ROTHAMSTED RESEARCH

Yields of the Field Experiments 1996

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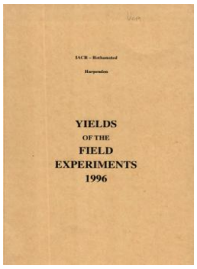

Experiments - Classicals

Rothamsted Research

Rothamsted Research (1997) *Experiments - Classicals ;* Yields Of The Field Experiments 1996, pp 11 - 37 **- DOI: https://doi.org/10.23637/ERADOC-1-51**

96/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, in 1996 the fallow was replaced by w.oats.

The 153rd year, w. wheat, w.oats and potatoes.

For previous years see 'Details' 1967 and 1973, Station Report for 1966, pp. 229-231, Station Report for 1968, Part 2, Station Report for 1982, Part 2, pp. 5-44 and 74-95/R/BK/1.

Areas harvested:

	Section	
Wheat:	0	0.00351
	1	0.00645
	2,4,6 and 7	0.00533
	8 and 9	0.00561
Oats:	3	0.00533
Potatoes:	5	0.00348

Treatments:

Whole plots

PLOT		Fertilizers and organic manures:-		
	Plot	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
17N1+3FH	17	N2(A)	N2 1/2(P K (Na) Mg)	N1+3 1/2(PK Mg)+
18N0+3FH	18	P K Na Mg(A)	N2 1/2(P K (Na) Mg)	N0+3 1/2(PK Mg)+
19(C)	19	C	C	(C) (since 1989)
20N2KMG	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.

W. oats; N and D were not applied.

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 34.5% N 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 triple superphosphate in 1974 and since 1988, single superphosphate in other years
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 t
(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. From 1968, ten strips of sub-plots (sections) were started with the following cropping:-

SECTION	1/W30	9/W38	0/W45	8/W2	6/W19	5/P	3/O	7/W2	4/W1	2/W3
Section	1	9	0*	8+	6**	5	3	7	4	2
Year										
1968	W	W	W	W	F	W	W	P	W	BE
1969	W	W	W	W	W	F	W	BE	P	W
1970	W	W	W	W	W	W	F	W	BE	P
1971	W	W	W	W	F	W	W	P	W	BE
1972	W	W	W	W	W	F	W	BE	P	W
1973	W	W	W	W	W	W	F	W	BE	P
1974	W	W	W	W	F	W	W	P	W	BE
1975	W	W	W	W	W	F	W	BE	P	W
1976	W	W	W	W	W	W	F	W	BE	P
1977	W	W	W	W	F	W	W	P	W	BE
1978	W	W	W	W	W	F	W	BE	P	W
1979	W	W	W	W	W	W	F	W	P	F
1980	W	W	W	W	W	W	W	F	W	P
1981	W	W	W	F	W	W	W	P	F	W
1982	W	W	W	W	W	W	W	W	P	F
1983	W	W	W	W	W	W	W	F	W	P
1984	W	W	W	W	W	W	W	P	F	W
1985	W	W	W	W	W	F	W	W	P	W
1986	W	W	W	W	W	P	F	W	W	W
1987	W	W	W	W	W	W	P	W	W	F
1988	W	W	W	F	W	W	W	F	W	P

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SECTION	1/W30	9/W38	0/W45	8/W2	6/W19	5/P	3/O	7/W2	4/W1	2/W3
Section	1	9	0*	8+	6**	5	3	7	4	2
Year										
1989	W	W	W	W	W	W	W	P	F	W
1990	W	W	W	W	W	F	W	W	P	W
1991	W	W	W	W	W	P	F	W	W	W
1992	W	W	W	W	W	W	P	W	W	F
1993	W	W	W	W	W	W	W	F	W	P
1994	W	W	W	F	W	W	W	P	F	W
1995	W	W	W	W	W	F	W	W	P	W
1996	W	W	W	W	W	P	O	W	W	W

W = w. wheat, O = w. oats, P = potatoes, BE = s. beans, F = fallow

* Straw incorporated since autumn 1986. ** No sprays except weedkillers since 1985. + No weedkillers.

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. From autumn 1988 until autumn 1992 a five-year cycle was 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. None applied since autumn 1991.

Experimental diary:

All sections:

18-Sep-95 : **T** : P applied.
21-Sep-95 : **T** : Mg and Na applied.
22-Sep-95 : **T** : K applied.
29-Sep-95 : B : Ploughed and furrow pressed.
09-Oct-95 : B : Spring-tine cultivated.

Cropped sections:

W. wheat:

11-Aug-95 : **T** : Straw chopped (section 0 only), straw baled (sections 1, 2, 6, 7, 8 and 9).
22-Sep-95 : **T** : Autumn N treatment applied.
26-Sep-95 : **T** : Farmyard manure applied.
11-Oct-95 : **T** : Rotary harrowed, Hereward, dressed Fonofos Seed Treatment, drilled at 380 seeds per m^2.
12-Oct-95 : **T** : Rolled.
17-Apr-96 : **T** : Spring N treatments applied.
26-Apr-96 : **T** : Ally at 30 g with Cheetah Super at 1.25 l in 200 l (except section 8).
: **T** : Barclay Eyetak at 0.9 l in 200 l (except section 6).
29-Apr-96 : **T** : Barclay Holdup at 2.3 l in 200 l (except section 6).
07-Jun-96 : **T** : Alto 100 SL at 0.6 l with Mallard 750 EC at 0.4 l in 320 l (except section 6).
16-Aug-96 : **T** : Combine harvested.

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Experimental diary:

Potatoes:

26-Sep-95	T	Farmyard manure applied.
17-Apr-96	T	Spring N treatments applied.
24-Apr-96	T	Heavy spring-tine cultivated.
30-Apr-96	T	Heavy spring-tine cultivated.
01-May-96	T	Rotary harrowed, planted Estima, dressed Fungazil 100 SL.
31-May-96	T	Rotary ridged.
04-Jun-96	T	Campbell's Linuron 45% Flowable at 5.0 l in 320 l.
05-Jul-96	T	Clayton Turret at 2.0 l in 260 l.
22-Jul-96	T	Clayton Turret at 2.0 l in 300 l.
02-Aug-96	T	Clayton Turret at 2.0 l in 400 l.
15-Aug-96	T	Shirlan at 0.3 l in 390 l.
02-Sep-96	T	Shirlan at 0.3 l in 260 l.
12-Sep-96	T	Haulm pulverised.
24-Sep-96	T	Potatoes lifted.

W. oats:

11-Aug-95	T	Straw baled.
12-Oct-95	T	Rotary harrowed, Image, dressed Vitaflo Extra, drilled at 350 seeds per m^2, rolled.
13-Oct-95	T	Tribunil at 2.25 kg in 200 l.
30-May-96	T	Tilt 250 EC at 0.5 l with Barclay Holdup at 2.3 l and Vassgro Spreader 200 ml in 200 l.
05-Aug-96	T	Combine harvested.

NOTE: Samples of wheat grain and straw from sections 1, 4, 6 and 9, samples of oat grain and straw and samples of potato tubers were taken for chemical analysis. Unground grain and straw samples were taken from selected plots and archived.

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96/R/BK/1 W. WHEAT

GRAIN TONNES/HECTARE

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

SECTION PLOT	4/W1	7/W2	8/W2	2/W3	6/W19	1/W30	9/W38	0/W45
01DN4PK	9.20	9.49	*	8.50	9.11	*	*	*
21DN2	9.16	8.65	5.49	7.60	8.18	8.53	7.81	7.29
22D	7.77	5.43	5.72	5.61	6.66	7.45	5.42	6.34
030	3.61	1.03	2.85	1.22	1.56	1.93	0.95	1.83
05F	3.03	1.08	2.97	1.45	2.05	1.77	1.62	1.40
06N1F	6.11	3.67	4.60	3.05	4.37	3.66	3.95	3.89
07N2F	7.74	5.70	5.56	5.03	6.27	6.27	5.83	6.53
08N3F	8.50	7.43	6.76	6.73	7.94	7.48	7.11	7.45
09N4F	8.82	8.31	7.01	7.35	8.13	8.04	8.02	8.23
10N2	6.11	4.54	4.63	4.38	4.17	3.80	3.58	4.20
11N2P	6.51	5.21	4.39	4.78	4.35	4.02	3.64	4.51
12N2PNA	6.67	5.59	4.80	4.84	5.67	4.61	4.21	5.21
13N2PK	7.52	5.84	5.56	5.33	6.41	5.46	5.78	6.46
14N2PKMG	7.76	5.99	6.31	5.23	6.48	5.83	5.61	6.35
15N5F	8.98	8.93	7.35	8.06	7.99	8.24	7.89	8.30
16N6F	8.59	8.51	6.65	7.94	7.84	7.97	8.50	8.33
17N1+3FH	8.75	8.78	6.84	7.97	8.38	7.73	8.20	7.60
18N0+3FH	8.59	7.92	6.15	6.78	8.18	7.23	7.36	7.53
19(C)	4.19	1.15	2.58	1.74	1.46	2.53	2.23	2.16
20NKMG	*	*	*	*	*	3.71	*	4.11

GRAIN MEAN DM% 86.0

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96/R/BK/1 W. WHEAT

STRAW TONNES/HECTARE

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

SECTION PLOT	4/W1	6/W19	1/W30	9/W38
01DN4PK	6.23	*	*	*
21DN2	5.50	5.31	6.20	3.74
22D	4.27	3.67	4.66	2.15
030	1.29	0.61	0.68	0.08
05F	0.92	0.67	0.58	0.52
06N1F	2.33	1.45	1.27	1.69
07N2F	3.57	2.68	2.79	2.40
08N3F	4.57	3.93	3.98	2.83
09N4F	4.89	4.36	4.69	3.21
10N2	1.95	*	1.41	*
11N2P	2.56	*	1.32	*
12N2PNA	2.62	*	1.92	*
13N2PK	3.18	*	2.41	*
14N2PKMG	3.54	*	2.46	*
15N5F	5.14	4.23	4.92	3.68
16N6F	4.90	4.69	4.95	4.19
17N1+3FH	4.79	*	4.18	*
18N0+3FH	4.58	*	3.58	*
19(C)	1.61	*	0.76	*
20NKMG	*	*	1.75	*

STRAW MEAN DM% 94.4

https://doi.org/10.23637/ERADOC-1-51

96/R/BK/1 W. OATS

TONNES/HECTARE

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

PLOT	GRAIN	STRAW
01DN4PK	8.31	4.10
21DN2	7.61	3.16
22D	7.49	2.98
030	2.05	0.59
05F	2.27	0.69
06N1F	2.36	0.73
07N2F	3.07	1.13
08N3F	3.70	1.24
09N4F	4.45	1.54
10N2	3.41	1.10
11N2P	3.34	0.87
12N2PNA	3.68	0.98
13N2PK	2.97	1.02
14N2PKMG	2.93	0.95
15N5F	6.94	2.82
16N6F	7.78	3.56
17N3FH	3.72	1.24
18N3FH	3.30	0.93
19(C)	2.17	0.49

GRAIN MEAN DM% 89.3

STRAW MEAN DM% 59.9

NOTE: Dung and nitrogen treatments are residual from the previous wheat.

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96/R/BK/1 POTATOES

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

PLOT	TOTAL TUBERS TONNES/ HECTARE	% WARE 3.81 CM (1.5 INCH) RIDDLE
01DN4PK	35.1	94.1
21DN2	40.9	95.4
22D	38.5	96.6
030	6.3	78.1
05F	11.0	88.8
06N1F	18.2	91.7
07N2F	23.7	94.4
08N3F	26.8	94.6
09N4F	24.0	95.1
10N2	5.2	68.3
11N2P	6.8	68.9
12N2PNA	9.0	68.5
13N2PK	11.4	90.2
14N2PKMG	28.3	94.5
15N5F	28.5	95.8
16N6F	23.6	94.3
17N3FH	15.5	91.1
18N3FH	18.3	93.2
19(C)	9.8	85.6

https://doi.org/10.23637/ERADOC-1-51

96/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 145th year, s. barley.

For previous years see 'Details' 1967 and 1973, Station Report for 1966 and 74-95/R/HB/2.

Treatments: All combinations of:-

Whole plots

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

		Form of N 1852-1966	Additional treatments 1852-1979	Changes since 1980
---	11	None	-	-
-P-	21	None	P	-
--K	31	None	K(Na)Mg	-
-PK	41	None	PK(Na)Mg	-
A--	12	A	-	-
AP-	22	A	P	-
A-K	32	A	K(Na)Mg	-
APK	42	A	PK(Na)Mg	-
N----	131	N	-	-
NP---	231	N	P	-
N-K--	331	N	K(Na)Mg	-
NPK--	431	N	PK(Na)Mg	-
N--S-	134	N	Si	Si omitted
NP-S-	234	N	P Si	"
N-KS-	334	N	K(Na)MgSi	"
NPKS-	434	N	PK(Na)MgSi	"
N---S	132	N	-	Si added
NP--S	232	N	P	"
N-K-S	332	N	K(Na)Mg	"
NPK-S	432	N	PK(Na)Mg	"
N--SS	133	N	Si	-
NP-SS	233	N	P Si	-
N-KSS	333	N	K(Na)MgSi	-
NPKSS	433	N	PK(Na)MgSi	-
C(--)	14	C	-	PKMg omitted
C(P-)	24	C	P	"
C(-K)	34	C	K(Na)Mg	"
C(PK)	44	C	PK(Na)Mg	"
D	72	None	D	-
(D)	71	None	(D)	
-				
(A)	62	None	(Ashes)	-
-	61	None	-	-

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96/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 triple superphosphate in 1974 and since 1988, single superphosphate in other years
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 t. (D): until 1871 only
(Ashes): Weed ash 1852-1916, furnace ash 1917-1932, none since

Sub-plots

2. **N** Nitrogen fertilizer (kg N), as 'Nitro-Chalk', since 1968-85, as 34.5% N since 1986 (cumulative N applications until 1973, on a cyclic system since 1974):

0
48
96
144

Plus extra plots testing all combinations of:-

Whole plots

1 **MANURE** Fertilizers other than magnesium:

55AN2PK	Plot 55 AN2PK
56--PK	Plot 56 --PK
57NN2--	Plot 57 NN2
58NN2--	Plot 58 NN2

N2: 96 kg N as 'Nitro-Chalk' since 1968-85, as 34.5% N since 1986. Other symbols as above.

Sub-plots

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

0
35

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

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96/R/HB/2

Experimental diary:

06-Aug-95 : B : Straw baled.
02-Nov-95 : T : P applied.
08-Nov-95 : T : K applied.
11-Dec-95 : T : Si applied.
14-Dec-95 : T : Farmyard manure applied.
19-Dec-95 : B : Ploughed.
15-Mar-96 : B : Spring-tine cultivated, rotary harrowed, Cooper, dressed Baytan Flowable, drilled at 350 seeds per m^2.
18-Mar-96 : B : Rolled.
30-Apr-96 : T : N applied.
02-Jun-96 : B : Duplosan New System CMPP at 2.0 l with Vindex at 1.4 l in 200 l.
11-Jul-96 : B : Pulled wild oats by hand.
22-Aug-96 : T : Combine harvested.

NOTE: Samples of grain and straw were taken from selected plots for chemical analysis and some were archived.

https://doi.org/10.23637/ERADOC-1-51

96/R/HB/2 MAIN PLOTS

GRAIN TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	1.49	1.82	1.91	1.65	1.72
-P-	1.19	2.14	3.12	3.27	2.43
--K	1.96	3.63	3.91	3.15	3.16
-PK	2.07	2.86	4.98	3.62	3.38
A--	0.58	1.52	2.01	1.60	1.43
AP-	1.81	1.81	2.06	2.62	2.07
A-K	1.26	1.19	2.67	2.32	1.86
APK	1.01	3.95	4.40	4.61	3.49
N----	0.53	1.04	1.39	1.64	1.15
NP---	1.38	3.42	2.78	3.50	2.77
N-K--	1.77	2.31	1.91	2.18	2.04
NPK--	1.98	3.15	4.51	4.78	3.60
N--S-	2.19	2.06	2.46	2.92	2.41
NP-S-	1.79	2.26	3.47	4.20	2.93
N-KS-	2.11	3.06	4.20	3.72	3.27
NPKS-	1.65	3.59	4.99	6.35	4.15
N---S	1.24	2.25	2.77	3.38	2.41
NP--S	2.24	2.58	3.19	3.78	2.95
N-K-S	1.12	3.10	4.57	3.12	2.98
NPK-S	1.71	3.30	4.71	4.85	3.64
N--SS	1.31	2.12	3.33	2.91	2.42
NP-SS	1.52	2.26	3.45	4.06	2.82
N-KSS	1.65	4.30	4.58	3.99	3.63
NPKSS	1.65	3.84	4.45	4.98	3.73
C(--)	1.71	3.98	4.19	3.80	3.42
C(P-)	1.47	2.91	4.24	4.32	3.24
C(-K)	1.71	2.90	4.39	4.10	3.28
C(PK)	2.15	4.96	3.80	4.91	3.95
D	7.99	9.03	8.24	9.89	8.79
(D)	3.58	3.38	4.84	3.84	3.91
(A)	0.77	3.06	2.82	4.20	2.71
-	1.70	2.27	3.21	2.61	2.45
Mean	1.82	3.00	3.67	3.78	3.07

GRAIN MEAN DM% 86.6

https://doi.org/10.23637/ERADOC-1-51

96/R/HB/2 MAIN PLOTS

STRAW TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	0.38	0.53	0.34	0.59	0.46
-P-	0.19	0.34	0.93	0.99	0.61
--K	0.47	1.44	1.06	0.66	0.91
-PK	0.38	0.42	1.68	0.67	0.79
A--	0.15	0.23	0.48	0.15	0.25
AP-	0.38	0.30	0.50	0.91	0.52
A-K	0.17	0.11	0.84	0.51	0.41
APK	0.15	0.83	1.02	0.80	0.70
D	2.45	2.26	2.41	2.57	2.42
(D)	0.75	0.65	1.68	1.36	1.11
(A)	0.15	0.80	0.55	0.71	0.55
-	0.49	0.50	1.47	0.74	0.80
Mean	0.51	0.70	1.08	0.89	0.79

STRAW MEAN DM% 88.6

EXTRA PLOTS

GRAIN TONNES/HECTARE

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

MANURE	551AN2PK	561--PK	571NN2--	581NN2--	Mean
MGNESIUM					
0	5.46	0.46	3.82	1.72	2.87
35	5.30	0.53	3.56	1.90	2.82
Mean	5.38	0.49	3.69	1.81	2.84

GRAIN MEAN DM% 87.4

https://doi.org/10.23637/ERADOC-1-51

96/R/WF/3

WHEAT AND FALLOW

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

The 141st year, w. wheat.

For previous years see 'Details' 1967, 1973 and 74-95/R/WF/3.

Whole plot dimensions: 9.0 x 211.

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

Experimental diary:
Wheat plot:
29-Sep-95 : **T** : Rotary harrowed, Hereward, dressed Fonofos Seed Treatment, drilled at 380 seeds per m^2.
26-Apr-96 : **T** : Ally at 30 g with Cheetah Super at 1.25 l in 200 l.
06-Jun-96 : **T** : Monicle at 1.0 l in 320 l.
16-Aug-96 : **T** : Combine harvested.
Fallow plot:
11-Aug-95 : **T** : Straw baled.
25-Sep-95 : **T** : Ploughed and furrow pressed.
30-Apr-96 : **T** : Heavy spring-tine cultivated.
17-Jul-96 : **T** : Shallow cultivated with thistle-bar.

GRAIN AND STRAW TONNES/HECTARE

	GRAIN	STRAW
YIELD	2.48	1.35
MEAN DM%	86.3	96.3
PLOT AREA HARVESTED	0.023232	

https://doi.org/10.23637/ERADOC-1-51

96/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 up to 1991, w. wheat since - Hoosfield.

The 141st year, w. wheat.

For previous years see 'Details' 1967, 1973 and 74-95/R/EX/4.

Treatments: All combinations of:-

Whole plots (P test)

1. **OLD RES**		Residues of manures applied annually 1876-1901:
	O	None
	D	Farmyard manure at 35 t
	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 RES**		Residues of phosphate (kg P) applied annually from 1986, as single superphosphate in 1986 and 1987, triple superphosphate from 1988 until 1992, none since:
	O	None
	P1	44
	P2	87
	P3	131

plus

Whole plots (K test, previously N test until 1991)

	OLD RES	Residues of manures applied annually 1876-1901:
	O	None
	D	Farmyard manure at 35 t
	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

Experimental diary:

P test:

18-Sep-95 : **T** : Muriate of potash at 171 kg.

K test:

18-Sep-95 : **T** : Triple superphosphate at 319 kg.

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96/R/EX/4

Experimental diary:
All plots:
11-Aug-95 : B : Straw baled.
25-Sep-95 : B : Ploughed and furrow pressed.
29-Sep-95 : B : Rotary harrowed, Hereward, dressed Panoctine, drilled at 380 seeds per m^2.
15-Apr-96 : B : 34.5% N at 580 kg.
26-Apr-96 : B : Ally at 30 g with Cheetah Super at 1.25 l and Barclay Holdup at 2.3 l in 200 l.
06-Jun-96 : B : Monicle at 1.0 l in 320 l.
08-Jul-96 : B : Pulled wild oats by hand.
15-Aug-96 : B : Combine harvested.

NOTE: Samples of grain and straw were taken for chemical analysis.

P TEST

GRAIN TONNES/HECTARE

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

P RES / OLD RES	0	P1	P2	P3	Mean
0	3.33	7.16	7.65	7.91	6.51
D	6.81	7.68	7.98	7.56	7.50
N	3.50	7.69	7.53	7.13	6.46
P	6.78	8.20	8.35	8.12	7.86
NPKNAMG	6.27	7.39	7.25	7.47	7.09
Mean	5.34	7.62	7.75	7.64	7.09

GRAIN MEAN DM% 86.9

STRAW TONNES/HECTARE

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

P RES / OLD RES	0	P1	P2	P3	Mean
0	1.54	3.20	4.08	4.46	3.32
D	3.07	3.66	4.04	3.92	3.68
N	1.70	3.80	3.76	3.76	3.26
P	2.85	3.68	3.87	3.81	3.55
NPKNAMG	2.68	3.70	3.39	3.44	3.30
Mean	2.37	3.61	3.83	3.88	3.42

STRAW MEAN DM% 93.1

PLOT AREA HARVESTED 0.00589

https://doi.org/10.23637/ERADOC-1-51

96/R/EX/4

K TEST

GRAIN TONNES/HECTARE

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

OLD RES	
O	6.89
D	7.56
N*	7.42
PK	8.30
N*PK	7.82
Mean	7.60

GRAIN MEAN DM% 86.9

STRAW TONNES/HECTARE

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

OLD RES	
O	3.66
D	3.86
N*	3.65
PK	4.45
N*PK	4.27
Mean	3.98

STRAW MEAN DM% 93.2

PLOT AREA HARVESTED 0.00589

https://doi.org/10.23637/ERADOC-1-51

96/R/PG/5

PARK GRASS

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

The 141st year, hay.

For previous years see 'Details' 1967 and 1973 and 74-95/R/PG/5.

Treatments: Combinations of:-

Whole plots

1. **MANURE**	Fertilizers and organic manures:	
N1	Plot 1	N1
K	Plot 2/1	K in 1996 (as 2/2 before)
O(D)	Plot 2/2	None (D until 1863)
O	Plot 3	None
P	Plot 4/1	P
N2P	Plot 4/2	N2 P
N1MN	Plot 6	N1 P K Na Mg
MN	Plot 7	P K Na Mg
PNAMG	Plot 8	P Na Mg
MN(N2)	Plot 9/1	P K Na Mg (N2 until 1989)
N2MN	Plot 9/2	N2 P K Na Mg
N2PNAMG	Plot 10	N2 P Na Mg
N3MN	Plot 11/1	N3 P K Na Mg
N3MNSI	Plot 11/2	N3 P K Na Mg Si
O	Plot 12	None
(D/F)	Plot 13/1	None (D/F until 1994)
D/F	Plot 13/2	D/F
MN(N2*)	Plot 14/1	P K Na Mg (N2* until 1989)
N2*MN	Plot 14/2	N2* P K Na Mg
MN(N2*)	Plot 15	P K Na Mg (N2* until 1875)
N1*MN	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 triple superphosphate in 1974 and since 1987, single superphosphate in other years
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 t every fourth year
F:	Fishmeal every fourth year to supply 63 kg N
MN:	P K Na Mg as above

https://doi.org/10.23637/ERADOC-1-51

96/R/PG/5

Sub-plots

2. **LIME** Liming plots 1-17:

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. Lime last applied in 1994.

Liming plots 18-20:

Differential rates of lime were applied to sub-plots 2 and 3 regularly 1920-1964. 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'. Plots 19 and 20 received no further chalk after 1968; plot 18/2 no further chalk after 1972.

In 1995 plot 13 was split in two, 13/1 to receive no more manure, 13/2 to receive organic manures as hitherto. In 1996 plot 2 was split in two, 2/1 to test potassium, 2/2 to continue without fertilizers.

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

Experimental diary:

02-Nov-95 : **T** : P applied.
07-Nov-95 : **T** : K, Na, Mg and Si applied.
29-Apr-96 : **T** : N applied.
17-Jun-96 : B : Cut.
19-Jun-96 : B : Hay turned.
20-Jun-96 : B : Hay rowed up and baled.
11-Nov-96 : B : Cut and herbage removed.

NOTE: Samples of herbage from selected plots were taken for chemical analysis. Unground herbage samples from all plots from both cuts were archived.

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96/R/PG/5

1ST CUT (17/6/96) DRY MATTER TONNES/HECTARE

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

LIME / MANURE		A	B	C	D	MEAN
N1	1	2.74	2.30	1.58	0.53	1.79
K	2/1	1.79	2.60	1.52	1.87	1.94
O(D)	2/2	2.09	2.77	1.19	1.35	1.85
O	3	1.80	1.88	1.06	1.32	1.51
P	4/1	2.41	3.08	1.80	2.03	2.33
N2P	4/2	2.39	2.18	1.88	0.57	1.75
N1MN	6	4.11	3.78			3.95
MN	7	4.05	4.45	3.14	1.59	3.31
PNAMG	8	2.66	3.41	2.31	2.21	2.65
MN(N2)	9/1	4.34	3.65	0.95	0.51	2.36
N2MN	9/2	4.92	4.09	3.01	1.93	3.49
N2PNAMG	10	4.27	3.20	2.54	1.42	2.86
N3MN	11/1	5.49	4.68	3.62	3.61	4.35
N3MNSI	11/2	5.19	4.21	3.27	4.26	4.23
O	12	1.84	1.99	1.17	1.21	1.55
(D/F)	13/1	3.23	4.23	3.08	3.03	3.39
D/F	13/2	3.52	4.89	4.47	3.84	4.18
MN(N2*)	14/1	3.97	4.08	3.21	4.01	3.82
N2*MN	14/2	4.94	4.94	5.26	4.72	4.97
MN(N2*)	15	3.54	3.66	2.44	1.82	2.87
N1*MN	16	4.07	4.09	2.88	3.28	3.58
N1*	17	2.41	2.23	3.11	2.92	2.67
N2KNAMG0	18/1			2.36	0.14	1.25
N2KNAMG2	18/2					2.91
N2KNAMG1	18/3	2.05	2.40			2.22
D0	19/1					3.39
D2	19/2					4.96
D1	19/3					3.46
D/N*PK0	20/1					4.24
D/N*PK2	20/2					5.01
D/N*PK1	20/3					4.55

1ST CUT MEAN DM% 33.4

https://doi.org/10.23637/ERADOC-1-51

96/R/PG/5

2ND CUT (11/11/96) DRY MATTER TONNES/HECTARE

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

LIME / MANURE		A	B	C	D	MEAN
N1	1	1.20	1.14	0.78	0.16	0.82
K	2/1	0.75	0.73	0.65	0.72	0.71
O(D)	2/2	0.38	0.35	0.32	0.41	0.37
O	3	0.42	0.37	0.43	0.56	0.44
P	4/1	0.44	0.51	0.59	0.68	0.55
N2P	4/2	1.02	0.87	0.64	0.51	0.76
N1MN	6	0.64	0.66			0.65
MN	7	0.45	0.54	0.78	0.50	0.57
PNAMG	8	0.76	0.90	1.02	0.95	0.91
MN(N2)	9/1	0.42	0.49	0.31	0.17	0.35
N2MN	9/2	0.85	0.95	0.77	1.10	0.92
N2PNAMG	10	0.85	1.07	0.85	0.83	0.90
N3MN	11/1	1.43	1.04	1.10	1.71	1.32
N3MNSI	11/2	1.64	0.97	0.75	1.67	1.26
O	12	0.31	0.34	0.49	0.34	0.37
(D/F)	13/1	0.73	0.61	0.38	0.39	0.53
D/F	13/2	1.24	1.33	0.64	0.72	0.99
MN(N2*)	14/1	0.94	0.73	0.69	1.00	0.84
N2*MN	14/2	1.16	1.12	1.40	1.60	1.32
MN(N2*)	15	0.65	0.69	0.68	0.56	0.65
N1*MN	16	0.92	0.82	0.66	0.70	0.78
N1*	17	0.64	0.71	0.90	1.05	0.82
N2KNAMG0	18/1			1.03	0.20	0.61
N2KNAMG2	18/2					1.68
N2KNAMG1	18/3	0.87	1.16			1.02
D0	19/1					0.63
D2	19/2					0.65
D1	19/3					0.64
D/N*PK0	20/1					0.71
D/N*PK2	20/2					0.72
D/N*PK1	20/3					0.68

2ND CUT MEAN DM% 29.5

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96/R/PG/5

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

LIME / MANURE		A	B	C	D	MEAN
N1	1	3.94	3.45	2.35	0.68	2.61
K	2/1	2.53	3.33	2.16	2.59	2.65
O(D)	2/2	2.47	3.11	1.51	1.76	2.21
O	3	2.21	2.24	1.49	1.89	1.96
P	4/1	2.85	3.59	2.39	2.71	2.88
N2P	4/2	3.40	3.05	2.52	1.09	2.52
N1MN	6	4.75	4.44			4.60
MN	7	4.50	4.99	3.93	2.08	3.88
PNAMG	8	3.42	4.31	3.34	3.17	3.56
MN(N2)	9/1	4.75	4.14	1.26	0.68	2.71
N2MN	9/2	5.76	5.04	3.78	3.03	4.40
N2PNAMG	10	5.12	4.27	3.40	2.25	3.76
N3MN	11/1	6.92	5.72	4.72	5.32	5.67
N3MNSI	11/2	6.83	5.17	4.02	5.94	5.49
O	12	2.15	2.33	1.66	1.54	1.92
(D/F)	13/1	3.96	4.83	3.46	3.42	3.92
D/F	13/2	4.76	6.22	5.11	4.56	5.16
MN(N2*)	14/1	4.91	4.81	3.90	5.01	4.66
N2*MN	14/2	6.10	6.07	6.66	6.33	6.29
MN(N2*)	15	4.19	4.35	3.12	2.38	3.51
N1*MN	16	4.99	4.91	3.53	3.98	4.36
N1*	17	3.04	2.95	4.00	3.97	3.49
N2KNAMG0	18/1			3.39	0.34	1.86
N2KNAMG2	18/2					4.58
N2KNAMG1	18/3	2.92	3.56			3.24
D0	19/1					4.03
D2	19/2					5.62
D1	19/3					4.10
D/N*PK0	20/1					4.95
D/N*PK2	20/2					5.73
D/N*PK1	20/3					5.23

TOTAL OF 2 CUTS MEAN DM% 31.5

https://doi.org/10.23637/ERADOC-1-51

96/R/BN/7

BARNFIELD

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

Sections 1 and 2, 2nd year of clover. Sections 3-6, 2nd year of grass/clover.

For previous years see 'Details' 1967 and 1973 and 74-95/R/BN/7.

Plot dimensions: 10.7 x 55.9.

Treatments to grass/clover, Sections 3-6: All combinations of:-

Whole plots

1. **MANURE**	Fertilizers and organic manures:
(D)	(D)
(D)PK	(D) P K
PKMG	P K (Na) Mg
P	P
PK	P K
PMG	P (Na) Mg
0	0

P: 35 kg P as triple superphosphate in 1974 and since 1987, single superphosphate in other years
K: 225 kg K as sulphate of potash
(Na): 90 kg Na as sodium chloride until 1973, none since
Mg: 90 kg Mg as kieserite every fourth year since 1974 (sulphate of magnesia until 1973)
(D): Farmyard manure at 35 t until 1975, none since

Sub-plots

2. **N PERCUT**	Nitrogen fertilizer in 1996 (kg N per cut) as 34.5% N, 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

No nitrogen fertilizer applied in 1995. Castor meal last applied 1961, nitrate of soda and sulphate of ammonia until 1959.

Plus one plot **MANURE** KMG 100

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96/R/BN/7

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

MANURE Fertilizers and organic manures as for grass/clover 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.

Experimental diary:
08-Nov-95 : **T** : P and K applied.
27-Mar-96 : **T** : N applied
25-Apr-96 : B : Rolled.
10-Jun-96 : **T** : Cut, herbage removed.
11-Jun-96 : **T** : N applied.
11-Nov-96 : **T** : Cut, herbage removed.

NOTE: Herbage samples were taken for chemical analysis.

GRASS/CLOVER

1ST CUT (10/6/96) DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	5.35	6.43	6.49	5.86	6.03
DPK	6.12	6.18	6.63	6.76	6.43
PKMG	5.43	5.52	5.54	5.67	5.54
P	4.30	4.06	4.41	4.54	4.33
PK	4.60	5.61	5.77	5.70	5.42
PMG	3.57	3.73	3.72	3.23	3.56
0	3.29	4.01	3.33	2.67	3.33
Mean	4.67	5.08	5.13	4.92	4.95

MANURE KMG 100 5.62

Grand mean 4.97

1ST CUT MEAN DM% 23.0

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96/R/BN/7

GRASS/CLOVER

2ND CUT (11/11/96) DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	1.26	2.31	2.54	3.21	2.33
DPK	2.03	2.80	2.35	3.36	2.63
PKMG	1.57	2.53	2.71	3.10	2.48
P	1.10	1.60	2.58	1.33	1.65
PK	1.29	2.22	2.69	3.50	2.42
PMG	1.06	0.95	1.79	0.75	1.14
0	0.70	0.64	0.58	0.55	0.62
Mean	1.29	1.86	2.18	2.26	1.90

MANURE KMG 100 2.46

Grand mean 1.92

2ND CUT MEAN DM% 22.2

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

N PERCUT / MANURE	75	100	125	150	Mean
D	6.61	8.73	9.03	9.07	8.36
DPK	8.15	8.98	8.98	10.12	9.06
PKMG	7.00	8.05	8.25	8.77	8.02
P	5.40	5.66	6.99	5.87	5.98
PK	5.89	7.82	8.46	9.20	7.84
PMG	4.63	4.68	5.52	3.98	4.70
0	3.99	4.65	3.91	3.22	3.94
Mean	5.95	6.94	7.31	7.18	6.84

MANURE KMG 100 8.08

Grand mean 6.89

TOTAL OF 2 CUTS MEAN DM% 22.6

PLOT AREA HARVESTED 0.00155

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96/R/BN/7

CLOVER

1ST CUT (10/6/96) DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	3.54	3.43	2.92	2.69	3.21	3.48	2.23	3.07

1ST CUT MEAN DM% 19.5

2ND CUT (11/11/96) DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	0.82	1.13	0.76	0.38	1.13	0.55	0.46	0.75

2ND CUT MEAN DM% 17.4

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

MANURE	D	DPK	PKMG	P	PK	PMG	0	Mean
	4.36	4.56	3.67	3.08	4.34	4.03	2.69	3.82

TOTAL OF 2 CUTS MEAN DM% 18.5

PLOT AREA HARVESTED 0.00155

https://doi.org/10.23637/ERADOC-1-51

96/R/GC/8

GARDEN CLOVER

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

The 143rd year, red clover.

For previous years see 'Details' 1967 and 1973, and 74-95/R/GC/8.

Design: 2 blocks of 2 plots.

Whole plot dimensions: 1.00 x 1.40.

Treatments:

FUNG RES	Residual effects of fungicide to control *Sclerotinia trifoliorum*:
NONE	None
BENOMYL	Benomyl sprays during previous winters, last applied November 1989.

Experimental diary:

25-Apr-96 : B : Chalk at 1.0 t, PK as (0:18:36) at 420 kg and Epsom salts at 530 kg. Hand dug, roots and stems removed.
31-May-96 : B : Raked, Merviot undressed sown at 30 kg.
18-Jun-96 : B : Irrigated 12.5 mm.
16-Oct-96 : B : Cut, hand weeded, patches re-sown with Merviot.

NOTE: Soils were sampled in March and harvested crop sampled for chemical analysis.

1ST CUT (16/10/96) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	1.91	1.78	1.84

1ST CUT MEAN DM% 19.5

PLOT AREA HARVESTED 0.00010

https://doi.org/10.23637/ERADOC-1-51 *pp 28*