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85/S/RN/1 Rotation I - Grass, W. Beans, W. Wheat

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85/S/RN/1

ROTATION I

Object: To compare nutrient cycles, uptakes of nutrients and responses to fresh P and K. To obtain an estimate of the rate of release of nutrients, particularly K, from Saxmundham soil - Saxmundham.

Sponsor: A.E. Johnston.

The 86th year, grass, w. wheat, w. beans.

For previous years see 'Details' 1967 and 1973, and 74-84/S/RN/1.

Whole plot dimensions (original treatments): 5.49 x 40.2.

Treatments: From 1899 to 1969 the experiment followed a four-course rotation of w. wheat, roots, s. barley, legumes. Each phase of the rotation was present each year on a separate block. From 1966 each plot was divided. A small area at the south end continued under the original treatment until 1979, these plots were sown to grass in 1970, the treatments were discontinued after 1979 and yields no longer taken although the plots remain in grass. Modified treatments (NEWTREAT) were applied on the larger sub-plots from 1966 (see below).

In 1970 the rotation was stopped and each pair of blocks was divided for lucerne and grass (the original treatment sub-plots formed part of the grass area). In 1977 lucerne was ploughed on one pair of blocks to start an arable rotation testing fresh K to plots previously given none since 1899 (S/RN/1-2). In 1978 lucerne on the other pair of blocks was replaced by a grass/clover mixture; this was ploughed in 1979 for a continuing test of subsoil loosening and incorporation of PK to the subsoil (S/RN/1-3).

Since autumn 1980 the four sections of NEWTREAT grass have been ploughed up progressively to start a sequence of arable crops (S/RN/1-1) measuring the effects of soil K depletion. The sequence of crops has been:

Section	1970-80	1981	1982	1983	1984	1985
(a)	G	W	BE	W	W	W
(b)	G	G	G	BE	W	W
(c)	G	G	G	G	BE	W
(d)	G	G	G	G	G	BE

G = NEWTREAT grass, W = w. wheat, BE = w. beans.

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Treatments to crops in these sections were:

TREATMENT 1899-1965	NEWTREAT Grass 1966-1984	W. wheat and w. beans until 1984	W. wheat and w. beans 1985
	MANURE	MANURE	MANURE
D	(D)N	(D)P2	(D)P2
B	BN	B	BP2
N	(N)P2N	(N)P2	(N)P2
P	(P)P1N	(P)P1	(P1)P2
K	(K)P2KN	(K)P2K	(K)P2K
-	(-)P2N	(-)P2	(-)P2
PK	(PK)P1KN	(PK)P1K	(P1K)P2K
NK	(NK)P2KN	(NK)P2K	(NP2K)P2K
NP	(NP)P1N	(NP)P1	(NP1)P2
NPK	(NPK)P1KN	(NPK)P1K	(NP1K)P2K

D: Farmyard manure at 15 tonnes
 (D): Farmyard manure at 30 tonnes, 60 tonnes in autumn 1969, none since
 B: Bonemeal at 0.5 tonnes
 N: 1899-1965, 38 kg N as nitrate of soda. Since 1970, 100 kg N as 'Nitro-Chalk' per cut of grass
 P: 1899-1965, 40 kg P2O5 as single superphosphate. 1966-79, 50 kg P2O5 as triple superphosphate
 P1, P2: 50, 100 kg P2O5 as triple superphosphate
 K: 1899-1965, 63 kg K2O as muriate of potash. Since 1966, 126 kg K2O

W. wheat in Sections (a), (b) and (c) tested in addition to MANURE all the combinations with the following nitrogen rates (kg N) applied in spring as 'Nitro-Chalk' (26% N) on 17 Apr, 1985:

N(NC)

120
160
200
240

Part of the w. wheat in Section (b) tested in addition to MANURE all the combinations with the following nitrogen rates (kg N) applied on 17 Apr as prilled urea:

N(PU)

0
160
200

NOTE: All w. wheat in Sections (a), (b) and (c) was given 45 kg N to the seedbed, as prilled urea, in addition to the spring nitrogen rates. On S/RN/1-2 and S/RN/1-3 w. beans were grown, yields not taken.

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Standard applications:

- W. wheat, on S/RN/1-1. Manures: P205 at 100 kg (as triple superphosphate). N at 45 kg (as prilled urea). Weedkillers: Mecoprop at 1.2 kg, bromoxynil at 0.26 kg and ioxynil at 0.26 kg in 220 l (to Section (c) only). Mecoprop at 1.2 kg, bromoxynil at 0.26 kg and ioxynil at 0.26 kg with isoproturon at 2.1 kg applied with the prochloraz in 220 l. (To Sections (a), (b) and (c) but on Section (c) the isoproturon was applied separately and earlier). Fungicides: Prochloraz at 0.42 kg. Maneb at 1.6 kg, carbendazim at 0.15 kg and tridemorph at 0.37 kg with captafol at 1.0 kg applied with the insecticide in 220 l. Insecticide: Pirimicarb at 0.14 kg.
- W. beans, on S/RN/1-1, S/RN/1-2 and S/RN/1-3: Manures: P205 at 100 kg (as triple superphosphate). Weedkillers: Simazine at 1.1 kg in 220 l (except to S/RN/1-3). Fungicide: Benomyl at 0.56 kg in 220 l.

Seed: W. wheat: Galahad, sown at 400 seeds per square metre.
W. beans: Banner, sown at 250 kg.

Cultivations, etc.:-

- W. wheat: S/RN/1-1 (Sections (a) and (b) only). K and bonemeal treatments applied: 6 Sept, 1984. P applied: 13 Sept. Ploughed: 15 Sept. Power harrowed, seed sown, seedbed N applied: 17 Oct. N treatments applied: 17 Apr, 1985. Mecoprop, bromoxynil and ioxynil with isoproturon and prochloraz applied: 23 Apr. Remaining fungicides and insecticide applied: 26 June. Combine harvested: 28 Aug (Section (a)), 29 Aug (Section (b)).
- W. wheat: S/RN/1-1 (Section (c)): P applied: 9 Oct, 1984. Ploughed, K and bonemeal treatments applied: 11 Oct. Power harrowed, seed sown, seedbed N applied: 30 Oct. Isoproturon applied: 31 Oct. Mecoprop, bromoxynil and ioxynil applied: 4 Dec. N treatments applied: 17 Apr, 1985. Mecoprop, bromoxynil and ioxynil with prochloraz applied: 23 Apr. Remaining fungicides and insecticide applied: 26 June. Combine harvested: 28 Aug.
- W. beans: S/RN/1-1 (Section (d)): P applied: 9 Oct, 1984. Ploughed, K and bonemeal treatments applied: 11 Oct. Seed sown: 17 Oct. Weedkiller applied: 31 Oct. Fungicide applied: 22 Apr, 1985. Combine harvested: 16 Sept.
- W. beans: S/RN/1-2 and S/RN/1-3: K and bonemeal treatments applied: 6 Sept, 1984. P applied: 13 Sept. Ploughed: 15 Sept (S/RN/1-2), 11 Oct (S/RN/1-3). Power harrowed, seed sown, weedkiller applied (S/RN/1-2 only): 17 Oct. Power harrowed, seed sown (S/RN/1-3 only): 31 Oct. Fungicide applied: 22 Apr, 1985. Combine harvested (yields not recorded): 19 Sept.

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3RD W.WHEAT AFTER W.BEANS SECTION (a)

GRAIN TONNES/HECTARE

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

N(NC) MANURE	120	160	200	240	MEAN
(D)P2	7.38	6.51	6.18	7.09	6.79
BP2	4.62	5.43	4.62	4.39	4.77
(N)P2	5.63	6.25	5.94	4.36	5.54
(P1)P2	6.00	5.14	6.15	6.28	5.89
(K)P2K	7.02	7.00	7.37	6.67	7.01
(-)P2	6.40	4.93	5.90	6.77	6.00
(P1K)P2K	6.62	6.39	6.67	7.20	6.72
(NP2K)P2K	6.84	7.38	6.76	7.50	7.12
(NP1)P2	6.14	6.44	6.12	6.57	6.32
(NP1K)P2K	7.38	5.74	6.65	7.31	6.77
MEAN	6.40	6.12	6.24	6.41	6.29

GRAIN MEAN DM% 85.6

PLOT AREA HARVESTED 0.00073

2ND W. WHEAT AFTER W.BEANS SECTION (b)

GRAIN TONNES/HECTARE

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

N(NC) MANURE	120	160	200	240	MEAN
(D)P2	6.65	6.43	7.46	6.09	6.66
BP2	6.57	8.14	6.64	5.70	6.76
(N)P2	8.28	7.06	5.88	6.26	6.87
(P1)P2	7.77	7.22	6.74	7.40	7.28
(K)P2K	7.59	8.18	6.94	6.53	7.31
(-)P2	6.88	7.90	7.96	7.35	7.52
(P1K)P2K	7.70	8.86	7.30	7.24	7.78
(NP2K)P2K	8.25	7.22	8.50	8.63	8.15
(NP1)P2	7.42	8.21	7.96	7.01	7.65
(NP1K)P2K	7.48	7.96	6.91	7.88	7.56
MEAN	7.46	7.72	7.23	7.01	7.35

GRAIN MEAN DM% 82.4

PLOT AREA HARVESTED 0.00073

85/S/RN/1

2ND W. WHEAT AFTER W.BEANS SECTION (b)

GRAIN TONNES/HECTARE

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

N(PU)	0	160	220	MEAN
MANURE				
(D)P2	3.64	6.89	6.37	5.13
BP2	2.18	4.79	6.41	3.89
(N)P2	1.71	3.77	6.56	3.44
(P1)P2	1.52	7.40	4.49	3.73
(K)P2K	2.01	7.63	7.46	4.78
(-)P2	1.95	7.75	6.57	4.56
(P1K)P2K	1.92	8.41	7.01	4.81
(NP2K)P2K	1.71	8.69	7.34	4.86
(NP1)P2	1.17	6.22	6.89	3.86
(NP1K)P2K	2.04	7.93	7.29	4.82
MEAN	1.98	6.95	6.64	4.39

GRAIN MEAN DM% 81.7

PLOT AREA HARVESTED 0.00073

1ST W.WHEAT AFTER W.BEANS SECTION (c)

GRAIN TONNES/HECTARE

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

N(NC)	120	160	200	240	MEAN
MANURE					
(D)P2	7.04	8.28	8.17	7.07	7.64
BP2	6.96	7.33	6.09	7.88	7.06
(N)P2	6.96	7.62	8.05	7.51	7.54
(P1)P2	7.85	7.76	7.19	6.96	7.44
(K)P2K	8.26	8.63	8.98	9.74	8.90
(-)P2	8.21	8.00	7.64	8.25	8.03
(P1K)P2K	8.72	9.27	8.99	7.88	8.72
(NP2K)P2K	8.32	10.57	8.87	6.93	8.67
(NP1)P2	7.74	7.75	7.52	7.90	7.73
(NP1K)P2K	7.05	8.60	8.67	6.05	7.59
MEAN	7.71	8.38	8.02	7.62	7.93

GRAIN MEAN DM% 85.3

PLOT AREA HARVESTED 0.00073

85/S/RN/1

W. BEANS SECTION (d)

GRAIN TONNES/HECTARE

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

MANURE	
(D)P2	1.07
BP2	1.01
(N)P2	0.93
(P1)P2	0.93
(K)P2K	2.15
(-)P2	1.19
(P1K)P2K	2.28
(NP2K)P2K	2.14
(NP1)P2	0.95
(NP1K)P2K	1.98
MEAN	1.46

GRAIN MEAN DM% 80.7

PLOT AREA HARVESTED 0.00229