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## Yields of the Field Experiments 1977

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### 77/S/RN/1 Rotation I - Grass, Lucerne, Potatoes, Beans

#### Rothamsted Research

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77/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 79th year, grass, lucerne, potatoes, barley and beans.

For previous years see 'Details' 1967 & 1973, and 74-76/S/RN/1.

Whole plot dimensions (new treatments): 5.49 x 17.1.

Treatments: From 1899 to 1969 the experiment followed a four-course rotation of wheat, roots, 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 being continued under the original treatment (OLDTREAT), modified treatments (NEWTREAT) being applied on the larger sub-plots (see below).

In 1970 the rotation was stopped and each pair of blocks was divided for lucerne and grass (the OLDTREAT sub-plots form a part of the Grass area).

TREATMENT 1899-1965	OLDTREAT Grass	NEWTREAT Lucerne	NEWTREAT Grass
	MANURE	MANURE	MANURE
D	(D)	(D)	(D)N
B	B	B	BN
N	N	(N)P2	(N)P2N
P	P	(P)P1	(P)P1N
K	K	(K)P2K	(K)P2KN
-	-	(-)P2	(-)P2N
PK	PK	(PK)P1K	(PK)P1KN
NK	NK	(NK)P2K	(NK)P2KN
NP	NP	(NP)P1	(NP)P1N
NPK	NPK	(NPK)P1K	(NPK)P1KN

- D: Farmyard manure at 15 tonnes
- (D): Farmyard manure at 30 tonnes (1966-1969 15 tonnes on OLDTREAT), 60 tonnes in autumn 1969, none since
- B: Bone meal at 0.5 tonnes
- N: 1899-1965 - 38 kg N as nitrate of soda. Since 1970 - 100 kg N (38 kg N on OLDTREAT) per cut as 'Nitro-Chalk'
- P: 1899-1965 40 kg P205 as single superphosphate. Since 1966 50 kg P205 as triple superphosphate
- P1,P2: 50, 100 kg P205 as triple superphosphate (single superphosphate until 1965)
- K: 1899-1965 63 kg K20 as muriate of potash. Since 1966 - 126 kg K20 (75 kg K20 on OLDTREAT)

- NOTES: (1) For a fuller record of treatments see 'Details' etc.  
 (2) On OLDTREAT grass, clover appeared naturally on some plots in 1975. To unify the plots white clover was sown on all at 33 kg.  
 (3) Lucerne was resown in 1976.

77/S/RN/1

In 1977 lucerne was ploughed on one pair of blocks and the area divided into three for the first three phases of the arable four-course rotation barley, potatoes, winter beans, wheat. Whole plot treatments are continued on the ploughed area as for NEWTREAT lucerne except all crops, except beans, are given N and plots previously given farmyard manure now receive phosphate fertiliser. Plots on this area are randomly subdivided for each crop for a test of potash fertiliser. All combinations of the following are present:

1. MANURE

Beans	Potatoes and barley
(D)P2	(D)P2N
B	BN
(N)P2	(N)P2N
(P)P1	(P)P1N
(K)P2K	(K)P2KN
(-)P2	(-)P2N
(PK)P1K	(PK)P1KN
(NK)P2K	(NK)P2KN
(NP)P1	(NP)P1N
(NPK)P1K	(NPK)P1KN

Symbols as above except N = 250 kg (potatoes); 94 kg (Barley)

2. POTASH Additional potash fertiliser, as muriate of potash (kg K<sub>2</sub>O):

Barley and beans Potatoes

0	0
63	224

Standard applications:

Barley: Weedkillers: Ioxynil at 0.42 kg with mecoprop at 1.3 kg in 340 l.  
Potatoes: Weedkillers: Linuron at 0.93 kg with paraquat at 0.28 kg ion in 280 l. Fungicide: Mancozeb at 1.3 kg in 280 l on four occasions.  
Insecticide: Menazon ('Saphi-Col' at 0.7 l) applied with the first fungicide application.

Seed: Barley: Julia, sown at 190 kg.  
Potatoes: Pentland Crown.  
Beans: Minden, sown at 270 kg.

Cultivations, etc.:-

OLDTREAT Grass: P, K and bone meal applied: 16 Feb, 1977. N applied: 16 Mar, 15 June. Cut: 1 June, 28 Sept.  
NEWTREAT Grass: P, K and bone meal applied: 16 Feb. N applied: 16 Mar, 15 June, 27 July. Cut: 1 June, 21 July, 28 Sept.  
Lucerne: P, K and bone meal applied: 16 Feb. Cut: 15 June, 10 Aug.  
All tillage crops: Ploughed: 12 Nov, 1976. Bone meal applied: 16 Feb, 1977. K and additional K applied: 16 Mar.  
Potatoes: N applied and planted: 28 Apr. Weedkillers applied: 25 May. Fungicide with insecticide applied: 6 July. Fungicide only applied: 21 July, 10 Aug, 21 Sept. Lifted: 18 Oct.  
Barley: Sown and N applied: 6 Apr. Weedkillers applied: 26 May. Combine harvested: 31 Aug.  
Beans: Sown: 7 Apr. Combine harvested: 8 Sept.

77/S/RN/1 GRASS OLD TREAT

DRY MATTER TONNES/HECTARE

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

	1ST CUT (1/6/77)	2ND CUT (28/9/77)	TOTAL OF 2 CUTS
MANURE			
(D)	2.07	1.04	3.11
B	1.87	1.02	2.89
N	2.34	1.19	3.53
P	1.82	1.05	2.87
K	0.84	0.42	1.26
-	1.07	0.59	1.66
PK	2.31	0.95	3.26
NK	2.68	1.21	3.89
NP	2.75	1.41	4.16
NPK	3.64	1.69	5.33
MEAN	2.14	1.06	3.20

1ST CUT MEAN DM% 30.0

2ND CUT MEAN DM% 43.3

TOTAL OF 2 CUTS MEAN DM% 36.6

PLOT AREA HARVESTED 0.00050

77/S/RN/1 GRASS NEW TREAT

DRY MATTER TONNES/HECTARE

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

	1ST CUT (1/6/77)	2ND CUT (21/7/77)	3RD CUT (28/9/77)	TOTAL OF 3 CUTS
MANURE				
(D)N	8.21	3.25	2.00	13.46
BN	6.94	2.56	1.94	11.44
(N)P2N	7.11	2.47	1.94	11.51
(P)P1N	6.81	2.42	1.91	11.14
(K)P2KN	7.58	2.66	2.25	12.49
(-)P2N	7.07	2.43	1.85	11.35
(PK)P1KN	7.39	2.61	2.13	12.13
(NK)P2KN	7.58	2.91	2.31	12.81
(NP)P1N	6.48	2.33	1.70	10.51
(NPK)P1K	7.57	2.93	1.79	12.29
MEAN	7.27	2.66	1.98	11.91

1ST CUT MEAN DM% 27.6

2ND CUT MEAN DM% 34.6

3RD CUT MEAN DM% 32.4

TOTAL OF 3 CUTS MEAN DM% 31.5

1ST CUT PLOT AREA HARVESTED 0.00124

2ND CUT PLOT AREA HARVESTED 0.00116

3RD CUT PLOT AREA HARVESTED 0.00112

77/S/RN/1 LUCERNE NEWTREAT

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

	1ST CUT (15/6/77)	2ND CUT (10/8/77)	TOTAL OF 2 CUTS
MANURE			
(D)	3.43	2.04	5.46
B	2.88	1.60	4.48
(N)P2	2.99	1.61	4.60
(P)P1	2.46	1.60	4.06
(K)P2K	2.81	1.67	4.49
(-)P2	3.17	1.73	4.90
(PK)P1K	2.80	1.80	4.61
(NK)P2K	2.78	1.90	4.68
(NP)P1	2.81	1.69	4.50
(NPK)P1K	3.10	2.10	5.19
MEAN	2.92	1.77	4.70

1ST CUT MEAN DM% 20.6  
 2ND CUT MEAN DM% 31.2  
 TOTAL OF 2 CUTS MEAN DM% 25.9

PLOT AREA HARVESTED 0.00156

77/S/RN/1 POTATOES

TUBERS TONNES/HECTARE

\*\*\*\*\* TABLES OF MEAN \*\*\*\*\*

POTASH	0	224	MEAN
MANURE			
(D)P2N	38.1	39.8	39.0
BN	25.2	32.5	28.8
(N)P2N	21.6	33.1	27.4
(P)P1N	24.3	31.4	27.9
(K)P2KN	36.7	39.9	38.3
(-)P2N	29.1	36.8	33.0
(PK)P1KN	39.2	40.9	40.1
(NK)P2KN	37.7	40.4	39.1
(NP)P1N	21.9	34.0	27.9
(NPK)P1K	35.4	37.8	36.6
MEAN	30.9	36.7	33.8

\*\*\*\*\* STANDARD ERRORS OF DIFFERENCES OF MEANS \*\*\*\*\*

TABLE	POTASH	MANURES* POTASH
SED	0.78	2.46

\* WITHIN SAME LEVEL OF MANURE ONLY

\*\*\*\*\* STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION \*\*\*\*\*

STRATUM	DF	SE	CV%
BLOCK.WP	9	1.57	4.7
BLOCK.WP.SP	10	2.46	7.3

SUB PLOT AREA HARVESTED 0.00143 38

77/S/RN/1 BARLEY

GRAIN TONNES/HECTARE

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

POTASH MANURE	0	63	MEAN
(D)P2N	5.27	6.08	5.68
BN	5.57	5.90	5.73
(N)P2N	5.74	5.86	5.80
(P)P1N	5.62	5.89	5.75
(K)P2KN	6.24	6.02	6.13
(-)P2N	5.74	5.69	5.72
(PK)P1KN	5.77	6.06	5.92
(NK)P2KN	5.76	5.88	5.82
(NP)P1N	5.61	5.27	5.44
(NPK)P1K	5.07	5.46	5.26
MEAN	5.64	5.81	5.72

\*\*\*\*\* STANDARD ERRORS OF DIFFERENCES OF MEANS \*\*\*\*\*

TABLE	POTASH	MANURE* POTASH
SED	0.119	0.376

\* WITHIN SAME LEVEL OF MANURE ONLY

\*\*\*\*\* STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION \*\*\*\*\*

STRATUM	DF	SE	CV%
BLOCK.WP	9	0.220	3.8
BLOCK.WP.SP	10	0.376	6.6

GRAIN MEAN DM% 79.8

STRAW TONNES/HECTARE

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

POTASH MANURE	0	63	MEAN
(D)P2N	3.08	3.68	3.38
BN	3.58	3.59	3.58
(N)P2N	3.32	3.67	3.50
(P)P1N	3.47	3.82	3.65
(K)P2KN	4.06	3.67	3.86
(-)P2N	3.72	3.87	3.80
(PK)P1KN	3.76	4.17	3.97
(NK)P2KN	3.74	4.03	3.89
(NP)P1N	3.29	3.21	3.25
(NPK)P1K	3.14	3.14	3.14
MEAN	3.52	3.69	3.60

STRAW MEAN DM% 66.9

SUB PLOT AREA HARVESTED 0.00077

77/S/RN/1 BEANS

GRAIN TONNES/HECTARE

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

	POTASH	0	63	MEAN
MANURE				
(D)P2		4.62	4.21	4.42
B		4.30	3.64	3.97
(N)P2		3.88	2.81	3.34
(P)P1		3.06	3.58	3.32
(K)P2K		4.18	3.91	4.04
(-)P2		3.87	3.70	3.78
(PK)P1K		3.99	3.65	3.82
(NK)P2K		4.21	3.99	4.10
(NP)P1		4.00	3.67	3.83
(NPK)P1K		3.45	3.61	3.53
MEAN		3.96	3.68	3.82

\*\*\*\*\* STANDARD ERRORS OF DIFFERENCES OF MEANS \*\*\*\*\*

TABLE	POTASH	MANURE* POTASH
-----		
SED	0.065	0.207

\* WITHIN SAME LEVEL OF MANURE ONLY

\*\*\*\*\* STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION \*\*\*\*\*

STRATUM	DF	SE	CV%
BLOCK.WP	9	0.428	11.2
BLOCK.WP.SP	6	0.207	5.4

GRAIN MEAN DM% 71.2

SUB PLOT AREA HARVESTED 0.00138