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# Yields of the Field Experiments 1981

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## 81/S/RN/1 Rotation I - Grass W. Wheat

### Rothamsted Research

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81/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 82nd year, grass, w. wheat.

For previous years see 'Details' 1967 & 1973, and 74-80/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 being continued under the original treatment until 1979 (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). In 1977 lucerne was ploughed on one pair of blocks to start an arable rotation and in 1978 lucerne on the other blocks was replaced by a grass/clover mixture. The grass/clover mixture was ploughed in 1979 for a test of subsoiling. Part of the grass area was ploughed in autumn 1980 and added to the arable rotation area. Remaining treatments to grass in 1981 were:

TREATMENT 1899-1965	OLDTREAT Grass 1966-79	NEWTREAT Grass 1966-81
	MANURE	MANURE
D	(D)	(D)N
B	B	BN
N	N	(N)P2N
P	P	(P)P1N
K	K	(K)P2KN
-	-	(-)P2N
PK	PK	(PK)P1KN
NK	NK	(NK)P2KN
NP	NP	(NP)P1N
NPK	NPK	(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 P2O5 as single superphosphate. Since 1966 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 (75 kg K2O on OLDTREAT)

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- 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) From 1980 treatments have not been applied to OLDTREAT grass and yields have not been taken.

The pair of blocks in arable crops from 1977 were divided into three for three phases of the four-course rotation w. barley, potatoes, beans, w. wheat. Whole plot treatments were continued as for NEWTREAT grass except w. beans were not given N and plots previously given farmyard manure received phosphate fertiliser. In 1981 all blocks and the new area ploughed from grass were sown to w. wheat. All combinations of the following were tested:

Whole plots

Blocks

1. PREVCROP      Crops in 1980:

WHEAT  
BARLEY  
POTATOES  
GRASS

2. MANURE

(D)P2N  
BN N  
(N)P2N  
(P)P1N  
(K)P2KN  
(-)P2N  
(PK)P1KN  
(NK)P2KN  
(NP)P1N  
(NPK)P1KN

Symbols as above except N = 40 kg at sowing

Sub plots

3. N              Nitrogen fertiliser (kg N) in spring:

80  
120  
160  
200

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The pair of blocks testing subsoiling were sown to w. wheat and tested all combinations of:

Whole plots

1. MANURE (as for w. wheat above) and:

2. TREATMNT Cultivations etc in May, 1979 only:

CNVNTIAL	Conventional, mouldboard ploughed
SUBDUG	Subsoil dug by Wye double digger
SUBDUG+F	Subsoil dug by Wye double digger incorporating P at 374 kg and K at 712 kg (as 0:20:20) into the subsoil at the time of working

Sub plots

3. N Nitrogen fertiliser (kg N) in spring:

80  
120  
160  
200

Standard applications:

Both arable sections: Manures: N at 40 kg to seedbed, as 'Nitro-Chalk'.  
Weedkillers: Chlortoluron at 5.6 l in 220 l. Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 3.5 l) in 220 l, applied with the benomyl. Fungicides: Benomyl at 0.28 kg. Carbendazim with maneb and tridemorph (as 'Cosmic' at 3.9 kg), applied with captafol at 1.0 kg and the insecticide in 280 l. Carbendazim at 0.25 kg with maneb at 1.61 kg and captafol at 1.0 kg in 280 l applied with the insecticide. Insecticide: Pirimicarb at 0.14 kg.

Seed: W. wheat (arable section other than subsoiling test section): Virtue, sown at 375 seeds per square metre.

W. wheat (subsoiling test section): Avalon, sown at 375 seeds per square metre.

Cultivations, etc.:-

Grass section: P, K and bonemeal applied: 19 Feb, 1981. N applied: 14 Apr. Cut: 11 June, 6 Aug. N applied: 19 June.

Both arable sections: Ploughed: 19 Sept, 1980. 'Brittox' & benomyl applied: 7 Apr, 1981. N applied: 14 Apr. 'Cosmic', captafol & insecticide applied: 28 May. Carbendazim, maneb, captafol and insecticide applied: 9 July. Combine harvested: 21 Aug.

Arable section (other than subsoiling test section): Potato site cleared, P, K and bonemeal applied: 25 Sept, 1980. N applied, seed sown: 9 Oct. Chlortoluron applied: 10 Oct.

Subsoiling test section: N applied, seed sown: 29 Sept, 1980. Chlortoluron applied: 30 Sept.

81/S/RN/1 GRASS

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

	1ST CUT(11/6/81)	2ND CUT(6/8/81)	TOTAL OF 2 CUTS
MANURE			
(D)N	6.33	4.62	10.95
BN	6.07	3.65	9.72
(N)P2N	6.34	3.82	10.16
(P)P1N	5.48	3.78	9.26
(K)P2KN	5.68	3.99	9.67
(-)P2N	5.76	3.82	9.58
(PK)P1KN	6.68	4.14	10.82
(NK)P2KN	6.76	3.96	10.72
(NP)P1N	5.89	3.80	9.69
(NPK)P1KN	6.69	4.17	10.86
MEAN	6.17	3.97	10.14
MEAN DM%	23.7	52.2	37.9
PLOT AREA HARVESTED	0.00095		

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WINTER WHEAT

GRAIN TONNES/HECTARE

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

PREVCROP	WHEAT	BARLEY	POTATOES	GRASS	MEAN
MANURE					
(D)P2N	9.19	8.70	9.67	7.80	8.84
BN N	8.98	8.15	8.76	6.23	8.03
(N)P2N	8.86	8.14	9.10	5.94	8.01
(P)P1N	8.99	8.57	8.81	6.47	8.21
(K)P2KN	9.20	8.42	9.74	8.28	8.91
(-)P2N	9.24	8.14	9.49	6.30	8.29
(PK)P1KN	9.20	8.20	9.38	8.10	8.72
(NK)P2KN	9.09	8.45	9.91	7.76	8.80
(NP)P1N	8.92	8.22	9.09	5.76	8.00
(NPK)P1KN	7.79	8.33	9.04	7.54	8.18
MEAN	8.95	8.33	9.30	7.02	8.40
N	80	120	160	200	MEAN
MANURE					
(D)P2N	8.67	8.59	8.90	9.19	8.84
BN N	7.85	7.97	8.06	8.23	8.03
(N)P2N	7.90	8.01	8.04	8.09	8.01
(P)P1N	7.84	8.52	7.90	8.59	8.21
(K)P2KN	8.47	8.87	9.12	9.17	8.91
(-)P2N	7.90	8.46	8.59	8.22	8.29
(PK)P1KN	8.19	8.70	9.23	8.77	8.72
(NK)P2KN	8.55	8.64	9.11	8.91	8.80
(NP)P1N	7.56	8.22	8.15	8.06	8.00
(NPK)P1KN	8.38	7.36	8.40	8.57	8.18
MEAN	8.13	8.33	8.55	8.58	8.40
N	80	120	160	200	MEAN
PREVCROP					
WHEAT	8.28	8.58	9.32	9.61	8.95
BARLEY	7.84	8.50	8.51	8.48	8.33
POTATOES	9.13	9.23	9.50	9.33	9.30
GRASS	7.28	7.02	6.87	6.91	7.02
MEAN	8.13	8.33	8.55	8.58	8.40

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WINTER WHEAT

GRAIN TONNES/HECTARE

	N	80	120	160	200
MANURE	PREVCROP				
(D)P2N	WHEAT	8.39	8.73	9.63	10.02
	BARLEY	8.97	8.83	8.25	8.74
	POTATOES	9.78	8.97	10.24	9.68
	GRASS	7.55	7.85	7.47	8.34
BN N	WHEAT	8.38	8.63	9.02	9.90
	BARLEY	7.26	8.60	8.56	8.17
	POTATOES	8.86	8.69	8.64	8.85
	GRASS	6.92	5.95	6.04	6.01
(N)P2N	WHEAT	8.01	8.36	9.31	9.78
	BARLEY	8.06	8.26	7.99	8.24
	POTATOES	8.55	9.58	9.28	8.98
	GRASS	6.98	5.85	5.56	5.38
(P)P1N	WHEAT	8.30	8.87	8.58	10.22
	BARLEY	7.82	9.48	8.93	8.07
	POTATOES	8.77	9.23	8.71	8.54
	GRASS	6.45	6.50	5.39	7.52
(K)P2KN	WHEAT	8.41	9.27	9.05	10.07
	BARLEY	7.50	8.45	8.95	8.76
	POTATOES	9.28	9.65	10.07	9.95
	GRASS	8.70	8.12	8.39	7.90
(-)P2N	WHEAT	8.27	9.36	9.68	9.65
	BARLEY	7.45	8.50	8.30	8.31
	POTATOES	9.14	9.63	9.65	9.56
	GRASS	6.74	6.35	6.75	5.36
(PK)P1KN	WHEAT	7.70	9.28	9.95	9.85
	BARLEY	7.49	7.90	8.70	8.71
	POTATOES	9.33	9.31	9.60	9.28
	GRASS	8.24	8.28	8.67	7.22
(NK)P2KN	WHEAT	8.73	8.82	9.61	9.22
	BARLEY	8.25	8.07	8.50	8.98
	POTATOES	9.29	9.78	10.79	9.78
	GRASS	7.93	7.89	7.54	7.67
(NP)P1N	WHEAT	7.91	9.11	9.43	9.25
	BARLEY	7.98	8.11	8.16	8.63
	POTATOES	9.02	9.53	8.95	8.84
	GRASS	5.33	6.12	6.07	5.51
(NPK)P1KN	WHEAT	8.67	5.40	9.00	8.11
	BARLEY	7.60	8.84	8.71	8.16
	POTATOES	9.31	7.91	9.10	9.85
	GRASS	7.93	7.30	6.80	8.15

GRAIN MEAN DM% 83.2

SUB PLOT AREA HARVESTED 0.00079

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WINTER WHEAT

GRAIN TONNES/HECTARE

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

TREATMNT	CNVNTIAL	SUBDUG	SUBDUG+F	MEAN	
MANURE					
(D)P2N	10.28	10.14	10.33	10.25	
BN N	9.32	9.70	9.86	9.63	
(N)P2N	10.08	9.91	10.00	10.00	
(P)P1N	9.97	9.71	10.20	9.96	
(K)P2KN	9.62	9.38	9.37	9.46	
(-)P2N	10.13	10.06	10.14	10.11	
(PK)P1KN	9.77	9.69	9.75	9.74	
(NK)P2KN	10.02	9.82	10.06	9.97	
(NP)P1N	9.56	9.40	9.46	9.47	
(NPK)P1KN	9.64	10.07	10.04	9.92	
MEAN	9.84	9.79	9.92	9.85	
N	80	120	160	200	MEAN
MANURE					
(D)P2N	9.48	10.00	10.53	10.98	10.25
BN N	8.64	9.67	10.41	9.79	9.63
(N)P2N	9.15	10.07	10.00	10.77	10.00
(P)P1N	8.94	9.59	10.35	10.98	9.96
(K)P2KN	8.80	8.79	9.63	10.61	9.46
(-)P2N	9.12	9.81	10.51	11.00	10.11
(PK)P1KN	8.48	9.60	10.25	10.63	9.74
(NK)P2KN	8.37	9.92	10.37	11.20	9.97
(NP)P1N	8.18	9.63	9.79	10.28	9.47
(NPK)P1KN	9.02	9.56	9.95	11.15	9.92
MEAN	8.82	9.66	10.18	10.74	9.85
N	80	120	160	200	MEAN
TREATMNT					
CNVNTIAL	8.92	9.82	10.06	10.56	9.84
SUBDUG	8.79	9.46	9.93	10.96	9.79
SUBDUG+F	8.74	9.71	10.54	10.70	9.92
MEAN	8.82	9.66	10.18	10.74	9.85



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WINTER WHEAT

GRAIN TONNES/HECTARE

		N	80	120	160	200
MANURE	TREATMNT					
(D)P2N	CNVNTIAL		9.57	10.25	10.52	10.78
	SUBDUG		9.26	9.61	10.08	11.59
	SUBDUG+F		9.61	10.15	10.99	10.57
BN N	CNVNTIAL		8.61	9.81	10.47	8.39
	SUBDUG		8.72	9.50	10.08	10.50
	SUBDUG+F		8.59	9.71	10.67	10.49
(N)P2N	CNVNTIAL		9.70	10.15	9.61	10.87
	SUBDUG		9.31	9.75	9.50	11.06
	SUBDUG+F		8.43	10.30	10.89	10.38
(P)P1N	CNVNTIAL		9.21	9.45	9.96	11.26
	SUBDUG		8.14	9.51	10.37	10.83
	SUBDUG+F		9.46	9.80	10.71	10.84
(K)P2KN	CNVNTIAL		9.28	9.12	9.71	10.37
	SUBDUG		8.50	8.65	9.61	10.74
	SUBDUG+F		8.61	8.58	9.57	10.72
(-)P2N	CNVNTIAL		9.07	10.15	10.50	10.79
	SUBDUG		9.12	9.75	10.67	10.69
	SUBDUG+F		9.16	9.52	10.36	11.51
(PK)P1KN	CNVNTIAL		8.31	9.76	10.52	10.50
	SUBDUG		8.16	9.73	10.47	10.41
	SUBDUG+F		8.97	9.31	9.75	10.97
(NK)P2KN	CNVNTIAL		8.47	10.08	10.17	11.35
	SUBDUG		8.42	9.81	9.98	11.10
	SUBDUG+F		8.23	9.88	10.97	11.16
(NP)P1N	CNVNTIAL		8.00	10.25	9.90	10.08
	SUBDUG		8.99	8.63	8.81	11.17
	SUBDUG+F		7.55	10.02	10.67	9.59
(NPK)P1KN	CNVNTIAL		8.98	9.16	9.26	11.16
	SUBDUG		9.31	9.68	9.78	11.51
	SUBDUG+F		8.77	9.83	10.82	10.77

GRAIN MEAN DM% 84.4

SUB PLOT AREA HARVESTED 0.00082