ROTHAMSTED RESEARCH

Yields of the Field Experiments 1980

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80/S/RN/1 Rotation I

Rothamsted Research

Rothamsted Research (1981) *80/S/RN/1 Rotation I ;* Yields Of The Field Experiments 1980, pp 35 - 41 **- DOI: https://doi.org/10.23637/ERADOC-1-31**

80/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, s. barley and potatoes.

For previous years see 'Details' 1967 & 1973, and 74-79/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 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. Remaining treatments to grass in 1980 were:

TREATMENT 1899-1965	OLDTREAT Grass 1966-79	NEWTREAT Grass 1966-80
	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 P205 as single superphosphate. Since 1966 50 kg P205 as triple superphosphate
P1,P2: 50, 100 kg P205 as triple superphosphate
K: 1899-1965 63 kg K20 as muriate of potash. Since 1966 - 126 kg K20 (75 kg K20 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 since 1977 are divided into three for three phases of the four-course rotation w. barley, potatoes, beans, w. wheat. Whole plot treatments are continued as for NEWTREAT grass except w. beans are not 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 (on w. wheat, w. barley and potatoes in 1980):-

1. MANURE

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

Symbols as above except N = 94 kg (including 31 kg at sowing) to w. wheat and w. barley; 251 kg to potatoes.

2. POTASH — Additional potash fertiliser, as muriate of potash (kg K20):

w. wheat w. barley	Potatoes
0	0
63	251

The pair of blocks testing subsoiling (in s. barley 1980) had all combinations of:

1. MANURE (as for arable crops above, N as for w. wheat above) and:

2. TREATMNT

CNVNTIAL	Conventional, mouldboard ploughed on 30 May, 1979
SUBDUG	Subsoil dug by Wye double digger on 24 May.
SUBDUG+F	Subsoil dug by Wye double digger on 24 May incorporating P at 374 kg and K at 712 kg (as 0:20:20) into the subsoil at the time of working

NOTE: W. wheat was sown on the subsoiling test section but was severely damaged by wheat bulb fly. The area was rotary cultivated in April and s. barley was sown.

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Standard applications:
Arable test crop section:
W. wheat and w. barley: Weedkillers: Isoproturon at 2.7 kg in 280 l. Ioxynil at 0.63 kg and mecoprop at 1.9 kg in 220 l.
W. wheat only: Fungicides: Carbendazim (as 'Bavistin' at 0.50 kg) in 280 l applied with the tridemorph. Tridemorph at 0.53 kg. Carbendazim at 0.25 kg with zineb at 1.6 kg applied in 220 l with the insecticide. Insecticide: Dimethoate at 0.34 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 applied six times, with the insecticide on the first and third occasion. Insecticide: Pirimicarb at 0.14 kg.
Subsoiling test section:
W. wheat: Manures: N at 52 kg to seedbed and at 75 kg in spring, as 'Nitro-Chalk'. Weedkillers: Ioxynil at 0.63 kg and mecoprop at 1.9 kg in 220 l. Fungicide: Tridemorph at 0.53 kg in 220 l applied with the pirimicarb. Insecticides: Dimethoate at 0.68 l in 220 l. Pirimicarb at 0.14 kg.

Seed: W. wheat: Hustler, sown at 200 kg.
W. barley: Sonja, sown at 180 kg.
S. barley: Goldmarker, sown at 180 kg.
Potatoes: Pentland Crown.

Cultivations, etc.:-
Grass section: P & K applied: 12 Feb, 1980. Bone meal and N applied: 25 Mar. Cut: 5 June, 4 Aug. N applied: 17 June.
Arable test crop section:
All crops: P and bone meal applied: 30 Aug, 1979.
W. wheat and w. barley: K applied: 30 Aug, 1979. Seed sown and N applied: 26 Sept. Isoproturon applied: 27 Sept. Ioxynil and mecoprop applied: 25 Mar, 1980. N applied: 31 Mar. Carbendazim and tridemorph applied to w. wheat only: 24 Apr. Carbendazim, zineb, and dimethoate applied to w. wheat only: 18 June. W. barley combine harvested: 29 July. W. wheat combine harvested: 20 Aug.
Potatoes: K applied: 10 Apr, 1980. N applied, potatoes planted: 23 Apr. Weedkillers applied: 29 May. Fungicide applied: 18 June, 25 June, 8 July, 24 July, 20 Aug, 5 Sept. Insecticide applied: 18 June, 8 July. Potatoes lifted: 25 Sept.
Subsoiling test section: Conventional P & K treatment applied: 29 Aug, 1979. Bone meal applied: 30 Aug. W. wheat sown and first N applied: 26 Sept. Weedkiller applied: 31 Mar, 1980. Second N applied: 10 Apr. W. wheat rotary cultivated, s. barley sown: 24 Apr. Dimethoate applied: 29 May. Pirimicarb and tridemorph applied: 25 June. Combine harvested: 14 Sept.

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GRASS

DRY MATTER TONNES/HECTARE

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

MANURE	1ST CUT(5/6/80)	2ND CUT(4/8/80)	TOTAL OF 2 CUTS
(D)N	6.50	3.91	10.41
BN	6.07	3.73	9.80
(N)P2N	6.49	3.76	10.25
(P)P1N	6.35	4.08	10.43
(K)P2KN	7.07	4.28	11.35
(-)P2N	6.33	4.22	10.56
(PK)P1KN	7.12	4.32	11.44
(NK)P2KN	6.88	4.54	11.42
(NP)P1N	6.15	3.71	9.86
(NPK)P1KN	6.78	4.27	11.05
MEAN	6.57	4.08	10.66
MEAN DM%	31.8	26.1	28.9

PLOT AREA HARVESTED 0.00095

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WINTER WHEAT

GRAIN TONNES/HECTARE

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

POTASH MANURE	0	63	MEAN
(D)P2N	10.64	10.52	10.58
BN	10.03	9.83	9.93
(N)P2N	10.49	9.78	10.13
(P)P1N	9.60	9.70	9.65
(K)P2KN	9.93	10.45	10.19
(-)P2N	10.12	9.75	9.94
(PK)P1KN	9.90	9.96	9.93
(NK)P2KN	9.78	9.93	9.85
(NP)P1N	9.13	9.20	9.17
(NPK)P1KN	9.06	9.26	9.16
MEAN	9.87	9.84	9.85

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

TABLE	POTASH	MANURE* POTASH
SED	0.150	0.475

* WITHIN THE SAME LEVEL OF MANURE ONLY

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

STRATUM	DF	SE	CV%
BLOCK.WP	9	0.182	1.8
BLOCK.WP.SP	10	0.475	4.8

GRAIN MEAN DM% 85.5

STRAW TONNES/HECTARE

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

POTASH MANURE	0	63	MEAN
(D)P2N	6.04	5.71	5.88
BN	4.13	3.97	4.05
(N)P2N	4.96	4.85	4.91
(P)P1N	3.95	5.09	4.52
(K)P2KN	4.20	5.37	4.78
(-)P2N	4.36	4.41	4.38
(PK)P1KN	5.15	4.59	4.87
(NK)P2KN	5.68	4.65	5.17
(NP)P1N	4.21	3.82	4.01
(NPK)P1KN	3.34	4.66	4.00
MEAN	4.60	4.71	4.66

STRAW MEAN DM% 59.9 SUB PLOT AREA HARVESTED 0.00075

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SPRING BARLEY

GRAIN TONNES/HECTARE

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

POTASH / MANURE	0	63	MEAN
(D)P2N	9.12	9.35	9.23
BN	8.95	8.39	8.67
(N)P2N	8.70	9.19	8.95
(P)P1N	8.81	8.60	8.70
(K)P2KN	8.46	8.92	8.69
(-)P2N	8.44	8.13	8.29
(PK)P1KN	8.65	8.56	8.61
(NK)P2KN	8.77	8.61	8.69
(NP)P1N	8.59	8.47	8.53
(NPK)P1KN	8.24	8.54	8.39
MEAN	8.67	8.68	8.68

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

TABLE	POTASH	MANURE* POTASH
SED	0.132	0.419

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

STRATUM	DF	SE	CV%
BLOCK.WP	9	0.210	2.4
BLOCK.WP.SP	10	0.419	4.8

GRAIN MEAN DM% 80.2

STRAW TONNES/HECTARE

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

POTASH / MANURE	0	63	MEAN
(D)P2N	6.45	6.52	6.49
BN	5.59	5.71	5.65
(N)P2N	4.97	5.11	5.04
(P)P1N	4.85	4.96	4.90
(K)P2KN	5.49	5.32	5.40
(-)P2N	4.64	5.09	4.86
(PK)P1KN	5.32	5.43	5.37
(NK)P2KN	6.09	5.15	5.62
(NP)P1N	4.91	4.58	4.74
(NPK)P1KN	5.11	5.30	5.20
MEAN	5.34	5.32	5.33

STRAW MEAN DM% 51.3 SUB PLOT AREA HARVESTED 0.00075

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POTATOES

TOTAL TUBERS TONNES/HECTARE

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

POTASH MANURE	0	251	MEAN
(D)P2N	39.9	44.8	42.4
BN	27.9	34.6	31.2
(N)P2N	25.8	36.0	30.9
(P)P1N	27.0	36.0	31.5
(K)P2KN	39.8	35.8	37.8
(-)P2N	33.7	38.5	36.1
(PK)P1KN	43.9	40.6	42.2
(NK)P2KN	39.7	40.7	40.2
(NP)P1N	25.9	36.5	31.2
(NPK)P1KN	40.2	41.7	40.9
MEAN	34.4	38.5	36.5

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

TABLE	POTASH	MANURE* POTASH
SED	1.30	4.11

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

STRATUM	DF	SE	CV%
BLOCK.WP	9	2.82	7.7
BLOCK.WP.SP	10	4.11	11.3

PLOT AREA HARVESTED 0.00069

WINTER WHEAT

GRAIN TONNES/HECTARE

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

TREATMNT MANURE	CNVNTIAL	SUBDUG	SUBDUG+F	MEAN
(D)P2N	4.82	5.09	4.88	4.93
BN	3.98	3.97	4.32	4.09
(N)P2N	3.83	4.26	4.22	4.11
(P)P1N	3.35	3.79	3.83	3.66
(K)P2KN	3.64	3.63	3.69	3.66
(-)P2N	4.00	3.86	3.88	3.92
(PK)P1KN	3.60	3.65	3.69	3.65
(NK)P2KN	3.80	3.82	3.97	3.86
(NP)P1N	3.92	3.84	4.08	3.95
(NPK)P1KN	3.82	4.00	4.05	3.96
MEAN	3.88	3.99	4.06	3.98

GRAIN MEAN DM% 83.9 SUB PLOT AREA HARVESTED 0.00230

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