.7	90.9
14N2PKMG	11.7	89.7
15N3F	13.9	90.8
16N2F	13.3	90.8
17N3FH	9.2	89.7
18N3FH	8.9	90.5
19C	5.8	89.9

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GRAIN TONNES/HECTARE

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

SECTION PLOT	SC4/W1P	SC8/W2F	SC3/W4	SC5/W5	SC6/W6	SC1/W17	SC9/W25	SC0/W32	MEAN
01DN2PK	7.69	*	7.05	7.39	7.58	*	*	*	7.43
21DN2	7.91	6.80	7.67	7.62	7.41	7.34	7.57	6.90	7.40
22D	5.41	4.82	5.24	4.90	4.43	5.24	5.28	5.22	5.07
030	1.96	2.23	1.59	1.44	1.36	1.69	1.82	2.24	1.79
05F	2.01	1.70	2.07	1.56	1.50	1.50	1.58	2.09	1.75
06N1F	5.04	3.19	4.58	4.06	3.38	3.52	4.02	4.05	3.98
07N2F	6.91	4.87	6.25	6.32	5.84	5.36	5.30	5.74	5.82
08N3F	7.37	5.77	6.97	6.37	6.32	5.78	6.09	6.01	6.34
09N4F	7.56	6.17	6.99	6.59	6.55	6.37	6.26	6.17	6.58
10N2	5.20	4.44	3.92	4.73	4.17	3.03	3.32	3.42	4.03
11N2P	5.73	4.14	4.38	4.34	4.54	3.82	3.39	3.96	4.29
12N2PNA	5.67	4.50	4.76	4.66	4.51	4.67	4.29	4.74	4.73
13N2PK	6.06	3.87	5.13	5.04	4.84	5.40	5.15	5.11	5.08
14N2PKMG	6.65	4.66	5.77	5.27	4.87	5.76	5.83	5.60	5.55
15N3F	6.93	5.23	6.20	6.11	6.29	6.17	6.18	6.20	6.16
16N2F	6.35	5.14	5.58	4.96	4.99	5.34	5.70	5.42	5.44
17N0+3FH	7.07	6.04	6.23	6.04	6.11	5.90	6.08	5.78	6.15
18N1+3FH	7.10	6.37	6.43	6.18	6.20	6.26	6.12	6.24	6.36
19C	4.41	2.55	3.10	3.27	2.38	3.56	3.25	2.96	3.19
20NKMG	*	*	*	*	*	2.80	*	3.21	3.01

GRAIN MEAN DM% 86.4

STRAW TONNES/HECTARE

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

SECTION PLOT	SC4/W1P	SC1/W17	MEAN
01DN2PK	6.79	*	6.79
21DN2	7.58	7.45	7.52
22D	3.63	3.99	3.81
030	1.08	0.82	0.95
05F	1.23	0.93	1.08
06N1F	3.37	3.01	3.19
07N2F	5.92	4.86	5.39
08N3F	6.21	4.97	5.59
09N4F	6.15	5.42	5.78
10N2	2.58	2.30	2.44
11N2P	3.58	2.07	2.82
12N2PNA	3.82	2.69	3.26
13N2PK	4.76	4.40	4.58
14N2PKMG	5.05	4.48	4.76
15N3F	5.55	4.77	5.16
16N2F	4.81	4.17	4.49
17N0+3FH	5.92	4.33	5.12
18N1+3FH	6.06	4.98	5.52
19C	2.15	2.00	2.07
20NKMG	*	1.65	1.65

STRAW MEAN DM% 92.9