ROTHAMSTED RESEARCH

Yields of the Field Experiments 1989

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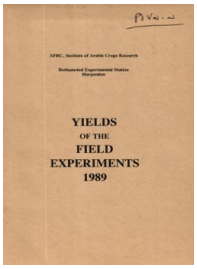

Experiments - Classicals

Rothamsted Research

Rothamsted Research (1990) *Experiments - Classicals ;* Yields Of The Field Experiments 1989, pp 9 - 33 **- DOI: https://doi.org/10.23637/ERADOC-1-40**

89/R/BK/1

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. Since 1985 part of the second rotation has been added to the first to extend the rotation to fallow, potatoes, w. wheat, w. wheat, w. wheat.

The 146th year, w. wheat, fallow, potatoes.

For previous years see 'Details' 1967 and 1973, Station Report for 1966, pp. 229-231, Station Report for 1968, Part 2, and 74-88/R/BK/1.

Areas harvested:

	Section	
Wheat:	0	0.00311
	1	0.00572
	2,3,5 and 6	0.00473
	8 and 9	0.00497
Potatoes:	7	0.00348

Treatments:

Whole plots

PLOT	Plot	Fertilizers and organic manures:- Treatments until 1967	Treatments from 1968	Treatments from 1985
01DN4PK	01	-	D N2 P K	D N4 P K
21DN2	21	D	D N2	D N2
22D	22	D	D	D
030	03	None	None	None
05F	05	P K Na Mg	P K (Na) Mg	PK Mg
06N1F	06	N1 P K Na Mg	N1 P K (Na) Mg	N1 P K Mg
07N2F	07	N2 P K Na Mg	N2 P K (Na) Mg	N2 P K Mg
08N3F	08	N3 P K Na Mg	N3 P K (Na) Mg	N3 P K Mg
09N4F	09	N*1 P K Na Mg	N4 P K (Na) Mg	N4 P K Mg
10N2	10	N2	N2	N2
11N2P	11	N2 P	N2 P	N2 P
12N2PNA	12	N2 P Na	N2 P Na	N2 P Na
13N2PK	13	N2 P K	N2 P K	N2 P K
14N2PKMG	14	N2 P Mg	N2 P K Mg	N2 P K Mg
15N5F	15	N2 P K Na Mg	N3 P K (Na) Mg	N5 P K Mg
16N6F	16	N*2 P K Na Mg	N2 P K (Na) Mg	N6 P K Mg
17N0+3FH	17	N2(A)	N2 1/2(P K (Na) Mg)	N0+3 1/2(PK Mg)+
18N1+3FH	18	P K Na Mg(A)	N2 1/2(P K (Na) Mg)	N1+3 1/2(PK Mg)+
19C	19	C	C	C
20NKMG	20	N2 K Na Mg	N2 K (Na) Mg	N2 K Mg

(A) Alternating

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\+ This change since 1980. Treatments shown are those to w. wheat; autumn N alternates. Potatoes receive N3 1/2 (PK Mg) on both Plots 17 and 18.

N1,N2,N3,N4,N5,N6: 48, 96, 144, 192, 240, 288 kg N (as sulphate of ammonia until 1967, except N* which was nitrate of soda. All as 'Nitro-Chalk' in spring from 1968 to 1985, as 'Nitram' since 1986.)

N0+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 until 1987, triple superphosphate in 1974 and since 1988

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 until 1988, none since

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:-

				70,	71,	72,										
				73,	74,	75,										
				and	and	and										
SECTION	Section	68	69	76	77	78	79	80	81	82	83	84	85	86	87	88	89
0/38B	0*	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
1/23B	1	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
2/1B	2	BE	W	P	BE	W	F	P	W	F	P	W	W	W	F	P	W
2/1S	2	BE	W	P	BE	W	F	P	W	F	P	W	W	W	F	P	W
3/2B	3	W	W	F	W	W	F	W	W	W	W	W	W	F	P	W	W
-	4	W	P	BE	W	P	P	W	F	P	W	F	P	W	W	W	F
5/3B	5	W	F	W	W	F	W	W	W	W	W	W	F	P	W	W	W
6/12B	6**	F	W	W	F	W	W	W	W	W	W	W	W	W	W	W	W
6/12S	6**	F	W	W	F	W	W	W	W	W	W	W	W	W	W	W	W
POTATOES	7	P	BE	W	P	BE	W	F	P	W	F	P	W	W	W	F	P
8/1B	8+	W	W	W	W	W	W	W	F	W	W	W	W	W	W	F	W
9/31B	9	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
9/31S	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

* Straw incorporated since 1987. ** No sprays except weedkillers since 1985. + No weedkillers.

B = Brimstone, S = Squareheads Master

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89/R/BK/1

NOTES: (1) For a fuller record of treatments see 'Details' etc.
(2) From autumn 1975 to autumn 1986, chalk was applied at 2.9 t each autumn to all plots in sets of Sections on a three-year cycle. Year 1: Sections 1,2,3. Year 2: Sections 6,7,8,9. Year 3: Sections 0,4,5. Since autumn 1988 a five-year cycle has been used. Year 1: Sections 1,3. Year 2: Sections 2,8. Year 3: Sections 7,9. Year 4: Sections 4,6. Year 5: Sections 0,5.

Standard applications:

W. wheat: Manures: Chalk at 2.9 t (to sections 1 and 3 only). Weedkillers: Glyphosate at 1.4 kg in 200 l (except to sections 2 and 8). Isoproturon at 2.5 kg in 200 l (except to section 8). Mecoprop at 2.2 kg, bromoxynil at 0.28 kg and ioxynil at 0.28 kg with isoproturon at 2.1 kg in 200 l (except to section 8). Fungicides (except to section 6): Prochloraz at 0.40 kg and carbendazim at 0.15 kg applied with the growth regulator in 200 l. Fenpropimorph at 0.56 kg with chlorothalonil at 0.75 kg in 200 l. Propiconazole at 0.12 kg with carbendazim at 0.25 kg and maneb at 1.6 kg in 200 l. Growth regulator (except to section 6): Chlormequat chloride at 1.6 kg.

Potatoes: Weedkiller: Metribuzin at 1.0 kg in 300 l. Fungicides: Mancozeb at 1.4 kg in 200 l on three occasions and at 1.0 kg in 200 l on a fourth occasion. Fentin hydroxide at 0.27 kg in 260 l.

Fallow: Weedkiller: Glyphosate at 1.4 kg in 200 l.

Seed: W. wheat: Brimstone, dressed fonofos, and Squareheads Master both sown at 180 kg.
Potatoes: Pentland Crown.

Cultivations, etc.:-

All Sections:
P applied to plots 17 and 18: 26 Sept, 1988. P applied to remaining plots: 7 Oct. K, Na and Mg applied: 5 Oct. FYM applied, ploughed: 14 Oct. Rotary harrowed: 24 Oct.

Cropped Sections:
W. wheat: Straw chopped (section 0): 9 Sept, 1988. Glyphosate applied (except to sections 2 and 8): 20 Sept. Autumn N treatments applied: 7 Oct. Chalk applied (sections 1 and 3): 11 Oct. Rotary harrowed, Brimstone seed sown: 26 Oct. Rotary harrowed, Squareheads Master seed sown: 27 Oct. Isoproturon applied (except to section 8): 15 Nov. Spring N treatments applied: 18 Apr, 1989. Prochloraz and carbendazim with the growth regulator applied (except to section 6): 19 Apr. Mecoprop, bromoxynil, ioxynil with isoproturon applied (except to section 8): 5 May. Fenpropimorph with chlorothalonil applied (except to section 6): 31 May. Propiconazole with carbendazim and maneb applied (except to section 6): 20 June. Combine harvested Brimstone: 7 Aug and Squareheads Master: 8 Aug.

Potatoes: Deep-tine cultivated: 29 Mar, 1989. N treatments applied: 18 Apr. Rotary harrowed, potatoes planted: 24 Apr. Rotary ridged: 25 May. Weedkiller applied: 31 May. Mancozeb applied: 3 July, 17 July, 28 July and 14 Aug. Fentin hydroxide applied: 30 Aug. Haulm mechanically destroyed: 5 Sept. Lifted: 12 Sept.

Fallow: Glyphosate applied: 20 Sept, 1988. Rotary cultivated: 9 May, 1989 and 19 June. Cultivated with thistle bar: 12 July.

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89/R/BK/1 W. WHEAT

GRAIN TONNES/HECTARE

***** Tables of means *****

SECTION PLOT	2/1B	2/1S	8/1B	3/2B	5/3B	6/12B	6/12S	1/23B	9/31B	9/31S	0/38B
01DN4PK	8.66	*	*	7.54	6.57	7.36	*	*	*	*	*
21DN2	7.94	*	5.06	7.24	7.23	7.37	*	7.54	7.56	*	5.63
22D	6.81	*	7.16	4.96	5.02	5.21	*	5.90	6.62	*	4.70
030	3.04	1.74	1.54	0.66	0.83	0.97	0.93	0.90	0.74	0.95	0.90
05F	2.86	1.66	3.00	0.95	0.99	1.31	0.82	1.12	1.62	1.25	0.90
06N1F	5.46	3.17	4.21	3.16	2.56	3.27	1.79	2.34	3.48	2.38	3.11
07N2F	6.21	3.71	4.58	4.27	3.73	4.52	2.58	4.40	4.31	3.01	3.53
08N3F	7.45	3.92	4.73	5.24	5.15	5.28	2.82	4.06	5.07	3.25	4.16
09N4F	7.10	4.06	5.43	5.41	4.47	5.03	3.33	4.55	4.70	3.50	4.02
10N2	3.95	3.28	1.43	1.63	3.16	2.49	2.15	2.48	2.16	2.03	1.62
11N2P	4.77	3.29	1.36	2.68	2.54	2.00	2.24	2.58	1.98	2.87	2.57
12N2PNA	5.04	3.58	2.37	3.49	3.46	3.29	2.08	3.10	3.68	3.16	2.75
13N2PK	5.59	3.61	2.78	3.63	3.87	3.15	2.48	4.67	5.06	3.17	3.17
14N2PKMG	6.13	3.54	4.13	4.19	3.93	3.63	2.24	4.65	4.82	3.29	3.49
15N5F	6.36	3.75	4.73	5.97	4.90	5.37	3.21	5.85	5.53	3.12	3.89
16N6F	7.13	3.65	5.95	6.42	5.07	5.97	3.12	4.63	5.82	3.29	1.98
17N0+3FN	6.83	3.78	4.66	4.49	4.34	5.11	3.18	3.32	5.45	3.51	2.26
18N1+3FN	7.19	3.93	5.16	5.56	5.59	5.76	3.32	3.69	5.24	3.44	2.94
19C	3.66	2.83	3.68	1.24	2.26	1.56	1.48	1.92	1.33	1.44	1.97
20NKMG	*	*	*	*	*	*	*	2.42	*	*	2.53

GRAIN MEAN DM% 88.9

STRAW TONNES/HECTARE

***** Tables of means *****

SECTION PLOT	2/1B	2/1S	1/23B
01DN4PK	3.70	*	*
21DN2	2.84	*	2.90
22D	1.75	*	2.31
030	0.57	1.28	0.30
05F	0.47	0.93	0.30
06N1F	1.29	3.14	0.80
07N2F	1.41	3.84	1.00
08N3F	1.63	5.13	0.94
09N4F	0.93	5.61	1.46
10N2	0.56	3.26	1.10
11N2P	0.90	2.58	0.92
12N2PNA	0.45	3.48	0.84
13N2PK	1.46	4.35	0.93
14N2PKMG	1.23	3.45	1.02
15N5F	1.75	4.48	1.30
16N6F	1.64	5.49	1.11
17N0+3FN	1.91	4.60	0.55
18N1+3FN	1.57	5.15	1.08
19C	0.56	1.58	0.71
20NKMG	*	*	0.74

STRAW MEAN DM% 89.7

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89/R/BK/1 POTATOES

***** Tables of means *****

PLOT	TOTAL TUBERS TONNES/ HECTARE	% WARE 3.81 CM (1.5 INCH) RIDDLE
01DN4PK	21.5	91.0
21DN2	25.6	95.6
22D	23.9	95.4
030	7.2	88.4
05F	6.4	78.9
06N1F	12.3	90.4
07N2F	16.8	94.6
08N3F	20.2	93.0
09N4F	18.4	92.5
10N2	5.6	80.3
11N2P	6.4	74.1
12N2PNA	7.9	80.8
13N2PK	14.0	92.0
14N2PKMG	18.4	92.2
15N5F	17.7	92.7
16N6F	20.8	91.6
17N3FH	14.2	91.9
18N3FH	16.4	92.7
19C	12.0	89.9

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89/R/HB/2

HOOS BARLEY

Object: To study the effects of organic and inorganic manures on continuous s. barley. From 1968 to 1978 a rotation of potatoes, beans and s. barley was practised. The rotation was discontinued in 1979 and the experiment reverted to continuous s. barley.

The 138th year, s. barley.

For previous years see 'Details' 1967 and 1973, Station Report for 1966 and 74-88/R/HB/2.

Treatments: All combinations of:-

1. **MANURE** Fertilizers and organic manures:

	Form of N 1852-1966	Additional treatments 1852-1979	Changes since 1980
---	None	-	-
-P-	None	P	-
--K	None	K(Na)Mg	-
-PK	None	PK(Na)Mg	-
A--	A	-	-
AP-	A	P	-
A-K	A	K(Na)Mg	-
APK	A	PK(Na)Mg	-
N----	N	-	-
NP---	N	P	-
N-K--	N	K(Na)Mg	-
NPK--	N	PK(Na)Mg	-
N--S-	N	Si	Si omitted
NP-S-	N	P Si	"
N-KS-	N	K(Na)MgSi	"
NPKS-	N	PK(Na)MgSi	"
N---S	N	-	Si added
NP--S	N	P	"
N-K-S	N	K(Na)Mg	"
NPK-S	N	PK(Na)Mg	"
N--SS	N	Si	-
NP-SS	N	P Si	-
N-KSS	N	K(Na)MgSi	-
NPKSS	N	PK(Na)MgSi	-
C(--)	C	-	PKMg omitted
C(P-)	C	P	"
C(-K)	C	K(Na)Mg	"
C(PK)	C	PK(Na)Mg	"
D	None	D	-
(D)	(D)	-	-
(A)	(Ashes)	-	-
-	None	-	-

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89/R/HB/2

Form of N: A, sulphate of ammonia: N, nitrate of soda - each to supply 48 kg N: C, castor meal to supply 96 kg N
P: 35 kg P as single superphosphate (triple superphosphate in 1974 and 1988)
K: 90 kg K as sulphate of potash
(Na): 16 kg Na as sulphate of soda until 1973
Mg: 35 kg Mg, as kieserite every third year since 1974 (sulphate of magnesia annually until 1973)
Si: Silicate of soda at 450 kg
D: Farmyard manure at 35 tonnes. (D): until 1871 only
(Ashes): Weed ash 1852-1916, furnace ash 1917-1932, none since

2. **N** Nitrogen fertilizer (kg N), as 'Nitro-Chalk', since 1968 (cumulative N applications until 1973, on a cyclic system since 1974):

0
48
96
144

Plus extra plots testing all combinations of:-

1. **MANURE** Fertilizers other than magnesium:

551AN2PK	Plot 551 AN2PK
561--PK	Plot 561 --PK
571NN2--	Plot 571 NN2
581NN2--	Plot 581 NN2

N2: 96 kg N as 'Nitro-Chalk' since 1968. Other symbols as above.

2. **MGNESIUM** Magnesium fertilizer (kg Mg) as kieserite every third year since 1974:

0
35

NOTE: For a fuller record see 'Details' etc.

Basal applications: Manures: Chalk at 2.5 t. Weedkillers: Glyphosate at 1.4 kg in 200 l. Mecoprop at 1.6 kg with ioxynil at 0.20 kg and bromoxynil at 0.20 kg in 200 l. Fungicides: Propiconazole at 0.12 kg with fenpropimorph at 0.75 kg in 200 l.

Seed: Triumph, seed dressed flutriafol, ethirimol and thiabendazole, sown at 160 kg.

Cultivations, etc.:- Glyphosate applied: 2 Oct, 1988. Chalk applied: 28 Nov. Silicate of soda applied: 7 Dec. Mg and K applied: 8 Dec. P applied: 9 Dec. FYM applied, ploughed: 13 Dec. Spring-tine cultivated twice, seed sown: 7 Feb, 1989. N applied: 31 Mar. Remaining weedkillers applied: 9 May. Fungicides applied: 9 June. Combine harvested: 1 Aug.

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89/R/HB/2

MAIN PLOTS

GRAIN TONNES/HECTARE

***** Tables of means *****

N	0	48	96	144	Mean
MANURE					
---	0.21	0.60	0.24	1.18	0.56
-P-	1.27	2.73	2.23	2.75	2.25
--K	0.25	0.35	0.78	1.20	0.64
-PK	1.77	3.01	3.90	3.03	2.93
A--	0.18	1.06	0.89	0.63	0.69
AP-	1.40	1.38	1.46	1.73	1.49
A-K	0.45	0.92	1.09	0.91	0.84
APK	1.82	2.94	4.90	3.48	3.28
N----	0.45	1.09	1.15	1.02	0.93
NP---	1.73	2.11	2.69	2.70	2.31
N-K--	0.19	0.81	1.08	1.93	1.00
NPK--	2.02	3.12	3.59	3.48	3.05
N--S-	1.01	0.57	0.63	1.02	0.81
NP-S-	1.53	2.70	2.75	2.69	2.42
N-KS-	0.95	1.79	2.18	1.64	1.64
NPKS-	2.00	3.41	4.62	3.95	3.50
N---S	0.89	1.53	1.15	1.15	1.18
NP--S	1.54	2.35	2.63	3.07	2.40
N-K-S	1.14	1.81	1.33	1.83	1.53
NPK-S	1.92	2.58	4.36	3.23	3.02
N--SS	0.45	1.34	1.15	1.40	1.08
NP-SS	1.27	2.75	2.04	3.65	2.43
N-KSS	1.46	1.51	2.02	2.09	1.77
NPKSS	1.48	3.32	3.94	3.55	3.07
C(--)	1.10	1.77	1.94	2.01	1.71
C(P-)	1.48	2.27	2.77	2.87	2.35
C(-K)	1.28	2.19	2.29	2.66	2.11
C(PK)	1.70	2.99	3.42	3.55	2.91
D	4.60	4.56	4.91	4.56	4.66
(D)	1.23	1.98	1.76	3.23	2.05
(A)	0.91	1.10	1.52	1.28	1.20
-	0.66	1.08	0.90	0.94	0.90
Mean	1.26	1.99	2.26	2.33	1.96

GRAIN MEAN DM% 84.0

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89/R/HB/2

MAIN PLOTS

STRAW TONNES/HECTARE

***** Tables of means *****

N	0	48	96	144	Mean
MANURE					
---	0.07	0.22	0.11	0.39	0.20
-P-	0.41	0.66	0.62	0.65	0.59
--K	0.11	0.07	0.21	0.42	0.20
-PK	0.39	0.76	1.23	1.06	0.86
A--	0.07	0.26	0.26	0.26	0.21
AP-	0.37	0.55	0.45	0.48	0.46
A-K	0.21	0.31	0.33	0.37	0.31
APK	0.54	0.98	1.50	1.51	1.13
D	1.78	2.00	2.32	2.14	2.06
(D)	0.29	0.61	0.53	1.16	0.65
(A)	0.28	0.34	0.45	0.44	0.38
-	0.19	0.33	0.29	0.33	0.28
Mean	0.39	0.59	0.69	0.77	0.53

STRAW MEAN DM% 85.5

PLOT AREA HARVESTED 0.00154

EXTRA PLOTS

GRAIN TONNES/HECTARE

***** Tables of means *****

MANURE	551AN2PK	561--PK	571NN2--	581NN2--	Mean
MGNESIUM					
0	3.54	0.27	2.01	0.75	1.64
35	4.42	0.30	1.60	0.95	1.82
Mean	3.98	0.28	1.81	0.85	1.73

GRAIN MEAN DM% 83.7

PLOT AREA HARVESTED 0.00329

https://doi.org/10.23637/ERADOC-1-40

89/R/WF/3

WHEAT AND FALLOW

Object: To study the effects of fallowing on unmanured w. wheat - Hoosfield.

The 134th year, w. wheat.

For previous years see 'Details' 1967, 1973 and 74-88/R/WF/3.

Whole plot dimensions: 9.60 x 211.

Treatments:
Each year there are two plots, one is sown to w. wheat, one is fallow; they alternate in successive years.

Seed: Brimstone, dressed fonofos, sown at 180 kg.

Cultivations, etc.:-
Wheat plot: Heavy spring-tine cultivated: 27 Oct, 1988. Seed sown: 28 Oct. Combine harvested: 9 Aug, 1989.
Fallow plot: Ploughed: 12 Dec, 1988. Rotary cultivated: 8 May, 1989. Cultivated with 'thistle bar': 31 July.

GRAIN AND STRAW TONNES/HECTARE

	GRAIN	STRAW
YIELD	1.91	0.69
MEAN DM%	87.8	86.9
PLOT AREA HARVESTED	0.016642	

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89/R/EX/4

EXHAUSTION LAND

Object: To study the residual effects of manures applied 1876-1901, and of additional phosphate applied since 1986, on the yield of continuous s. barley - Hoosfield.

The 134th year, s. barley.

For previous years see 'Details' 1967, 1973 and 74-88/R/EX/4.

Treatments: All combinations of:-

Whole plots

1. **OLD RES** — Residues of manures applied annually 1876-1901:

O	None
D	Farmyard manure at 35 tonnes
N	96 kg N as ammonium salts
P	34 kg P as superphosphate
NPKNAMG	N and P as above plus 137 kg K as sulphate of potash, 16 kg Na as sulphate of soda, 11 kg Mg as sulphate of magnesia

2. **P** — Phosphate applied annually from 1986 as superphosphate until 1987, triple superphosphate since:

O	None
P1	44 kg P
P2	87 kg P
P3	131 kg P

plus all combinations of:-

1. **OLD RES** — Residues of manures applied annually 1876-1901:

O	None
D	Farmyard manure at 35 tonnes
N*	96 kg N as nitrate of soda
PK	34 kg P as superphosphate, 137 kg K as sulphate of potash
N*PK	N, P and K as above

2. **N89** — Nitrogen fertilizer (kg N) as 'Nitro-Chalk' until 1985, as 'Nitram' since 1986 (basal until 1975, on a cyclic system since 1976):

0
48
96
144

NOTE: All plots of the combination OLD RES, P were given N at 144 kg as 'Nitram' and K at 83 kg as muriate of potash.

https://doi.org/10.23637/ERADOC-1-40 *pp 12*

89/R/EX/4

Basal applications: Weedkillers: Glyphosate at 1.4 kg in 200 l. Mecoprop at 1.6 kg with ioxynil at 0.20 kg and bromoxynil at 0.20 kg in 200 l. Fungicide: Propiconazole at 0.12 kg in 200 l.

Seed: Triumph, seed dressed flutriafol, ethirimol and thiabendazole, sown at 160 kg.

Cultivations, etc.:- Glyphosate applied: 19 Oct, 1988. P and K applied: 10 Nov. Ploughed: 14 Dec. Rotary harrowed, seed sown: 8 Feb, 1989. N applied: 8 May. Remaining weedkillers applied: 18 May. Fungicide applied: 9 June. Combine harvested: 16 Aug.

PHOSPHATE PLOTS

GRAIN TONNES/HECTARE

***** Tables of means *****

P	0	P1	P2	P3	Mean
OLD RES					
0	0.99	2.18	2.33	2.08	1.89
D	2.25	2.52	2.44	2.00	2.30
N	0.77	1.85	2.31	1.96	1.72
P	1.50	2.38	2.89	2.63	2.35
NPKNAMG	1.49	1.96	2.51	2.17	2.03
Mean	1.40	2.18	2.49	2.17	2.06

GRAIN MEAN DM% 83.8

STRAW TONNES/HECTARE

***** Tables of means *****

P	0	P1	P2	P3	Mean
OLD RES					
0	0.58	0.87	0.95	0.79	0.80
D	0.96	1.09	1.06	0.72	0.96
N	0.45	0.86	1.04	0.73	0.77
P	0.66	1.00	1.21	1.17	1.01
NPKNAMG	0.65	0.79	1.07	0.92	0.86
Mean	0.66	0.92	1.07	0.87	0.88

STRAW MEAN DM% 89.7

PLOT AREA HARVESTED 0.00728

https://doi.org/10.23637/ERADOC-1-40

89/R/EX/4

NITROGEN PLOTS

GRAIN TONNES/HECTARE

***** Tables of means *****

N89	0	48	96	144	Mean
OLD RES					
O	0.68	0.83	1.20	1.08	0.95
D	1.12	1.74	1.03	1.64	1.38
N*	0.58	0.66	1.13	0.58	0.74
PK	0.60	1.47	1.43	1.25	1.19
N*PK	0.63	1.19	1.02	1.20	1.01
Mean	0.72	1.18	1.16	1.15	1.05

GRAIN MEAN DM% 83.5

STRAW TONNES/HECTARE

***** Tables of means *****

N89	0	48	96	144	Mean
OLD RES					
O	0.37	0.44	0.44	0.37	0.41
D	0.43	0.65	0.44	0.65	0.54
N*	0.22	0.29	0.44	0.22	0.29
PK	0.43	0.48	0.45	0.51	0.47
N*PK	0.29	0.43	0.44	0.51	0.42
Mean	0.35	0.46	0.44	0.45	0.43

STRAW MEAN DM% 88.9

PLOT AREA HARVESTED 0.00728

https://doi.org/10.23637/ERADOC-1-40

89/R/PG/5

PARK GRASS

Object: To study the effects of organic and inorganic manures and lime on old grass (for hay).

The 134th year, hay.

For previous years see 'Details' 1967 and 1973 and 74-88/R/PG/5.

Treatments: Combinations of:-

Whole plots

1. **MANURE** Fertilizers and organic manures:

N1	Plot 1	N1
O(D)	Plot 2	None (D until 1863)
O/PLOT3	Plot 3	None
P	Plot 4-1	P
N2P	Plot 4-2	N2 P
N1MIN	Plot 6	N1 P K Na Mg
MIN	Plot 7	P K Na Mg
PNAMG	Plot 8	P Na Mg
N2MIN	Plot 9	N2 P K Na Mg
N2PNAMG	Plot 10	N2 P Na Mg
N3MIN	Plot 11-1	N3 P K Na Mg
N3MINSI	Plot 11-2	N3 P K Na Mg Si
O/PLOT12	Plot 12	None
D/F	Plot 13	D/F
N2*MIN	Plot 14	N2* P K Na Mg
MIN(N2*)	Plot 15	P K Na Mg (N2* until 1875)
N1*MIN	Plot 16	N1* P K Na Mg
N1*	Plot 17	N1*
N2KNAMG	Plot 18	N2 K Na Mg
D	Plot 19	D
D/N*PK	Plot 20	D/N*P K

N1, N2, N3:	48, 96, 144 kg N as sulphate of ammonia
N1*, N2*:	48, 96 kg N as nitrate of soda (30 kg N to Plot 20, only in years with no farmyard manure)
P:	35 kg P (15 kg P to Plot 20, only in years with no farmyard manure) as single superphosphate until 1986, triple superphosphate in 1974, and since 1987
K:	225 kg K (45 kg K to Plot 20, only in years with no farmyard manure) as sulphate of potash
Na:	15 kg Na as sulphate of soda
Mg:	10 kg Mg as sulphate of magnesia
Si:	Silicate of soda at 450 kg
D:	Farmyard manure at 35 tonnes every fourth year
F:	Fish meal every fourth year to supply 63 kg N
MIN:	P K Na Mg

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89/R/PG/5

Sub plots

2. **LIME** Liming:

A	a Ground chalk applied as necessary to achieve pH7
B	b Ground chalk applied as necessary to achieve pH6
C	c Ground chalk applied as necessary to achieve pH5
D	d None

NOTE: Lime was applied regularly, and at the same rate, to all a and b sub plots of Plots 1 to 17 (except 12) from 1924. Differential liming started in 1965 on certain b and c sub plots (except on Plot 12) and in 1976 on certain a sub plots (including Plot 12) and 12b.

Additional sub plots (Plots 18, 19 and 20 only) (tonnes $CaCO_3$ applied every fourth year 1920-1964):

N2KNAMG0	18-1	None
N2KNAMG2	18-2	13.5
N2KNAMG1	18-3	7.9
DO	19-1	None
D2	19-2	6.3
D1	19-3	1.1
D/N*PK0	20-1	None
D/N*PK2	20-2	5.6
D/N*PK1	20-3	1.1

Since 1965 Plot 18-1 has been split into two for treatments 'c' and 'd' above and Plot 18-3 split into two for treatments 'a' and 'b'. The remaining sub plots of Plots 18, 19 and 20 are treated as 'a'.

NOTE: For a fuller record of treatments see ' Details' etc.

Cultivations, etc.:- K, Na, Mg and Si applied: 7 Dec, 1988. P applied: 8 Dec. FYM applied: 14 Dec. N applied: 4 May, 1989. Cut: 12 June, 26 Sept.

https://doi.org/10.23637/ERADOC-1-40

89/R/PG/5

1ST CUT (12/6/89) DRY MATTER TONNES/HECTARE

***** Tables of means *****

LIME / MANURE	A	B	C	D	MEAN
N1	1.65	1.13	0.56	0.36	0.92
O(D)	1.79	2.06	0.83	0.65	1.33
O/PLOT3	1.52	1.86	0.43	0.60	1.10
P	2.54	2.76	1.44	1.64	2.10
N2P	1.22	1.24	1.24	0.85	1.14
N1MIN	3.76	3.83			3.80
MIN	4.38	4.51	3.45	3.15	3.87
PNAMG	1.94	2.25	1.79	2.01	2.00
N2MIN	3.49	3.81	2.25	1.51	2.77
N2PNAMG	1.74	1.64	1.26	0.87	1.38
N3MIN	3.76	3.28	2.53	2.45	3.01
N3MINSI	4.13	3.80	3.33	1.97	3.31
O/PLOT12	1.16	1.08	0.55	0.75	0.89
D/F	4.60	4.36	3.89	3.45	4.08
N2*MIN	4.72	5.08	4.41	4.34	4.64
MIN(N2*)	3.52	3.38	2.61	2.50	3.00
N1*MIN	4.56	4.59	2.83	3.16	3.79
N1*	2.51	2.64	1.85	1.69	2.17
N2KNAMG0	0.24	0.24	0.24		
N2KNAMG2	1.59				1.59
N2KNAMG1	1.62	1.24			1.43
D0	4.14				4.14
D2	4.87				4.87
D1	4.54				4.54
D/N*PK0	4.64				4.64
D/N*PK2	5.10				5.10
D/N*PK1	4.41				4.41

1ST CUT MEAN DM% 28.4

https://doi.org/10.23637/ERADOC-1-40

89/R/PG/5

2ND CUT (26/9/89) DRY MATTER TONNES/HECTARE

***** Tables of means *****

LIME / MANURE	A	B	C	D	MEAN
N1	1.28	0.60	0.17	0.08	0.53
O(D)	0.50	0.75	0.21	0.25	0.43
O/PLOT3	0.30	0.58	0.14	0.13	0.29
P	0.51	0.73	0.42	0.23	0.47
N2P	0.88	1.02	0.67	0.66	0.81
N1MIN	0.68	0.98			0.83
MIN	1.29	1.32	1.18	0.76	1.14
PNAMG	0.54	0.61	0.69	0.56	0.60
N2MIN	0.91	1.10	1.16	1.06	1.06
N2PNAMG	0.78	0.87	0.72	0.63	0.75
N3MIN	1.54	1.14	1.51	1.35	1.38
N3MINSI	1.61	1.55	1.43	1.73	1.58
O/PLOT12	0.52	0.49	0.55	0.48	0.51
D/F	1.67	1.50	1.04	0.94	1.29
N2*MIN	1.19	1.34	0.88	0.94	1.09
MIN(N2*)	1.10	0.75	0.69	0.55	0.77
N1*MIN	1.17	1.27	0.40	0.40	0.81
N1*	0.48	0.43	0.49	0.86	0.56
N2KNAMG0	0.10	0.09	0.09		
N2KNAMG2	1.00				1.00
N2KNAMG1	0.63	0.76			0.69
D0	0.80				0.80
D2	1.34				1.34
D1	1.02				1.02
D/N*PK0	1.05				1.05
D/N*PK2	1.24				1.24
D/N*PK1	1.23				1.23

2ND CUT MEAN DM% 43.9

https://doi.org/10.23637/ERADOC-1-40

89/R/PG/5

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

***** Tables of means *****

LIME / MANURE	A	B	C	D	MEAN
N1	2.92	1.73	0.73	0.44	1.45
O(D)	2.29	2.81	1.04	0.90	1.76
O/PLOT3	1.82	2.44	0.57	0.72	1.39
P	3.05	3.49	1.87	1.87	2.57
N2P	2.11	2.26	1.90	1.51	1.94
N1MIN	4.45	4.81			4.63
MIN	5.67	5.83	4.64	3.91	5.01
PNAMG	2.49	2.86	2.48	2.57	2.60
N2MIN	4.40	4.91	3.41	2.57	3.82
N2PNAMG	2.52	2.51	1.98	1.50	2.13
N3MIN	5.31	4.41	4.04	3.80	4.39
N3MINSI	5.74	5.35	4.75	3.70	4.89
O/PLOT12	1.68	1.57	1.11	1.23	1.40
D/F	6.28	5.86	4.93	4.39	5.37
N2*MIN	5.91	6.42	5.29	5.28	5.73
MIN(N2*)	4.62	4.12	3.30	3.05	3.78
N1*MIN	5.73	5.86	3.23	3.56	4.59
N1*	2.98	3.07	2.34	2.55	2.74
N2KNAMG0	0.34	0.33	0.33		
N2KNAMG2	2.58				2.58
N2KNAMG1	2.25	2.00			2.12
D0	4.94				4.94
D2	6.21				6.21
D1	5.56				5.56
D/N*PK0	5.69				5.69
D/N*PK2	6.34				6.34
D/N*PK1	5.64				5.64

TOTAL OF 2 CUTS MEAN DM% 36.1

PLOT AREA HARVESTED 0.00002

https://doi.org/10.23637/ERADOC-1-40

89/R/AG/6

AGDELL

Object: To study, the residual values of phosphate and potash applied in the period 1848-1951 and further dressings since 1964.

The 20th year of revised scheme, ley.

For previous years see 'Details' 1967 and 1973, and 74-88/R/AG/6.

NOTE: Yields were not taken and no new treatments were applied.

Basal applications: Manures: 'Nitram' at 400 kg and later at 180 kg.

Cultivations, etc.:- First N applied: 28 Mar, 1989. Cut: 27 May.
Second N applied: 5 June. Cut: Started 30 Sept, completed 31 Oct.

https://doi.org/10.23637/ERADOC-1-40 *pp 20*

89/R/BN/7

BARNFIELD

Object: The experiment was designed to study the effects of organic and inorganic manures on continuous root crops. It has been progressively modified to study effects on other crops.

Sections 1 and 2 the sixth year of grass/clover. The 15th year of grass on the rest of the experiment.

For previous years see 'Details' 1967 and 1973 and 74-88/R/BN/7.

Plot dimensions: 10.7 x 55.9.

Treatments to grass: All combinations of:-

Whole plots

1. **MANURE** Fertilizers and organic manures:

D	D
DPK	D P K
PKMG	P K (Na) Mg
P	P
PK	P K
PMG	P (Na) Mg
0	0

P: 35 kg P as single superphosphate until 1987, triple superphosphate since and in 1974
K: 225 kg K as sulphate of potash
(Na): 90 kg Na as sodium chloride until 1973
Mg: 90 kg Mg as kieserite every fourth year since 1974 (sulphate of magnesia until 1973)
D: Farmyard manure at 35 tonnes (until 1975).

Quarter plots

2. **N PERCUT** Nitrogen fertilizer in 1989 (kg N per cut) as 'Nitram', cumulative to previous dressings, and residues of forms of N previously each supplying 96 kg N per annum:

75	75, previously nitrate of soda, section 3
100	100, previously sulphate of ammonia, section 4
125	125, previously sulphate of ammonia + castor meal, section 5
150	150, previously castor meal, section 6

Castor meal last applied 1961, nitrate of soda and sulphate of ammonia until 1959.

Plus one plot **MANURE** KMG 100

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89/R/BN/7

Treatments to grass/clover, sections 1 and 2 (not given nitrogen fertilizer):

MANURE Fertilizers and organic manures as for grass above, excluding KMG.

NOTES: (1) P K and D treatments were applied to Sections 1 and 2 until 1980. None were applied subsequently until the resumption of P and K treatments, only, from 1985.
(2) Yields were not taken from section 2.

Cultivations, etc.:-
All sections: K applied: 8 Dec, 1988. P applied: 9 Dec. Cut: 25 May, 1989, 27 Sept.
Grass (Sections 3, 4, 5 and 6) only: N applied: 10 Apr, 1989, 6 June.

GRASS

1ST CUT (25/5/89) DRY MATTER TONNES/HECTARE

***** Tables of means *****

N PERCUT / MANURE	75	100	125	150	Mean
D	4.28	4.77	4.83	4.72	4.65
DPK	4.62	5.07	5.30	5.09	5.02
PKMG	4.03	4.57	4.97	4.90	4.62
P	2.52	2.34	2.22	2.02	2.27
PK	3.73	4.33	4.68	4.27	4.25
PMG	2.81	2.63	2.21	1.96	2.40
0	2.41	2.56	2.66	2.25	2.47
Mean	3.49	3.75	3.84	3.60	3.67

MANURE KMG 100 4.33

Grand mean 3.69

1ST CUT MEAN DM% 22.5

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89/R/BN/7

GRASS

2ND CUT (27/9/89) DRY MATTER TONNES/HECTARE

***** Tables of means *****

N PERCUT / MANURE	75	100	125	150	Mean
D	1.31	1.73	1.62	1.40	1.52
DPK	1.24	1.73	1.62	1.51	1.53
PKMG	0.86	1.16	1.56	1.43	1.25
P	0.65	0.56	0.53	0.32	0.52
PK	0.57	1.42	1.34	0.96	1.07
PMG	0.52	0.61	0.33	0.30	0.44
0	0.41	0.37	0.38	0.41	0.39
Mean	0.80	1.08	1.06	0.90	0.96

MANURE KMG 100 0.91

Grand mean 0.96

2ND CUT MEAN DM% 37.4

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

***** Tables of means *****

N PERCUT / MANURE	75	100	125	150	Mean
D	5.60	6.49	6.45	6.12	6.16
DPK	5.86	6.80	6.92	6.60	6.55
PKMG	4.89	5.73	6.53	6.33	5.87
P	3.17	2.90	2.76	2.34	2.79
PK	4.30	5.75	6.02	5.23	5.32
PMG	3.34	3.24	2.54	2.26	2.85
0	2.82	2.93	3.04	2.66	2.86
Mean	4.28	4.83	4.89	4.51	4.63

MANURE KMG 100 5.24

Grand mean 4.65

TOTAL OF 2 CUTS MEAN DM% 29.9

PLOT AREA HARVESTED 0.00568

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89/R/BN/7

GRASS/CLOVER

1ST CUT (25/5/89) DRY MATTER TONNES/HECTARE

***** Tables of means *****

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	2.60	3.07	1.99	1.12	1.94	1.69	1.16	1.94

1ST CUT MEAN DM% 25.1

2ND CUT (27/9/89) DRY MATTER TONNES/HECTARE

***** Tables of means *****

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	0.49	0.58	0.12	0.40	0.17	0.39	0.51	0.38

2ND CUT MEAN DM% 37.1

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

***** Tables of means *****

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	3.09	3.65	2.11	1.52	2.12	2.08	1.67	2.32

TOTAL OF 2 CUTS MEAN DM% 31.1

PLOT AREA HARVESTED 0.00568

https://doi.org/10.23637/ERADOC-1-40

89/R/GC/8

GARDEN CLOVER

Object: To study yields and pathogens of red clover grown continuously - Manor Garden.

The 136th year, red clover.

For previous years see 'Details' 1967 and 1973, and 74-88/R/GC/8.

Design: 2 blocks of 2 plots.

Whole plot dimensions: 1.02 x 1.42.

Treatments:

FUNGCIDE	Fungicide, to control Sclerotinia trifoliorum:
NONE	None
BENOMYL	Benomyl at 0.60 kg in 800 l on 14 Oct, 1988, 6 Dec, 3 Jan, 1989, 26 Jan and 8 March

Basal applications: Manures: Chalk at 1.25 t. (0:18:36) at 420 kg. Mg at 50 kg, as Epsom Salts.

NOTE: Additional K was applied to replace that removed by the crop in 1988. **FUNGCIDE** NONE required 882 and 671 kg K2O to the first and second blocks respectively, **FUNGCIDE** BENOMYL 601 and 571 kg K2O. This was applied as muriate of potash, one third in spring 1989 and one third after the first and second cuts.

Seed: Hungaropoly, sown at 34 kg in 1987.

Cultivations, etc.:- Chalk, PK and Mg applied: 21 Oct, 1988. K applied: 12 Apr, 1989. Cut and K applied: 1 June, 5 July. Cut: 15 Aug, 25 Sept.

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89/R/GC/8

1ST CUT (1/6/89) DRY MATTER TONNES/HECTARE

***** Tables of means *****

FUNGCIDE	NONE	BENOMYL	Mean
	6.65	6.53	6.59

1ST CUT MEAN DM% 18.1

2ND CUT (5/7/89) DRY MATTER TONNES/HECTARE

***** Tables of means *****

FUNGCIDE	NONE	BENOMYL	Mean
	1.97	1.92	1.94

2ND CUT MEAN DM% 21.3

3RD CUT (15/8/89) DRY MATTER TONNES/HECTARE

***** Tables of means *****

FUNGCIDE	NONE	BENOMYL	Mean
	1.51	1.50	1.51

3RD CUT MEAN DM% 23.1

4TH CUT (25/9/89) DRY MATTER TONNES/HECTARE

***** Tables of means *****

FUNGCIDE	NONE	BENOMYL	Mean
	0.08	0.10	0.09

4TH CUT MEAN DM% 26.1

TOTAL OF 4 CUTS DRY MATTER TONNES/HECTARE

***** Tables of means *****

FUNGCIDE	NONE	BENOMYL	Mean
	10.21	10.06	10.13

TOTAL OF 4 CUTS MEAN DM% 22.1

PLOT AREA HARVESTED 0.00010

https://doi.org/10.23637/ERADOC-1-40