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Results of the Classical and Other Long-term Experiments 2005

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2005

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**Results of the
Classical
and other
Long-term Experiments
2005**

Rothamsted Research

List of Experiments in the 2005 Yield Book

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W/CS/478	Continuous Maize

CONVENTIONS

For each experiment current treatments are shown with the factor and level names which are used in the tables.

For each experiment references are given to previous years. These refer to the '(Numerical)(Results)' previous editions of 'Yields of the Field Experiments'.

For the classical and some long-term experiments reference is made to 'Details' - separate publications, giving full descriptions of treatments until 1977 & 1973, with full titles 'Details of the Classical and Long Term Experiments up to 1977' and 'Details of the Classical and Long Term Experiments up to 1973'.

The following conventions are observed unless otherwise stated.

All areas are in hectares. All plot dimensions are in metres.

All rates of application of fertilizers, sprays etc. are per hectare.

All yields are per hectare.

For any other crop, details of abbreviations are given as necessary.

Fertilizers

27% N or 34.5% N means nitrogen as ammonium nitrate

Epsom salts	$MgSO_4 \cdot 7H_2O$ 10% magnesium and 13% sulphur
Fishmeal	approximately 6.5% nitrogen
FYM	Farmyard manure (from bullocks)
Gypsum	17.5% sulphur
Mn 500 Headland	500 g/l Manganese
Kieserite	$MgSO_4 \cdot H_2O$ 17.7% magnesium and 23.3% sulphur
Manganese sulphate	$Mn_2(SO_4)_3$ 27% manganese and 24% sulphur
Muriate of potash	60% K_2O
Nitrate of soda	$NaNO_3$ 16% nitrogen and 27% sodium
Rhodoman	A seed dressing containing 500 g/l inorganic manganese
Silicate of soda	Na_2SiO_3 37% sodium and 23% silica
Sulphur Gold	30% nitrogen and 7.6% sulphur
Sulphate of ammonia	$(NH_4)_2SO_4$ 21% nitrogen 24% sulphur
Sulphate of potash	K_2SO_4 50% K_2O and 18.4% sulphur
Triple superphosphate (TSP)	47% P_2O_5

Cereal straw is removed unless otherwise stated.

GS: Growth stage.

tm): Tank mix; two or more products applied together.
tr.: means seed dressing

Machinery definitions as used in the diary.

Accord	Pneumatic drill with Suffolk coulters 12.5 cm apart.
Combine drilled	Drill mounted behind a rotary harrow.
Dutch harrow	Rigid tine harrow
Flexitine	Heavy spring-tine cultivator.
Nodet Gougis	Pneumatic precision drill with variable spacing.
Nordsten	Drill with Suffolk coulters 12 cm apart.
Oyjord	Drill with Suffolk coulters 14.2 cm apart.
Shakerator	Deep tine cultivator with vibrating tines 60 cm apart and 45 cm deep.
Subsoiler	Deep tine cultivator with vibrating tines 60 cm apart and 45 cm deep

Tables of means

The following abbreviations are used in variate headings:

Wheat, barley, oats, beans, lupins etc.
Grain: Grain (at 85% dry matter)
Straw: Straw (at 85% dry matter)

All crops
Mean D.M. %: Mean dry matter % as harvested

Standard errors

- NOTES:** (1) This report gives standard errors of differences, not of means.
(2) Annotations (e.g. * min rep, max-min, max rep) to S.E.Ds are only explained the first time they occur in any experiment.

PESTICIDES USED

The following list of pesticides is based on The UK Pesticides Guide, CAB International and The British Crop Protection Council. CABI Publishing

KEY TO ABBREVIATIONS

A Acaricide	Ad Adjuvant
D Desiccant	F Fungicide
GR Growth regulator	H Herbicide
I Insecticide	M Molluscicide
N Nematicide	

<u>TRADE NAME</u>	<u>FUNCTION</u>	<u>ACTIVE INGREDIENT</u>
Acanto	F	250 g/l picoxystrobin
Alistel	H	220:30:30 g/l 2,4-DB + linuron + MCPA
Ally SX	H	20% w/w metsulfuron-methyl
Alpha IPU 500	H	500 g/l isoproturon
Amber	Ad	95% methylated vegetable oil
Amistar	F	250 g/l azoxystrobin
Amistar Opti	F	80:400 g/l azoxystrobin + chlorothalonil
Atlantis	H	0.6:3.0% w/w iodosulfuron-methyl-sodium + mesosulfuron-methyl
Atlas Chlormequat 700	GR	700 g/l chlormequat
Azural	H	360 g/l glyphosate
Bravo 500	F	500 g/l chlorothalonil

BioPower	Ad	6.7% w/w 3,6- dioxaeicosylsulphate sodium salt + 20.2 w/w 3,6- dioxaoctadecylsulphate sodium saly
Bromotril P	H	240 g/l bromoxynil
Corbel	F	750 g/l fenpropimorph
Claymore	H	400 g/l pendimethalin
Dow Shield	H	200 g/l clopyralid
Duplosan KV	H	600 g/l mecoprop-P
Dursban 4	I	480 g/l chlorpyrifos
Fandango	F	100:100 g/l fluoxastrobin + prothioconazole
Fludioxonil	F	fludioxonil seed treatment
Folicur	F	250 g/l tebuconazole
Gesaprim	H	500 g/l atrazine
Glyphosate 360	H	360 g/l glyphosate
Hallmark with Zeon Technology	I	100 g/l lambda-cyhalothrin
Harmony M SX	H	4:40% w/w metsulfuron-methyl + thifensulfuron-methyl
Hawk	H	12:383 g/l clodinafop-propargyl + trifluralin
Lexus Class WSB	H	33.3:16.7% w/w carfentrazone- ethyl + flupyrsulfuron-methyl
Lupus	M	3% methiocarb
MesuroI	M, I	methiocarb seed treatment
Metalaxyl-M	F	phenlyamide seed treatment
Methiocarb	M, I	methiocarb seed treatment
Nufarm Cropoil	Ad	99% highly refined mineral oil
Opus	F	125 g/l epoxiconazole
Phase 2	AD	95% w/w esterified rapeseed oil
Raxil S	F	20:20 g/l tebuconazole + triazoxide
Samson	H	4% nicosulphuron
Sibutol Secur		140:8.6:87.5 g/l bitertanol + fuberidazole + imidacloprid
Starane 2	H	200 g/l fluroxypyr
Thiram	F	600 g/l thiram seed treatment
Tolkan Liquid	H	500 g/l isoproturon
Twist	F	125 g/l trifloxystrobin
Unix	F	75% w/w cyprodinil

05/R/BK/1

BROADBALK

Object: To study the effects of organic manures and inorganic fertilisers on continuous w. wheat and wheat in rotation. 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 was 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 and potatoes replaced by maize in 1997.

The 161st year, w. wheat, w. oats and forage maize.

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 74-04/BK/1.

Areas harvested:

Wheat:	Section	
	0	0.00320
	1	0.00589
	2,3,6 and 7	0.00487
	8,9	0.00512
Oats:	5	0.00487
Maize:	4	0.00162

Treatments:

In 2001 a number of the treatments were changed. The treatments are now: -

Whole plots

PLOT	Fertilizers and organic manures	
	Treatments	
	Plot	from 2001
01 (FYM)N4	01	N4
21FYMN3	2.1	FYM N2 ⁽¹⁾
22FYM	2.2	FYM
03Nil	03	None
05 (P) KMg	05	(P) K Mg
06N1 (P) KMg	06	N1 (P) K Mg
07N2 (P) KMg	07	N2 (P) K Mg
08N3 (P) KMg	08	N3 (P) K Mg
09N4 (P) KMg	09	N4 (P) K Mg
10N4	10	N4
11N4PMg	11	N4 P Mg
12N1+3+1 (P) K2Mg2	12	N1+3+1 (P) K2 Mg2
13N4PK	13	N4 P K
14N4PK* (Mg*)	14	N4 P K* (Mg*)
15N5 (P) KMg	15	N5 (P) K Mg
16N6 (P) KMg	16	N6 (P) K Mg
17N1+4+1PKMg	17	N1+4+1 P K Mg
18N1+2+1PKMg	18	N1+2+1 P K Mg
19N1+1+1KMg	19	N1+1+1 K Mg
20N4KMg	20	N4 K Mg

(1) FYM N3 since 2005

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W. oats; Nitrogen and farmyard manure were not applied.

N1,N2,N3,N4,N5,N6: 48, 96, 144, 192, 240, 288 kg N as 33.5% N; to be applied at the same time as the second dressings in the split nitrogen plots for wheat and to the seedbed for forage maize.

Split N to wheat

N1+1+1, 1+2+1 etc: Rates as above. Timings: first two weeks of March, GS31 or mid-April (whichever comes first) and GS37/mid-May.

Split N to forage maize

N2+1,2+2,2+3,2+4: Rates as above. Timings: to the seedbed and post-emergence.

P: 35 kg P as triple superphosphate.

(P): (none), to be reviewed in 2004/5.

K: 90 kg K as potassium sulphate.

K2: 180 kg K as potassium sulphate (plus 450 kg K autumn 2000 only).

K*: 90 kg K as potassium chloride.

Mg: 12 kg Mg as kieserite.

Mg2: 24 kg Mg as kieserite (plus 60 kg Mg, autumn 2000 only).

(Mg*): (none), to be reviewed in 2004/5.

FYM: Farmyard manure at 35 t

Previous treatment: -

Whole plots

PLOT	Plot	Fertilizers and organic manures:-		
		Treatments until 1967	Treatments from 1968	Treatments from 1985 - 2000
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 ½[P K (Na) Mg]	N1+3 ½[PK Mg] (A)+
18N0+3FH	18	P K Na Mg (A)	N2 ½[P K (Na) Mg]	N0+3 ½[PK Mg] (A)+
19 (C)	19	C	C	(C) (since 1989)
20N2KMG	20	N2 K Na Mg	N2 K (Na) Mg	N2 K Mg

(A) Alternating each year

05/R/BK/1

+ This change since 1980. Treatments shown are those to w. wheat; autumn N alternates. Maize received N3 ½[PK Mg] on both plots 17 and 18. These treatments shown incorrectly in 1999-02 Yield books.

W. oats; Nitrogen and dung 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 (applied at 26 kg 1990 to 2000), 35 kg Mg every third year to other plots since 1974 (applied at 30 kg in 1991, 1994, 1997 and 2000 and at 15 kg on half rate treatments). 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: Full rate P K (Na) Mg as above H: Half rate of above

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	9	0*	8+	6**	5	3	7	4	2
Section										
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	F	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

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
1997	W	W	W	W	W	W	M	W	W	O
1998	W	W	W	W	W	W	W	O	W	M
1999	W	W	W	W	W	W	W	M	O	W
2000	W	W	W	W	W	O	W	W	M	W
2001	W	W	W	F	W	M	O	W	W	W
2002	W	W	W	W	W	W	M	W	W	O
2003	W	W	F	W	W	W	W	O	W	M
2004	W	W	F	W	W	W	W	M	O	W
2005	W	W	W	W	W	O	W	W	M	W

W = w. wheat, O = w. oats (spring oats 2001), P = potatoes, BE = s. beans, F = fallow, M = forage maize

* 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.
 (3) In 2003 and 2004 section 0 was used for an experiment (CS/595) investigating different herbicides to control *Equisetum arvense*

Experimental diary:

All sections:

- 25-Sep-04 Weedazol-TL at 30 l in 200 L (excluding Section 8 and plots 03, 05 and 19 on Section 0).
 13-Oct-04 K* Muriate of potash at 181 kg, strip 14.
 P TSP at 170 kg, strips 11, 13, 14, 17, & 18.
 18-Oct-04 FYM FYM at 35.0 tonnes, strips 2.1 & 2.2, not to Section 5. Ploughed 25 cm wide furrows.
 15-Mar-05 MG Kieserite at 80 kg, strips 5, 6, 7, 8, 9, 11, 15, 16, 17, 18, 19, & 20.
 MG2 Kieserite at 160 kg, strip 12.
 K Sulphate of potash at 217 kg, strips 5, 6, 7, 8, 9, 13, 15, 16, 17, 18, 19 & 20.
 K2 Sulphate of potash at 434 kg, strip 12.
 18-Mar-05 Rolled, not to Section 4.

05/R/BK/1

Experimental diary:

Cropped sections:

Winter wheat

05-Nov-04 Combination drilled, Hereward, tr. Sibutol Secur, at 400 seeds/m² with the Accord drill.
20-Nov-04 Lupus at 5 kg
14-Jan-05 tm)Hawk at 2.0 l in 200 l, excluding Section 8.
tm)Amber at 1.0 l in 200 l, excluding Section 8.
tm)Tolkan Liquid at 2.5 l in 200 l, excluding Section 8.
07-Mar-05 1st split N applied.
14-Apr-05 Main N and 2nd split N applied.
20-Apr-05 tm)Harmony M SX at 100 g in 200 l, excluding Section 8.
tm)Duplosan KV at 1.6 l in 200 l, excluding Section 8.
10-May-05 3rd split N applied.
15-May-05 Starane 2 at 0.5 l in 200 l, excluding Section 8.
tm)Bravo 500 at 1.0 l in 200 l, excluding Section 6.
tm)Opus at 0.75 l in 200 l, excluding Section 6.
31-May-05 tm)Opus at 0.75 l in 200 l, excluding Section 6.
tm)Amistar Opti at 1.5 l in 200 l, excluding Section 6.
tm)Corbel at 0.6 l in 200 l, excluding Section 6.
10-Aug-05 Combine harvested plots for yield, swathed straw, sampled and weighed straw.
10-Aug-05 Baled straw.
16-Aug-05 Combine harvested discards, swathed straw.
18-Aug-05 Baled remaining straw.

W. oats

06-Nov-04 Combination drilled, Gerald, tr. Sibutol Secur, at 400 seeds/m² with the Accord drill.
20-Nov-04 Lupus at 5 kg
14-Dec-04 Lexus Class WSB at 60 g in 200 l.
20-Apr-05 tm)Harmony M SX at 100 g in 200 l.
tm)Duplosan KV at 1.6 l in 200 l.
11-May-05 Corbel at 0.75 l in 200 l.
15-May-05 Starane 2 at 0.5 l in 200 l.
16-Aug-05 Combine harvested plots for yield, swathed straw.
Combined discards, swathed straw.
17-Aug-05 Sampled and weighed straw.
18-Aug-05 Baled straw.

Forage maize

07-Apr-05 Springtined.
29-Apr-05 Main N and 1st split N applied.
05-May-05 Power harrowed, drilled, Hudson, tr. Mesuro1 at 10.2 seeds/m², with the Nodet Gougis drill, rolled.
10-May-05 2nd split N applied.
11-May-05 Samson at 1.5 l in 200 l.
22-Sep-04 Cut sample areas by hand, weighed, and sampled.
26-Sep-04 Cleared maize.

NOTE: Samples of wheat and oat grain and straw, and forage maize were taken for chemical analysis. Unground wheat grain and straw from Section 1 and maize samples from Section 4 were archived.

05/R/BK/1

WHEAT

GRAIN TONNES/HECTARE

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

SECTION PLOT	7/W1	2/W2	3/W3	8/W4	6/W28	0/W1	1/W39	9/W47
01 (FYM)N4	9.55	6.69	7.87	*	6.01	*	*	*
21FYMN3	9.32	7.93	8.47	4.67	6.53	8.18	7.51	7.38
22FYM	5.66	4.40	4.34	3.86	5.29	5.14	4.18	6.03
03Nil	1.33	1.14	0.80	1.17	1.02	1.64	1.05	0.51
05 (P) KMg	1.77	1.46	0.99	1.54	0.92	1.93	1.09	0.88
06N1 (P) KMg	3.93	4.11	3.70	2.07	3.14	4.84	3.27	3.33
07N2 (P) KMg	5.45	5.09	5.38	2.35	4.89	6.28	5.12	4.98
08N3 (P) KMg	6.49	5.51	6.08	2.73	5.74	6.63	5.82	6.23
09N4 (P) KMg	8.66	6.98	7.00	3.33	6.73	8.11	7.10	7.17
10N4	5.77	5.89	4.63	1.70	2.86	5.91	3.05	2.62
11N4PMg	4.31	5.32	3.75	2.82	3.47	6.59	4.05	3.71
12N1+3+1 (P) K2Mg2	8.86	7.22	7.14	3.53	7.00	8.11	7.00	7.47
13N4PK	7.84	6.70	6.29	3.68	6.40	7.55	6.23	7.08
14N4PK* (Mg*)	8.05	7.16	6.98	4.03	6.54	8.18	7.04	7.47
15N5 (P) KMg	8.88	6.45	6.60	3.01	6.44	7.99	7.14	6.77
16N6 (P) KMg	8.74	7.46	7.29	3.98	6.98	8.38	7.41	7.43
17N1+4+1PKMg	9.07	7.82	7.66	3.77	7.25	8.54	7.13	7.09
18N1+2+1PKMg	9.07	6.79	6.90	3.51	7.06	8.18	6.03	6.71
19N1+1+1KMg	7.20	5.72	5.65	2.56	5.67	7.46	5.47	6.28
20N4KMg	*	*	*	*	*	6.13	1.63	*

GRAIN MEAN DM% 88.6

STRAW TONNES/HECTARE

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

SECTION PLOT	7/W1	8/W4	1/W39
01 (FYM)N4	5.71	*	*
21FYMN3	5.02	6.94	4.16
22FYM	1.88	5.97	1.81
03Nil	0.09	1.70	0.23
05 (P) KMg	0.19	2.81	0.16
06N1 (P) KMg	0.78	3.20	0.88
07N2 (P) KMg	1.62	3.26	1.67
08N3 (P) KMg	1.98	4.35	1.69
09N4 (P) KMg	3.95	3.62	2.57
10N4	1.17	1.84	0.69
11N4PMg	1.15	3.29	1.07
12N1+3+1 (P) K2Mg2	3.35	5.00	2.95
13N4PK	3.05	4.73	1.99
14N4PK* (Mg*)	3.11	5.72	2.85
15N5 (P) KMg	3.91	5.90	2.27
16N6 (P) KMg	4.75	6.38	3.56
17N1+4+1PKMg	5.00	6.28	3.32
18N1+2+1PKMg	4.84	5.94	2.85
19N1+1+1KMg	2.82	5.02	2.55
20N4KMg	*	*	0.38

STRAW MEAN DM% 94.1

05/R/BK/1

W. OATS

TONNES/HECTARE

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

PLOT	GRAIN	STRAW
01 (FYM) [N4]	7.44	2.67
21 [FYMN2]	7.61	3.08
22 [FYM]	6.60	1.89
03Nil	1.57	0.24
05 (P) KMg	1.34	0.11
06 [N1] (P) KMg	1.80	0.29
07 [N2] (P) KMg	3.06	0.53
08 [N3] (P) KMg	3.92	0.79
09 [N4] (P) KMg	5.56	1.31
10 [N4]	5.22	1.05
11 [N4] PMg	5.57	0.99
12 [N2] (P) K2Mg2	4.20	0.76
13 [N4] PK	5.15	1.17
14 [N4] PK* (Mg*)	5.78	1.25
15 [N5] (P) KMg	6.04	1.54
16 [N6] (P) KMg	7.50	2.41
17 [N1+4+1] PKMg	7.04	2.19
18 [N1+2+1] PKMg	3.62	0.71
19 [N1+1+1] KMg	2.48	0.34
MEAN DM%	87.7	90.0

FORAGE MAIZE

WHOLE CROP (100% DM) TONNES/HECTARE

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

PLOT	WHOLE CROP
01 (FYM)N4	20.09
21FYMN3	22.26
22FYM	14.02
03Nil	2.64
05 (P) KMg	3.21
06N1 (P) KMg	9.88
07N2 (P) KMg	13.17
08N3 (P) KMg	14.85
09N4 (P) KMg	12.20
10N4	4.06
11N4PMg	11.51
12N2+3 (P) K2Mg2	16.17
13N4PK	13.71
14N4PK* (Mg*)	17.68
15N5 (P) KMg	14.18
16N6 (P) KMg	15.01
17N2+4PKMg	14.61
18N2+2PKMg	15.68
19N2+1KMg	7.90
CROP MEAN DM%	30.1

05/R/HB/2

HOOS BARLEY

Object: To study the effects of organic manures and inorganic fertilisers 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 continued in s. barley. The experiment was modified for 2003. The Main plots continue as previously. The Silicate Test plots continue but are not split to test rates of N (basal N is applied). The remaining plots are to be used to study the effect on yield of P residues, (basal N applied).

The 154th year, s. barley.

For previous years see 'Details' 1967 and 1973, Station Report for 1966 and 74-04/HB/2.

Main plots

Treatments:

Whole plots

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

		Form of N 1852-1966	Additional treatments 1852-2002	Treatments since 2003
---	11	None	-	-
-P-	21	None	P	(P)
--K	31	None	K(Na)Mg	K(Mg)
-PK	41	None	PK(Na)Mg	(P)K(Mg)
A--	12	A	-	-
AP-	22	A	P	(P)
A-K	32	A	K(Na)Mg	K(Mg)
APK	42	A	PK(Na)Mg	(P)K(Mg)
D1852	72	None	D	D
(D)	71	None	(D)	(D)
(A)	62	None	(Ashes)	(Ashes)
-	61	None	-	-
D2001 ^(a)	73 ^(a)	-	D	D
P2KMg ^(a)	63 ^(a)	-	P2KMg	P2KMg

^(a) Plots 63 and 73 started in 2001

Form of N: A, sulphate of ammonia to supply 48kg N
 P: 35 kg P as triple superphosphate in 1974 and from 1988 to 2002, single superphosphate in other years
 (P): (none), P application to be reviewed for 2008
 P2: 44 kg P as triple superphosphate since 2001.
 K: 90 kg K as sulphate of potash
 (Na): (none) 16 kg Na as sulphate of soda until 1973
 Mg: 35 kg Mg as kieserite every third year since 1974 (applied at 30 kg in 1992, 1995 and 1998) (sulphate of magnesium annually until 1973). Annually to new plot 63.
 (Mg): (none), Mg application to be reviewed for 2008
 D1852: Farmyard manure at 35 t since 1852.
 D2001: Farmyard manure at 35 t since 2001
 (D): Farmyard manure 1852 - 1871 only
 (Ashes): Weed ash 1852-1916, furnace ash 1917-1932, none since

05/R/HB/2

Sub-plots

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

Silicate Test plots

Treatments :

Whole plots

MANURE Plot Fertilizers:

		Additional treatment 1852-1979	Changes since 1980	Treatments since 2003
N----	131	-	-	N3
NP---	231	P	-	N3 (P)
N-K--	331	K(Na)Mg	-	N3 K(Mg)
NPK--	431	PK(Na)Mg	-	N3 (P)K(Mg)
N--S-	134	Si	Si omitted	N3 (Si)
NP-S-	234	P Si	"	N3 (P) (Si)
N-KS-	334	K(Na)MgSi	"	N3 K(Mg) (Si)
NPKS-	434	PK(Na)MgSi	"	N3 (P)K(Mg) (Si)
N---S	132	-	Si added	N3 Si
NP--S	232	P	"	N3 (P) Si
N-K-S	332	K(Na)Mg	"	N3 K(Mg) Si
NPK-S	432	PK(Na)Mg	"	N3 (P)K(Mg) Si
N--SS	133	Si	-	N3 Si
NP-SS	233	P Si	-	N3 (P) Si
N-KSS	333	K(Na)MgSi	-	N3 K(Mg) Si
NPKSS	433	PK(Na)MgSi	-	N3 (P)K(Mg) Si

N: From 1852-1966 whole plots received 48kg N as nitrate of soda. Between 1968-2002 whole plots were split to test 4 rates of N as "Nitro-chalk" (cumulative applications until 1973, on a cyclic system from 1974).

N3: Basal N, 144kg as "Nitro-chalk" since 2003

Si: Silicate of soda at 450kg (Note: S also refers to silicate of soda)

(Si): Silicate of soda omitted since 1980

P, (P), K, Mg, (Mg), (Na): as above

P Test plots

Treatments:

Since 2003 the remaining plots [ex-Castor meal (plots 14, 24, 34 & 44) and those testing combinations of NPK with and without Mg (plots 55, 56, 57 & 58)] have been used to study the effect of P residues on yield. Previous treatments have resulted in different levels of available P in the soil. Large dressings of K were applied to some plots to increase levels of exchangeable K in the soil such that K should not limit yield; plots 141 and 241 were sacrificed and used as discard areas so that the K applications did not encroach on adjacent no K plots on the Silicate Test. Other plots received the normal rate of K. The level of exchangeable Mg in the soil is such that Mg should not limit yield; the need to apply Mg will be reviewed for 2008.

05/R/HB/2

Whole plots
Manure

Plot	Treatment since 2003
142	N3K*
143	N3K*
144	N3K*
242	N3K*
243	N3K*
244	N3K*
341	N3K
342	N3K
343	N3K
344	N3K
441	N3K
442	N3K
443	N3K
444	N3K
551	N3K
552	N3K
561	N3K
562	N3K
571	N3K*
572	N3K*
581	N3K*
582	N3K*

N3: Basal N, 144kg as "Nitro-chalk"
K : 90kg K as sulphate of potash
K*: 450kg K as sulphate of potash

In 2005 the extra dressings of K (ie K*) was stopped and the whole experiment reverted to K dressings of 90 kg K/ha/year.

Experimental diary:

18-Oct-04 : B : Glyphosate 360 at 3.0 l in 200 l.
04-Nov-04 : T : : P, K, Mg (to plot 63) applied.
05-Nov-04 : T : : Si and FYM applied
 : B : : Ploughed 25 cm wide furrow.
19-Feb-05 : B : : Springtined, combination drilled, Optic, tr. Raxil
 : S, at 375 seeds/m² with the Accord drill.
21-Apr-05 : T : : N (27% N) to Main plots (old Series O, A).
22-Apr-05 : T : : N (34.5% N) to remainder.
15-May-05 : B : : tm)Corbel at 0.75 l in 200 l.
 : B : : tm)Fandango at 1.0 l in 200 l.
 : B : : tm)Harmony M SX at 100 g in 200 l.
11-Jul-05 : : Hand rogued wild oats.
30-Aug-05 : B : : Combine harvested plots for yield.
 : B : : Sampled and weighed straw.
01-Sep-05 : B : : Combine harvested discards, swathed straw.
02-Sep-05 : B : : Baled straw.

NOTE: Samples of grain and straw were taken for chemical analysis.
Unground grain and straw samples from selected treatments were archived.

05/R/HB/2

MAIN PLOTS

GRAIN TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	0.84	0.67	1.09	1.06	0.92
-P-	2.17	3.75	3.33	3.55	3.20
--K	0.72	1.07	1.41	1.30	1.12
-PK	1.34	2.98	5.19	3.90	3.35
A--	0.64	1.28	1.24	0.97	1.03
AP-	2.51	2.73	1.97	2.68	2.47
A-K	0.70	0.88	1.09	1.18	0.96
APK	2.10	3.93	5.39	5.69	4.28
D1852	5.98	6.52	7.48	7.53	6.88
(D)	0.80	1.56	2.53	4.98	2.47
(A)	1.07	1.32	2.76	1.96	1.78
-	0.83	0.90	1.25	1.15	1.03
D2001	4.83	5.84	6.94	6.97	6.15
P2KMg	2.76	4.87	5.51	6.59	4.93
Mean	1.95	2.73	3.37	3.54	2.90

GRAIN MEAN DM% 91.6

STRAW TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	0.31	0.26	0.61	0.56	0.43
-P-	0.75	1.83	1.46	1.60	1.41
--K	0.25	0.49	0.60	0.65	0.50
-PK	0.44	0.99	1.32	1.48	1.06
A--	0.26	0.52	0.49	0.49	0.44
AP-	0.93	1.03	0.85	1.03	0.96
A-K	0.22	0.30	0.21	0.44	0.29
APK	0.58	1.70	2.48	2.70	1.86
D1852	2.52	3.36	3.80	4.09	3.45
(D)	0.25	0.63	0.97	1.89	0.93
(A)	0.51	0.60	0.65	0.98	0.68
-	0.60	0.43	0.63	0.51	0.54
D2001	2.01	2.95	2.41	3.72	2.78
P2KMg	0.93	1.61	2.67	2.82	2.01
Mean	0.76	1.19	1.37	1.64	1.24

Straw Mean DM% 84.8

05/R/HB/2

SILICATE PLOTS

GRAIN TONNES/HECTARE

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

	PK	N3--	N3P-	N3-K	N3PK	Mean
Silicate						
(-)-		2.14	3.07	1.43	6.31	2.61
(Si)-		2.18	4.34	2.84	6.36	4.13
(-)Si		3.00	4.64	2.55	6.14	2.51
(Si)Si		3.11	4.47	3.23	6.35	6.29
Mean		2.61	4.13	2.51	6.29	3.89

GRAIN MEAN DM% 88.5

PHOSPHATE PLOTS

GRAIN TONNES/HECTARE

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

PLOTS	
142	3.28
143	3.11
144	2.82
242	6.33
243	6.24
244	5.90
341	3.54
342	4.18
343	4.21
344	4.80
441	6.28
442	6.34
443	6.34
444	6.08
551	5.58
552	5.27
561	4.94
562	4.66
571	3.35
572	3.92
581	1.52
582	1.27
Mean	4.54

GRAIN MEAN DM% 88.4

PLOT AREA HARVESTED 0.00256

05/R/WF/3

WHEAT AND FALLOW

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

The 150th year, w. wheat.

For previous years see 'Details' 1967, 1973 and 74-04/R/WF/3.

Whole plot dimensions: 9 x 211.

Treatments:

Two plots, one sown to w. wheat, one fallow; alternating in successive years.

Experimental diary:

29-Sep-04 : : Ploughed, 25 cm wide furrows.
30-Sep-04 : : Cultipressed
05-Oct-04 : : Flexitined
06-Oct-04 : : Combination drilled, Hereward, tr. Sibutol Secur, at
350 seeds/m² with the Accord drill.
: : Rolled.
25-Nov-04 : : tm)Hawk at 2.0 l in 200 l to wheat plot.
: : tm)Alpha IPU 500 at 2.5 l in 200 l to wheat plot.
: : tm)Nufarm Cropoil at 1.0 l in 200 L to wheat plot.
: : tm)Hallmark with Zeon Technology at 50 ml in 200 L to
wheat plot.
07-Apr-05 : : Springtined fallow plot.
29-Apr-05 : : tm)Opus at 0.75 l in 200 l to wheat plot.
: : tm)Bravo 500 at 1.0 l in 200 l to wheat plot.
: : tm)Atlas Chlormequat 700 at 2.25 L in 200 L to wheat
plot.
03-May-05 : : Ally SX at 30 g in 200 l to wheat plot.
13-May-05 : : Flexitined fallow plot.
15-May-05 : : tm)Opus at 0.75 l in 200 l to wheat plot.
: : tm)Bravo 500 at 1.0 l in 200 l to wheat plot.
: : tm)Starane 2 at 0.5 l in 200 L to wheat plot.
31-May-05 : : tm)Opus at 0.75 l in 200 l to wheat plot.
: : tm)Amistar Opti at 1.5 l in 200 l to wheat plot.
06-Jun-05 : : Power harrowed.
12-Jul-05 : : Power harrowed.
16-Aug-05 : : Combine harvested, plot for yield, swathed straw.
17-Aug-05 : : Sampled and weighed straw.

NOTE: Unground grain and straw was archived.

GRAIN AND STRAW YIELDS TONNES/HECTARE

	GRAIN	STRAW
YIELD	1.92	0.48
MEAN DM%	86.1	88.6
PLOT AREA HARVESTED	0.04431	

05/R/EX/4

EXHAUSTION LAND

Object: To study the residual effects of manures applied 1856-1901, and of additional phosphate applied since 1986, on the yield of continuous s. barley up to 1991, w. wheat since - Hoosfield.

The 150th year, w. wheat.

For previous years see 'Details' 1977, 1973 and 74-04/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** Maintenance P (20 kg P) applied annually from 2000 to maintain existing levels of available P in the soil. (P1) (P2) and (P3) are residues of P applied annually 1986-1992:

	2000-04	1986-92
O	None	None
P(P1)	20 kg P	44 kg P
P(P2)	20 kg P	87 kg P
P(P3)	20 kg P	131 kg P

NOTE: P treatments were applied at 61.5 kg P in error in 2000.

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 |

Whole plots

Nitrogen: 50 kg N as ammonium sulphate (to supply sufficient S) during first two weeks in March, 200kg N as ammonium nitrate at GS31/mid-April (whichever comes first) and 50 kg N as ammonium nitrate at GS37 (not later than mid-May)

Experimental diary:

K test:

29-Sep-04 : T : P : P basal:(triple superphosphate at 98 kg), plots 2, 4, 6, 8 & 10.

P test:

29-Sep-04 : T : K : K basal/124.5 kg (muriate of potash at 250 kg)*, plots 1, 3, 5, 7 & 9.
: T : P : P test:(triple superphosphate at 98 kg), plots 011-013, 031-033, 051-053, 071-073, & 091-093.

All plots

29-Sep-04 : B : : Ploughed 25 cm wide furrows.
30-Sep-04 : B : : Cultipress.

05-Oct-04 : B : : Flexitined, combination drilled, Xi/19, tr. Sibutol
 Secur at 350 seeds/m².
 : B : : Rolled.
 25-Nov-04 : B : : tm)Hawk at 2.0 l in 200 l.
 : B : : tm)Alpha iPU 500 at 2.5 l in 200 l.
 : B : : tm)Nufarm Cropoil at 1.0 l in 200 l.
 : B : : tm)Hallmark with Zeon Technology at 50 ml in 200 l.
 15-Mar-05 : B : : Ammonium sulphate (21% N) at 238 kg
 14-Apr-05 : B : : 34.5% N at 580 kg.
 29-Apr-05 : B : : tm)Opus at 0.75 l in 200 l.
 : B : : tm)Bravo 500 at 1.0 l in 200 l.
 : B : : tm)Atlas Chlormequat 700 at 2.25 l in 200 l.
 03-May-05 : B : : Ally SX at 30 g in 200 l.
 10-May-05 : B : : 34.5% N at 145 kg.
 15-May-03 : B : : tm)Bravo 500 at 1.0 l in 200 l.
 : B : : tm)Opus at 0.75 l in 200 l.
 : B : : tm)Starane 2 at 0.5 l in 200 l.
 31-May-05 : B : : tm)Opus at 0.75 l in 200 l.
 : B : : tm)Amistar Opti at 1.5 l in 200 l.
 07-Jun-05 : B : : tm)Amistar at 0.3 l in 200 l.
 : B : : tm)Folicur at 0.3 l in 200 l.
 : B : : tm)Dursban 4 at 0.6 l in 200 l.
 25-Jul-05 : B : : Rotavate down paths
 16-Aug-05 : B : : Combine harvested, plots for yield, straw swathed.
 17-Aug-05 : B : : Straw sampled and weighed.

* this is wrongly entered for the 2001 - 2004 Yield Books which incorrectly stated that the basal K was 100 kg K.

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

P TEST

GRAIN TONNES/HECTARE

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

	P	O	P(P1)	P(P2)	P(P3)	Mean
OLD_RES						
O		4.35	9.80	9.75	9.50	8.35
D		7.85	9.98	9.61	9.42	9.21
N		4.85	9.57	10.37	9.35	8.53
P		7.84	10.18	10.35	9.55	9.48
NPKNAMG		6.59	9.44	9.49	9.79	8.83
Mean		6.30	9.79	9.91	9.52	8.88

GRAIN MEAN DM% 87.1

STRAW TONNES/HECTARE

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

	P	O	P(P1)	P(P2)	P(P3)	Mean
OLD_RES						
O		1.87	4.70	5.23	4.84	4.16
D		3.24	5.38	5.63	5.62	4.97
N		2.13	4.16	5.19	4.47	3.99
P		3.44	5.28	5.58	5.27	4.89
NPKNAMG		2.95	5.09	5.33	4.60	4.49
Mean		2.73	4.92	5.39	4.96	4.50

STRAW MEAN DM% 88.4

PLOT AREA HARVESTED 0.00538

05/R/EX/4

K TEST

GRAIN TONNES/HECTARE

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

OLD_RES	
O	6.31
D	6.72
N*	6.50
PK	7.79
N*PK	7.00
Mean	6.87

GRAIN MEAN DM% 87.7

STRAW TONNES/HECTARE

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

OLD_RES	
O	3.44
D	4.18
N*	3.51
PK	4.41
N*PK	3.62
Mean	3.83

STRAW MEAN DM% 89.7

PLOT AREA HARVESTED 0.00538

05/R/PG/5

PARK GRASS

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

The 150th year, hay.

For previous years see 'Details' 1977 and 1973 and 74-04/R/PG/5.

Treatments: Combinations of:-

Whole plots

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

N1	Plot 1	N1
K	Plot 2/1	K since 1996 (as 2/2 before)
None (FYM)	Plot 2/2	None (FYM until 1863)
None	Plot 3	None
P	Plot 4/1	P
N2P	Plot 4/2	N2 P
N1PKNaMg	Plot 6	N1 P K Na Mg
PKNaMg	Plot 7	P K Na Mg
PNaMg	Plot 8	P Na Mg
PKNaMg (N2)	Plot 9/1	P K Na Mg (N2 until 1989)
N2PKNaMg	Plot 9/2	N2 P K Na Mg
N2FNaMg	Plot 10	N2 P Na Mg
N3PKNaMg	Plot 11/1	N3 P K Na Mg
N3PKNaMgSi	Plot 11/2	N3 P K Na Mg Si
None	Plot 12	None
(FYM/F)	Plot 13/1	None (FYM/F until 1993/1995)
FYM/PM	Plot 13/2	FYM/PM (F until 1999)
PKNaMg (N2*)	Plot 14/1	P K Na Mg (N2* until 1989)
N2*PKNaMg	Plot 14/2	N2* P K Na Mg
PKNaMg (N2*)	Plot 15	P K Na Mg (N2* until 1875)
N1*PKNaMg	Plot 16	N1* P K Na Mg
N1*	Plot 17	N1*
N2KNaMg	Plot 18	N2 K Na Mg
FYM	Plot 19	FYM
FYM/N*PK	Plot 20	FYM/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 in years with no farmyard manure)	
P:	35 kg P (15 kg P to plot 20 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 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	
FYM:	Farmyard manure at 35 t every fourth year	
F:	Fishmeal every fourth year to supply 63 kg N (stopped 1999; replaced by PM)	

05/R/PG/5

1. **Manure** Fertilizers and organic manures(cont.)
- PM Pelleted poultry manure at 2 t, every fourth year to supply 63 kg N (started 2003)
- Sub-plots
2. **Lime** Liming plots 1-18 (excluding 18/2):
- a Ground chalk applied as necessary to achieve pH7
- b Ground chalk applied as necessary to achieve pH6
- c Ground chalk applied as necessary to achieve pH5
- d None

NOTE: Lime was applied regularly 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 was applied in 2003, the fourth application in a triennial scheme of soil pH analysis and remedial chalk applications.

[This note was incorrect in 97-01/R/PG/5 Yield book entries.]

Lime Liming plots 18-20:

NOTE: Differential rates of lime were applied to sub-plots 2 and 3 regularly 1920-1974. Since 1975 plot 18-1 has been split into two for treatments 'c' and 'd' as 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.

[This note was incorrect in 97-01/R/PG/5 Yield book entries.]

Experimental diary:

31-Jan-05 : T : : P applied.
: T : : K applied to plot 2/1.
02-Feb-05 : T : : K (remainder), Si, Na, Mg applied.
04-Feb-05 : T : : FYM applied.
~~27-Apr-05 : T : : N applied.~~
15-Mar-05 : B : : Rolled.
05-Apr-05 : T : : N applied (N* applied to plot 20 in error).
09-May-05 : : : Cut paths.
07-Jun-05 : : : Cut paths.
20-Jun-05 : T : : Cut sample areas for yield, sampled and weighed, and carted cut grass.
21-Jun-05 : T : : Cut sample areas for yield, sampled and weighed, and carted cut grass. Cut discards.
22-Jun-05 : B : : Turned hay.
23-Jun-05 : B : : Turned hay.
: B : : Rowed up and baled hay.
01-Nov-05 : T : : Cut sample areas for yield, sampled and weighed, and carted cut grass.
14-Nov-04 : B : : Cut discards and baled.

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

05/R/PG/5

1ST CUT (20-21/6/05) DRY MATTER TONNES/HECTARE

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

Manure	Lime	a	b	c	d	Mean
N1	1	3.03	2.24	1.78	0.82	1.97
K	2/1	1.96	2.15	1.04	1.11	1.56
None (FYM)	2/2	1.87	2.29	0.94	1.04	1.53
None	3	1.86	2.26	1.20	1.30	1.65
P	4/1	2.79	2.84	2.09	1.90	2.40
N2P	4/2	3.35	2.89	3.53	2.14	2.98
N1PKNaMg	6	6.18	5.74			5.96
PKNaMg	7	5.88	6.15	4.18	2.67	4.72
PNaMg	8	2.48	2.56	2.34	2.16	2.38
PKNaMg (N2)	9/1	5.58	5.50	4.51	2.90	4.62
N2PKNaMg	9/2	6.52	6.40	5.09	4.45	5.62
N2PNaMg	10	3.56	3.17	3.42	3.32	3.37
N3PKNaMg	11/1	6.79	6.47	5.30	4.69	5.82
N3PKNaMgSi	11/2	7.01	7.11	5.61	5.68	6.35
None	12	2.46	2.28	1.53	1.41	1.92
(FYM/F)	13/1	4.00	4.00	3.12	2.83	3.49
FYM/PM	13/2	4.41	5.70	4.95	4.31	4.84
PKNaMg (N2*)	14/1	4.42	4.94	4.53	4.09	4.50
N2*PKNaMg	14/2	5.05	5.27	4.79	6.03	5.29
PKNaMg (N2*)	15	5.31	5.61	3.41	2.62	4.24
N1*PKNaMg	16	4.87	5.39	4.45	3.95	4.67
N1*	17	2.48	2.83	2.25	2.38	2.48
N2KNaMg	18	3.07	4.23	4.10	2.02	3.36
N2KNaMg	18/2					3.84
FYM	19/1					4.24
FYM	19/2					5.08
FYM	19/3					3.76
FYM/N*PK	20/1					5.80
FYM/N*PK	20/2					6.30
FYM/N*PK	20/3					5.53

1ST CUT MEAN DM% 30.1

05/R/PG/5

2ND CUT (1/11/05) DRY MATTER TONNES/HECTARE

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

	Manure	Lime	a	b	c	d	Mean
	N1	1	0.73	0.63	0.38	0.11	0.46
	K	2/1	0.76	0.62	0.50	0.39	0.56
	None (FYM)	2/2	0.51	0.77	0.47	0.39	0.53
	None	3	0.60	0.93	0.53	0.50	0.64
	P	4/1	0.87	0.62	0.57	0.37	0.61
	N2P	4/2	0.72	0.91	0.68	0.84	0.79
	N1PKNaMg	6	1.07	1.12			1.09
	PKNaMg	7	1.30	1.37	0.93	0.50	1.02
	PNaMg	8	0.44	0.56	0.57	0.58	0.54
	PKNaMg (N2)	9/1	1.29	1.17	0.85	0.29	0.90
	N2PKNaMg	9/2	1.12	1.28	1.05	2.11	1.39
	N2PNaMg	10	0.64	0.86	1.00	1.57	1.02
	N3PKNaMg	11/1	1.94	1.82	1.64	2.12	1.88
	N3PKNaMgSi	11/2	2.20	1.78	1.62	1.97	1.89
	None	12	0.81	1.07	0.94	0.64	0.87
	(FYM/F)	13/1	2.05	1.77	1.52	0.81	1.54
	FYM/PM	13/2	1.54	2.52	1.56	1.40	1.76
	PKNaMg (N2*)	14/1	1.30	1.38	1.06	0.91	1.16
	N2*PKNaMg	14/2	1.11	1.62	1.72	1.45	1.47
	PKNaMg (N2*)	15	1.10	1.15	0.70	0.37	0.83
	N1*PKNaMg	16	1.04	1.21	1.07	0.82	1.03
	N1*	17	0.62	0.86	0.81	0.82	0.78
	N2KNaMg	18	1.04	1.33	1.11	0.45	0.98
	N2KNaMg	18/2					1.66
	FYM	19/1					1.56
	FYM	19/2					1.77
	FYM	19/3					1.08
	FYM/N*PK	20/1					1.41
	FYM/N*PK	20/2					1.56
	FYM/N*PK	20/3					1.24

2ND CUT MEAN DM% 27.0

05/R/PG/5

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

	Manure	Lime	a	b	c	d	Mean
	N1	1	3.76	2.87	2.16	0.93	2.43
	K	2/1	2.72	2.76	1.54	1.49	2.13
	None (FYM)	2/2	2.37	3.05	1.41	1.43	2.06
	None	3	2.46	3.19	1.72	1.79	2.29
	P	4/1	3.65	3.46	2.66	2.27	3.01
	N2P	4/2	4.07	3.79	4.21	2.98	3.76
	N1PKNaMg	6	7.25	6.86			7.05
	PKNaMg	7	7.18	7.52	5.11	3.16	5.74
	PNaMg	8	2.92	3.12	2.90	2.74	2.92
	PKNaMg (N2)	9/1	6.88	6.67	5.36	3.19	5.52
	N2PKNaMg	9/2	7.64	7.68	6.14	6.56	7.01
	N2PNaMg	10	4.20	4.03	4.42	4.90	4.39
	N3PKNaMg	11/1	8.73	8.29	6.95	6.81	7.70
	N3PKNaMgSi	11/2	9.21	8.89	7.23	7.65	8.24
	None	12	3.26	3.35	2.48	2.05	2.79
	(FYM/F)	13/1	6.05	5.78	4.64	3.64	5.03
	FYM/PM	13/2	5.95	8.22	6.51	5.71	6.60
	PKNaMg (N2*)	14/1	5.72	6.32	5.59	5.00	5.66
	N2*PKNaMg	14/2	6.16	6.89	6.51	7.48	6.76
	PKNaMg (N2*)	15	6.42	6.77	4.12	2.99	5.07
	N1*PKNaMg	16	5.91	6.59	5.52	4.77	5.70
	N1*	17	3.10	3.68	3.05	3.20	3.26
	N2KNaMg	18	4.11	5.56	5.21	2.48	4.34
	N2KNaMg	18/2					5.50
	FYM	19/1					5.79
	FYM	19/2					6.85
	FYM	19/3					4.84
	FYM/N*PK	20/1					7.21
	FYM/N*PK	20/2					7.86
	FYM/N*PK	20/3					6.76

TOTAL OF 2 CUTS MEAN DM% 28.6

05/R/GC/8

GARDEN CLOVER

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

The 152nd year, red clover.

For previous years see 'Details' 1967 and 1973, and 74-04/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 <i>Sclerotinia trifoliorum</i> :
NONE	None
BENOMYL	Benomyl sprays during previous winters, last applied November 1989.

Experimental diary:

09-Jun-05 First Cut
04-Oct-05 Second Cut

05/R/GC/8

1ST CUT (9/6/05) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	1.24	1.21	1.23

1ST CUT MEAN DM% 21.9

1ST CUT PLOT AREA HARVESTED 0.00014

2ND CUT (4/10/05) DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	2.32	3.37	2.85

2ND CUT MEAN DM% 26.1

2ND CUT PLOT AREA HARVESTED 0.00014

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

FUNG RES	NONE	BENOMYL	Mean
	3.56	4.58	4.07

TOTAL OF 2 CUTS MEAN DM% 24.0

05/R/CS/326 and 05/W/CS/326

AMOUNTS OF STRAW

Object: To study the effects of different amounts of straw, incorporated into the soil, on w. wheat - Rothamsted (R) Great Knott III, Woburn (W) Far Field I.

Sponsors: M.J. Glendining, P.C. Brookes.

The 18th year, w. wheat.

For previous years see 87-04/R & W/CS/326.

Design: 4 randomised blocks of 4 plots (R).
3 randomised blocks of 4 plots (W).

Whole plot dimensions: 3.0 x 13.5 (R). 0.004 ha
3.0 x 14.5 (W).

Treatments:

STRAW Amounts of straw incorporated into the seedbed, cumulative to previous annual dressings:

		R	W
NONE	None	-	-
NORMAL	Normal	4.31	1.68
2 NORMAL	Twice normal	8.62	3.36
4 NORMAL	Four times normal	17.24	6.72

Experimental diary:

Great Knott III (R):

02-Sep-04 : T : : Straw treatments applied.
07-Sep-04 : T : : Chopped straw.
21-Sep-04 : B : : Ploughed 35 cm furrows.
22-Sep-04 : B : : Cultipress
27-Sep-04 : B : : Combination drilled, Hereward, tr. Sibutol Secur, at 350 seeds/m² with the Accord drill, rolled.
05-Nov-04 : B : : tm)Claymore at 3.3 l in 200 l.
: B : : tm)Alpha IPU 500 at 2.5 l in 200 l.
: B : : tm)Hallmark with Zeon Technology at 50 ml in 200 l.
19-Mar-05 : B : : tm)Duplosan KV at 1.5 l in 200 l.
: B : : tm)Atlantis at 0.4 l in 200 l.
: B : : tm)Biopower at 1.0 l in 200 l.
03-Apr-05 : B : : Sulphur Gold at 167 kg. (50 kg N).
30-Apr-05 : B : : 34.5% N at 406 kg. (140 kg N).
27-May-05 : B : : tm)Opus at 0.75 l in 200 l.
: B : : tm)Twist at 0.8 l in 200 l.
: B : : tm)Starane 2 at 0.75 l in 200 l.
17-Aug-05 : B : : Combine harvested plots for yield, combined discards, swathed straw and weighed.

05/R/CS/326 and 05/W/CS/326

Experimental diary:

Far Field I (W):

07-Sep-04 : T : : Straw treatments applied.
26-Sep-04 : B : : Glyphosate 360 at 4.0 l in 200 l.
02-Oct-04 : B : : Ploughed 35 cm furrows.
: B : : Power harrowed, drilled, Hereward, tr. Sibutol Secur
at 350 seeds/m² with the Accord drill.
14-Nov-04 : B : : tm)Claymore at 2.5 l in 200 l.
: B : : tm)Alpha IPU 500 at 2.5 l in 200 l.
: B : : tm)Hallmark with Zeon Technology at 50 ml in 200 l.
09-Apr-05 : B : : Sulphur Gold 30% N, 7.6% S at 167 kg.
14-May-05 : B : : Sulphur Gold 30% N, 7.6% S at 467 kg.
15-May-05 : B : : tm)Opus at 0.75 l in 200 l.
: B : : tm)Amistar Opti at 1.5 l in 200 l.
: B : : tm)Starane 2 at 0.5 l in 200 l.
09-Jun-05 : B : : tm)Amistar at 0.3 l in 200 l.
: B : : tm)Opus at 0.5 l in 200 l.
02-Sep-05 : T : : Combine harvested plots for yield, combined
discards, swathed straw, sampled, baled and weighed
straw.

NOTE: Grain and straw samples were taken for N analysis.

05/R/CS/326

GRAIN TONNES/HECTARE

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

STRAW	
NONE	8.37
NORMAL	7.98
2 NORMAL	8.17
4 NORMAL	7.87
Mean	8.10

*** Standard errors of differences of means ***

STRAW
0.224

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
Blocks.Plots	9	0.317	3.9

GRAIN MEAN DM% 85.2

STRAW TONNES/HECTARE

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

STRAW	
NONE	5.81
NORMAL	5.39
2 NORMAL	5.74
4 NORMAL	5.54
Mean	5.62

STRAW MEAN DM% 93.6

PLOT AREA HARVESTED 0.00284

05/W/CS/326

GRAIN TONNES/HECTARE

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

STRAW	
NONE	5.88
NORMAL	5.15
2 NORMAL	5.62
4 NORMAL	5.95
Mean	5.65

*** Standard errors of differences of means ***

STRAW
0.290

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
Blocks.Plots	6	0.355	6.3

GRAIN MEAN DM% 89.0

STRAW TONNES/HECTARE

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

STRAW	
NONE	2.51
NORMAL	3.27
2 NORMAL	2.94
4 NORMAL	2.50
Mean	2.80

STRAW MEAN DM% 92.3

PLOT AREA HARVESTED 0.00305

05/R/CS/477

CONTINUOUS MAIZE

Object: To monitor the fate of organic carbon in the soil organic matter - Hoosfield.

Sponsors: P.R. Poulton and A.J. Macdonald.

The ninth year, forage maize and s. barley.

For previous years see 97-04/R/CS/477

Design: 3 randomised blocks of 6 plots.

Plot dimensions: 12.0 x 25.0.

Treatments:-

CROP	Crop and straw treatments:
M	Continuous maize, stubble incorporated
(M)B	S. barley after five years maize, stubble incorporated
MT	Maize, stubble plus 10 t maize tops incorporated
(B)M	Maize, after three years of s. barley with straw removed
BT	Continuous spring barley, straw removed plus 10 t maize tops incorporated
B	Continuous spring barley, straw removed

Experimental diary:

07-Oct-04 : T : BT, MT : Maize tops at 300 kg per plot
29-Oct-04 : B : : Muriate of potash at 180 kg.
: B : : Triple superphosphate at 170 kg.
01-Nov-04 : B : : Ploughed 25 cm wide furrows.
07-Apr-05 : B : : Springtined.
: T : (M)B, BT, B: Combination drilled, Optic, tr. Raxil S, at 350 seeds/m² with the Accord drill.
: T : (M)B, BT, B: Rolled.
22-Apr-05 : B : : Sulphur Gold (30% N, 7.6% S) at 400 kg.
05-May-05 : T : (B)M, MT, M: Power harrowed.
: T : (B)M, MT, M: Drilled, Hudson, tr. Thiram, Methiocarb, Fludioxonil, Metalaxyl M, at 10.2 seeds/m² with the Nodet Gougis drill.
11-May-05 : T : (B)M, MT, M: Samson at 1.5 l in 200 l.
15-May-05 : T : (M)B, BT, B: tm)Corbel at 0.75 l in 200 l.
: : : tm)Fandango at 1.0 l in 200 l.
: : : tm)Harmony M SX at 100 g in 200 l.
22-Jun-05 : T : (B)M, MT, M: Dow Shield at 0.5 l in 200 l.
13-Jul-05 : T : (B)M, MT, M: Dow Shield at 1.0 l in 200 l.
30-Aug-05 : T : (M)B, BT, B: Combine harvested plots for yield, swathed straw.
01-Sep-05 : T : (M)B, BT, B: Combine harvested discards, swathed straw.
02-Sep-04 : T : (M)B, BT, B: Baled.
22-Sep-04 : T : (B)M, MT, M: Cut sample areas by hand, weighed and sampled.
17-Oct-05 : T : (B)M, MT, M: Harvested discards.

NOTE: Forage maize and barley grain samples were taken for N analysis.

05/R/CS/477

MAIZE

WHOLE CROP (AT 100% DRY MATTER) TONNES/HECTARE

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

CROP	
M	11.94
(B)M	13.99
MT	12.34
Mean	12.76

*** Standard errors of differences of means ***

CROP
0.970

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
Blocks.Plots	4	1.188	9.3

MEAN DM% 30.3

PLOT AREA HARVESTED 0.00108

SPRING BARLEY

GRAIN TONNES/HECTARE

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

CROP	
(M)B	5.31
BT	5.37
B	5.04
Mean	5.24

*** Standard errors of differences of means ***

CROP
0.281

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
Blocks.Plots	4	0.344	6.6

GRAIN MEAN DM% 89.4

PLOT AREA HARVESTED 0.00525

05/W/RN/3

LEY/ARABLE

Object: To compare the effects on soil fertility of rotations with or without leys - Woburn, Stackyard D.

Sponsors: P.R. Poulton and A.J. Macdonald.

The 68th year, leys, w. beans, w. wheat, w. rye, forage maize.

For previous years see 'Details' 1967 & 1973 and 74-04/W/RN/3.

Design: 5 series of 8 plots, split for treatments other than rotations.

Whole plot dimensions: 8.53 x 40.7.

Treatments: All phases of four five-course rotations were originally present:

ROTATION

LEY	Clover/grass ley:	L, L, L, P, W
CLO	All legume ley:	SA, SA, SA, P, W until 1971 then CL, CL, CL, P, W
A	Arable with roots:	P, R, C, P, W until 1971 then P, B, B, P, W
A H	Arable with hay:	P, R, H, P, W until 1971 then P, B, H, P, W

P = potatoes, R = w. rye, C = carrots, W = w. wheat, B = s. barley,
H = hay, L = clover/grass ley, SA = sainfoin ley, CL = red clover ley

Rotations themselves followed different cycles:

On four plots in each block the rotations were repeated

On four plots in each block arable rotations alternated each five years with ley rotations

From 1976 all the rotations were changed on all phases except for the first and second test crops in 1976:

LN 3	(Previous LEY) LN1, LN2, LN3, W, R
LC 3	(Previous CLO) LC1, LC2, LC3, W, R
AF	(Previous A) F, F, BE, W, R
AB	(Previous A H) B, B, BE, W, R

From 1998 rotations AF and AB are replaced by AM and ABe respectively. Phased in at the beginning of each treatment crop sequence.

AM	R, BE, M, W, R
ABe	R, M, BE, W, R

05/W/RN/3

ROTATION (continued)

LN1 to LN3 = three year grass ley with N, 1st year to 3rd year,
LC = clover/grass ley, no N, BE = beans (s. oats until 1980), F = fallow,
M = forage maize

Plots hitherto in alternating rotations were changed to
test eight-year leys and two test crops:

LLN LLN1, LLN2, LLN3, LLN4, LLN5, LLN6, LLN7, LLN8, W, R
LLC LLC1, LLC2, LLC3, LLC4, LLC5, LLC6, LLC7, LLC8, W, R

LLN1 to LLN8 = eight year grass ley with nitrogen, first year to eighth
year, similarly for LLC - clover/grass ley, no nitrogen

The new scheme started by sowing these new leys in spring 1976 on four
phases and in spring 1977 on the fifth phase (2nd test crop in 1976).

In 1992 w. rye (R) replaced s. barley (B) as the second test crop.

Yields are taken from the leys, arable treatment crops and the test crops.

Treatments to first test crop w. wheat, all combinations of:

Whole plots:

1. **ROTATION** Rotations before wheat:

LLN 8
LN 3
LLC 8
LC 3
AM
ABe

1/2 plots:

2. **NSPLIT(FYM res)** Farmyard manure residues, last applied 1960s:

Nsplit(noFYM)
Nsingle(FYM)

1/8 plots:

3. **N** Nitrogen fertilizer in spring 2005 (kg N) as 27% N:

0
70)as a 40 + 30)split dressings
140)single OR 40 + 100)late Feb/early Mar
210)dressing 40 + 170)and GS31 or mid-Apr

05/W/RN/3

Treatments to second test crop w. rye, all combinations of:

Whole plots:

1. **ROTATION** Rotations before first test crop:

LLN 8
LN 3
LLC 8
LC 3
AF
AB

1/2 plots:

2. **NSPLIT(FYM res)** Farmyard manure residues, last applied 1960s:

Nsplit to wheat in 2004(noFYM)
Nsingle to wheat in 2004 (FYM)

1/8 plots:

3. **N** Nitrogen fertilizer in spring 2005(kg N) as 27% N:

0
40
80
120

Treatments to leys:

FYM RES Farmyard manure residues:

NONE
FYM 38 t on each occasion, last applied 1960s.

NOTE: Corrective K dressings (kg K₂O) as muriate of potash, applied where necessary to first test crop w. wheat and long-term leys in the wheat block, applied 13 October 2004.

Continuous rotations before wheat	No FYM half plots	FYM Res half plots
ABe	360	420
AM	350	460

None to other plots.

05/W/RN/3

Experimental diary:

Grass ley and clover/grass ley, 1st year (ROTATION LN1, LLN1, LC1, and LLC1)

01-Oct-04 Glyphosate 360 @ 4.0 l in 200 l.
12-Oct-04 Ploughed 35cm wide furrows.
13-Oct-04 Triplesuperphosphate at 213 kg
26-Oct-04 Power harrowed. Drilled Promesse Timothy + Senu Fescue,
50:50, @ 30 kg and Promesse Timothy + Senu Fescue + Merwi
White Clover, 45:45:10 @ 30 kg with the Accord drill.
Rolled.
16-Nov-04 27.0% N at 93 kg, 1st year grass/clover leys; at 185 kg, 1st
year grass leys.
16-Mar-05 Potassium sulphate at 140 kg.
17-Mar-05 Muriate of potash at 167 kg.
27-May-05 Alistel at 3.0 l in 200 l to grass leys only.
12-Jul-05 Cut yield strips, weighed and sampled.
01-Aug-05 Topped to tidy.
03-Aug-05 Muriate of Potash at 83 kg to all leys.
34.5% N at 218 kg to grass leys only.
20-Dec-05 2nd cut yield strips, weighed and sampled.

Grass leys 2nd to 8th year (ROTATION LN2-3 and LLN2-8)

16-Mar-05 Potassium sulphate at 140 kg,
34.5% N at 218 kg
17-Mar-05 Muriate of potash at 167 kg.
Triple superphosphate at 213 kg.
27-May-05 Alistel at 3.0 l in 200 l to grass leys only.
12-Jul-05 Cut yield strips, weighed and sampled.
01-Aug-05 Topped to tidy.
03-Aug-05 Muriate of Potash at 83 kg
34.5% N at 218 kg.
10-Aug-05 Azural at 4.0 l in 200 l to ley plots going into wheat.
20-Dec-05 2nd cut yield strips, weighed and sampled (all other long
ley plots).
21-Dec-05 Discards mown and cuttings removed.

Clover/grass leys 2nd to 8th year (ROTATION LC2-3 and LLC2-8)

16-Mar-05 Potassium sulphate at 140 kg,
17-Mar-05 Muriate of potash at 167 kg.
Triple superphosphate at 213 kg.
12-Jul-05 Cut yield strips, weighed and sampled.
01-Aug-05 Topped to tidy.
03-Aug-05 Muriate of Potash at 83 kg.
10-Aug-05 Azural at 4.0 l in 200 l to ley plots going into wheat.
20-Dec-05 2nd cut yield strips, weighed and sampled (all other long
ley plots).
21-Dec-05 Discards mown and cuttings removed.

W. beans, 2nd and 3rd treatment crop (ROTATION AM and ABe)

13-Oct-04 Triple superphosphate at 127 kg.
23-Nov-04 Broadcast, Clipper, recleaned at 30 seeds/m².
24-Nov-04 Ploughed 35 cm wide furrows.
16-Mar-05 Potassium sulphate at 140 kg.
25-Apr-05 Basagran SG at 1.65 kg in 200 l.
11-May-05 tm)Bravo at 1.0 l in 200 l.
tm)Folicur at 0.5 l in 200 l.
tm)Hallmark with Zeon Technology at 0.75 l in 200 l.
03-Sep-05 Combine harvested plots for yield. Straw swathed.
04-Sep-05 Combine harvested discards. Straw swathed.
08-Sep-05 Straw baled and removed.

05/W/RN/3

Forage maize, 2nd and 3rd treatment crop (**ROTATION** ABe and AM)

13-Oct-04 Triple superphosphate at 127 kg.
24-Nov-04 Ploughed 35 cm wide furrows.
16-Mar-05 Potassium sulphate at 140 kg.
18-Apr-05 Flexitined.
04-May-05 Power harrowed. Drilled, Hudson, tr. Thiram + Methiocarb +
fludioxonil + metalaxyl M, at 10.2 seeds/m² with the
Nodet drill.
14-May-05 34.5% N at 290 kg.
08-Jun-05 tm)Gesaprim at 3.0 l in 220 l.
tm)Phase 2 at 3.0 l in 220 l.
22-Sep-05 Cut sampled and weighted.

W. wheat, 1st test crop (W)

12-Oct-04 Ploughed 35 cm wide furrows.
13-Oct-04 Triple superphosphate at 127 kg.
Muriate of potash (corrective K) at 420 kg K₂O to plot 1,
360 kg to 2, 460 kg to 5 and 350 kg to 6.
26-Oct-04 Power harrowed. Drilled Hereward, tr. Sibutol Secur, at 375
seeds/m² with the Accord drill. Rolled.
16-Mar-05 Potassium sulphate at 140 kg
24-Mar-05 1st N (27% N) applied to split N sub-plots.
14-Apr-05 27% N to single application plots
07-May-05 2nd N (27% N) applied to split N sub-plots.
15-May-05 tm)Starane 2 at 0.5 l in 200 l.
tm)Amistar Opti at 1.5 L in 200 l.
tm)Opus at 0.75 l in 200 l.
09-Jun-05 Opus at 0.5 l in 200 l.
03-Sep-05 Combine harvested plots for yield. Straw swathed.
04-Sep-05 Combine harvested discards. Straw swathed.
08-Sep-05 Straw baled and removed.

W. rye, 2nd test crop and 1st treatment crop (**ROTATION** ABe and AM)

16-Sep-04 Chalk at 5.0 t, (not to ROTATION ABe and AM plots).
01-Oct-04 Glyphosate 360 @ 4.0 l in 200 l.
12-Oct-04 Ploughed 35 cm wide furrows.
13-Oct-04 Triple superphosphate at 127 kg.
27-Oct-04 Power harrowed. Drilled, Protector, tr. Beret Gold, at 300
seeds/m² with the Accord drill. Rolled.
16-Mar-05 Potassium sulphate at 140 kg
18-Apr-05 27% N to 2nd test crop only.
14 May-05 34.5% N at 232 kg to 1st treatment crops.
09-Jun-05 Opus at 0.5 l in 200 l.
03-Sep-05 Combine harvested plots for yield. Straw swathed.
04-Sep-05 Combine harvested discards. Straw swathed.
88-Sep-05 Straw baled and removed.

05/W/RN/3

LEYS

1ST CUT (12/7/05) DRY MATTER TONNES/HECTARE

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

FYM_RES	NONE	FYM	Mean
LEY			
LC1	5.21	4.80	5.01
LC2	5.01	3.97	4.49
LC3	3.63	3.87	3.75
LN1	6.94	5.81	6.37
LN2	5.12	5.11	5.12
LN3	4.93	4.93	4.93
LLC1	3.63	4.21	3.92
LLC2	4.40	4.15	4.28
LLC3	4.34	4.04	4.19
LLC4	3.67	2.50	3.08
LLC5	3.40	2.73	3.07
LLC6	5.52	4.79	5.15
LLC7	3.53	3.78	3.65
LLC8	2.37	3.08	2.72
LLN1	6.34	5.25	5.79
LLN2	5.58	5.40	5.49
LLN3	5.07	5.08	5.08
LLN4	4.86	5.11	4.98
LLN5	5.16	5.60	5.38
LLN6	4.47	4.14	4.31
LLN7	5.21	5.58	5.40
LLN8	3.83	4.10	3.97
Mean	4.65	4.46	4.55

1ST CUT MEAN DM% 40.6

05/W/RN/3

LEYS

2ND CUT (20/12/05) DRY MATTER TONNES/HECTARE

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

FYM_RES	NONE	FYM	Mean
LEY			
LC1	0.00	0.00	0.00
LC2	0.53	1.01	0.77
LN1	1.28	1.28	1.28
LN2	1.28	1.18	1.23
LLC1	0.00	0.00	0.00
LLC2	0.89	0.65	0.77
LLC3	0.18	0.10	0.14
LLC4	0.05	0.30	0.17
LLC5	0.15	0.11	0.13
LLC6	0.39	0.74	0.56
LLC7	1.32	0.69	1.00
LLN1	0.41	0.47	0.44
LLN2	1.60	1.86	1.73
LLN3	1.63	1.08	1.36
LLN4	0.80	0.76	0.78
LLN5	0.74	1.02	0.88
LLN6	0.88	0.92	0.90
LLN7	1.76	1.65	1.71
Mean	0.77	0.77	0.77

2ND CUT MEAN DM% 26.3

05/W/RN/3

LEYS

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

FYM_RES	NONE	FYM	Mean
LEY			
LC1	5.21	4.80	5.01
LC2	5.54	4.98	5.26
LC3	3.63	3.87	3.75
LN1	8.22	7.09	7.65
LN2	6.40	6.30	6.35
LN3	4.93	4.93	4.93
LLC1	3.63	4.21	3.92
LLC2	5.29	4.81	5.05
LLC3	4.53	4.14	4.33
LLC4	3.72	2.79	3.25
LLC5	3.55	2.84	3.20
LLC6	5.91	5.53	5.72
LLC7	4.85	4.47	4.66
LLC8	2.37	3.08	2.72
LLN1	6.75	5.72	6.23
LLN2	7.18	7.26	7.22
LLN3	6.70	6.16	6.43
LLN4	5.66	5.87	5.77
LLN5	5.90	6.61	6.26
LLN6	5.35	5.07	5.21
LLN7	6.97	7.24	7.10
LLN8	3.83	4.10	3.97
Mean	5.28	5.08	5.18

TOTAL OF 2 CUTS MEAN DM% 35.0

PLOT AREA HARVESTED 0.00200

05/W/RN/3

ARABLE TREATMENT CROPS

RYE

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

FYMRES	NONE	FYM	Mean
ROTATION			
AM	2.47	2.72	2.60
ABe	2.65	2.66	2.65
Mean	2.56	2.69	2.63

GRAIN MEAN DM% 86.8

PLOT AREA HARVESTED 0.00413

MAIZE

WHOLE CROP (100% DRY MATTER) TONNES/HECTARE

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

FYMRES	NONE	FYM	Mean
ROTATION			
AM	17.14	15.31	16.23
ABe	17.85	14.33	16.09
Mean	17.50	14.82	16.16

GRAIN MEAN DM% 39.3

PLOT AREA HARVESTED 0.00108

W. BEANS

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

FYMRES	NONE	FYM	Mean
ROTATION			
AM	2.37	3.11	2.74
ABe	1.02	1.90	1.46
Mean	1.70	2.51	2.10

GRAIN MEAN DM% 88.3

PLOT AREA HARVESTED 0.00413

05/W/RN/3

W. WHEAT

GRAIN TONNES/HECTARE

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

NSPLITFYM	Nsplit(noFYM)	Nsingle(FYM)	Mean		
ROTATION					
LLN 8	1.80	3.39	2.59		
LN 3	4.71	4.95	4.83		
LLC 8	4.84	4.95	4.89		
LC 3	4.84	4.52	4.68		
AM	3.59	3.71	3.65		
ABe	4.07	3.64	3.85		
Mean	3.97	4.19	4.08		
N	0	70	140	210	Mean
ROTATION					
LLN 8	1.54	2.33	2.79	3.72	2.59
LN 3	3.14	4.88	5.39	5.91	4.83
LLC 8	3.38	4.56	5.59	6.04	4.89
LC 3	2.65	4.71	5.25	6.10	4.68
AM	0.91	3.80	4.57	5.32	3.65
ABe	1.76	3.68	4.48	5.49	3.85
Mean	2.23	3.99	4.68	5.43	4.08
N	0	70	140	210	Mean
NSPLITFYM					
Nsplit(noFYM)	2.27	3.99	4.57	5.05	3.97
Nsingle(FYM)	2.19	3.99	4.78	5.81	4.19
Mean	2.23	3.99	4.68	5.43	4.08
N	0	70	140	210	
ROTATION					
LLN 8	Nsplit(noFYM)	1.07	1.92	1.59	2.61
	Nsingle(FYM)	2.00	2.74	3.99	4.84
LN 3	Nsplit(noFYM)	2.90	4.98	5.46	5.49
	Nsingle(FYM)	3.39	4.78	5.31	6.32
LLC 8	Nsplit(noFYM)	3.91	4.42	5.42	5.59
	Nsingle(FYM)	2.85	4.71	5.75	6.50
LC 3	Nsplit(noFYM)	3.01	4.77	5.41	6.15
	Nsingle(FYM)	2.30	4.65	5.10	6.04
AM	Nsplit(noFYM)	0.94	3.66	4.70	5.05
	Nsingle(FYM)	0.88	3.94	4.43	5.58
ABe	Nsplit(noFYM)	1.80	4.21	4.87	5.39
	Nsingle(FYM)	1.73	3.15	4.09	5.59

GRAIN MEAN DM% 85.5

PLOT AREA HARVESTED 0.00169

05/W/RN/3

W. RYE

GRAIN TONNES/HECTARE

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

NSPLITFYM	NONE	FYM	Mean		
ROTATION					
LLN 8	3.84	4.13	3.99		
LN 3	4.61	4.26	4.44		
LLC 8	3.75	3.47	3.61		
LC 3	4.24	3.93	4.08		
AM	3.11	3.18	3.15		
ABe	3.14	3.10	3.12		
Mean	3.78	3.68	3.73		
N	0	40	80	120	Mean
ROTATION					
LLN 8	3.38	4.39	4.10	4.07	3.99
LN 3	3.77	4.12	4.84	5.02	4.44
LLC 8	2.37	3.35	3.83	4.89	3.61
LC 3	3.24	3.80	4.63	4.66	4.08
AM	1.35	2.52	3.91	4.81	3.15
ABe	1.36	2.81	4.04	4.27	3.12
Mean	2.58	3.50	4.22	4.62	3.73
N	0	40	80	120	Mean
NSPLITFYM					
NONE	2.46	3.54	4.32	4.81	3.78
FYM	2.70	3.45	4.13	4.43	3.68
Mean	2.58	3.50	4.22	4.62	3.73
ROTATION	N	0	40	80	120
NSPLITFYM					
LLN 8	NONE	2.81	4.18	3.87	4.49
	FYM	3.96	4.59	4.33	3.64
LN 3	NONE	3.66	4.41	5.49	4.90
	FYM	3.87	3.84	4.19	5.14
LLC 8	NONE	2.49	3.65	3.80	5.05
	FYM	2.25	3.05	3.85	4.73
LC 3	NONE	3.16	3.70	4.98	5.12
	FYM	3.33	3.89	4.27	4.21
AM	NONE	1.36	2.59	3.78	4.71
	FYM	1.34	2.44	4.04	4.90
ABe	NONE	1.27	2.73	3.98	4.58
	FYM	1.46	2.89	4.10	3.95

GRAIN MEAN DM% 86.8

PLOT AREA HARVESTED 0.00192

05/W/RN/12

ORGANIC MANURING

Object: To study, from crop yields and soil analyses, the effects of a range of types of organic matter - Woburn, Stackyard B.

Sponsors: P.R. Poulton and A.J.Macdonald.

The 41st year, w. beans.

For previous years see 'Details' 1973 and 74-04/W/RN/12.

Design: 4 blocks of 8 plots.

Whole plot dimensions: 8.0 x 29.5 (8.0 x 26.5 on Block III).

Treatments: From 1966 to 1971 the experiment had a preliminary period designed to build up organic matter from different sources. An arable rotation was started on two blocks in 1972 and the remaining two blocks in 1973. After a period of testing the residues, a further period of accumulation was started; on two blocks (which included ley sown in 1979) in 1981 and on the other two (which included ley sown in 1980) in 1982. A second test phase began when leys on the first pair of blocks were ploughed for the 1st test crop in 1987 and on the second pair for the 1st test crop in 1988. From 1988 two blocks, and 1989 the other two, to 1994, plots were split into 6 sub-plots to test five levels of nitrogen and nil. From 1995 to 1997 residual effects of that nitrogen were measured. In 1998 to 2000 yields were taken from whole plots only. In 2001 plots were split into half-plots to test two rates of N. For 2003 the experiment was modified to test further inputs of organic matter. An arable rotation (w. rye, s. barley, w. beans, w. wheat, forage maize) was started on seven plots within each block; the eighth was sown to a grass/clover ley.

Whole plots

1. **TREATMNT** (Not necessarily applied each year):

1966-1971/2	1979/82-1986/7	Since 2003
Fd	Fd	F
Ln	Lc6	F
St	St	St
Gm	Lc8	CC
Pt	Lc8	Co
Fs	Fs	Dg10
Dg	Dg	Dg25
Lc	Lc6	Lc

F: no organic amendment. St: chopped straw at 7.5t/ha. CC: cover crop prior to spring sown crops. Co: compost at 40t/ha. Dg10: FYM at 10t/ha. Dg25: FYM at 25t/ha. Dg: FYM at 50t/ha. Fd: fertilizers equivalent to FYM. Fs: fertilizers equivalent to straw (+P). Lc/Lc6/Lc8: grass/clover leys. Ln: grass ley + N. Gm: green manure. Pt: peat.

04/W/RN/12

1. **TREATMNT** (Not necessarily applied each year):(cont.)

Since 2003, all treatments, except Dg25, have also received PKS fertilizers : 20 kg P/ha, 83 kg K/ha, 36 kg S/ha.

In addition in 2003 F and CC treatments received 120 kg N/ha, St received 90 kg N/ha. Dg10 received 60 kg N/ha. No N was applied to Dg25, Co or Lc treatments.

In 2004 all plots, except Lc (permanent grass/clover), split into 6 at random and the following nitrogen range applied as Nitro-chalk:

N0, 1, 2, 3, 4, 5 as 0, 35, 70, 105, 140, 175 kg N.

Note, no nitrogen was applied to the bean crop in 2005.

Experimental diary:

09-Sep-04 : T : : Chopped straw applied at 7.5 t to St plots.
11-Nov-04 : B : : Glyphosate 360 at 4.0 l in 200 l.
17-Nov-04 : T : : Compost applied at 40 t to CO plots.
: T : : FYM applied at 25 t to Dg25 plots and at 10 t to Dg10 plots.
23-Nov-04 : B : : Clipper broadcast at 30 seeds/m², to bean plots.
24-Nov-04 : B : : Ploughed 35cm wide furrows, to bean plots.
07-May-05 T : : Sulphate of Potash at 200 kg (not to Dg25).
: T : : Triple Superphosphate at 97.5 kg (not to Dg25).
11-May-05 : B : : tm)Bravo 500 at 1.0 l in 200 l to bean plots.
: B : : tm)Folicur at 0.5 l in 200 l to bean plots.
: B : : tm)Hallmark with Zeon Technology at 0.75 l in 200 l to bean plots.
13-Jul-05 : : 1st cut yield strips Lc plots only, weighed and sampled.
01-Aug-05 : T : : Topped, Lc plots only.
03-Sep-05 : T : : Combine harvested, bean plots for yield, swathed straw.
03-Sep-05 : T : : Combine harvested discards, swathed straw.
08-Sep-05 : T : : Baled straw.
20-Dec-05 : : 2nd cut yield strips Lc plots only, weighed and sampled.
21-Dec-05 : : Discards mown and cuttings removed.

NOTE: Samples of grain were taken for chemical analysis.

05/W/RN/12

GRAIN TONNES/HECTARE

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

TREATMNT	
F (Fd)	1.28
F (Ln, Lc6)	1.90
St (St)	1.74
CC (Gm, Lc8)	1.56
Co (Pt, Lc8)	2.01
Dg10 (Fs)	1.41
Dg25 (Dg)	1.20
Mean	1.59

*** Standard errors of differences of means ***

TREATMNT
0.346

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
Blocks.Plots	18	0.489	30.8
GRAIN MEAN DM%	87.2		
PLOT AREA HARVESTED	0.00619		

05/W/CS/478

CONTINUOUS MAIZE

Object: To monitor the fate of organic carbon in the soil organic matter -
Woburn, Stackyard A I.

Sponsors: P.R. Poulton and A.J. Macdonald.

The ninth year, forage maize and s. barley.

For previous years see 97-04/W/CS/478.

Design: 3 randomised blocks of 6 plots.

Plot dimensions: 9.0 x 25.0.

Treatments:

CROP	Crop and straw treatments:
M	Continuous maize, stubble incorporated
(M)B	S. barley after five years maize, stubble incorporated
MT	Maize, stubble plus 10 t maize tops incorporated
(B)M	Maize after three years of spring barley, straw removed
BT	Continuous spring barley, straw removed plus 10 t maize tops incorporated
B	Continuous spring barley, straw removed

Experimental diary:

05-Oct-04	: T :	BT, MT	: Maize tops applied at 225 kg per plot.
01-Nov-04	: B :		: Muriate of potash at 250 kg.
	: B :		: Triple superphosphate at 180 kg.
03-Nov-04	: B :		: Ploughed 30 cm wide furrows.
07-Apr-05	: B :		: Rotary harrowed.
	: T :	(M)B, BT, B:	Drilled, Optic, tr. Raxil S, at 375 seeds/m ² with the Accord drill, rolled.
04-May-05	: T :	(B)M, MT, M:	Rotary harrowed, drilled, Hudson, tr. Thiram, Methiocarb, Fludioxonil, Metalaxyl M, at 10.2 seeds/m ² with the Nodet drill.
10-May-05	: T :	(B)M, MT, M:	pdq at 4.0 l in 220l.
14-May-05	: B :		: Sulphur Gold (30% N, 7.6% S) at 320 kg.
30-May-05	: B :	(M)B, BT, B:	tm)Corbel at 0.5 l in 220 l.
	: B :		: tm)Acanto at 0.5 l in 220 l.
	: B :		: tm)Harmony M SX at 100 g in 220 l.
	: B :		: tm)Mn 500 Headland at 1.0 kg in 220 l.
	: B :		: tm)Unix at 0.5 kg in 220 l.
	: B :		: tm)Duplosan KV at 1.5 l in 220 l.
08-Jun-05	: T :	(B)M, MT, M:	tm)Gesaprim at 3.0 l in 220l. tm)Phase 2 at 3.0 l in 220 l.
27-Jun-05	: T :	(B)M, MT, M:	Bromotril P at 2.5 l in 200l.
	: T :	(M)B, BT, B:	tm)Amistar Opti at 0.5 l in 200 l.
	: B :		: tm)Opus at 0.5 l in 200 l.
03-Sep-05	: T :	(M)B, BT, B:	Combine harvested plots for yield, swathed straw
04-Sep-05	: T :	(M)B, BT, B:	Combine harvested discards, swathed straw
08-Sep-05	: T :	(M)B, BT, B:	Baled.
22-Sep-05	: T :	(B)M, MT, M:	Cut sample areas, weighed, and sampled.
09-Nov-05	: T :	(B)M, MT, M:	Cut discards.

05/W/CS/478

NOTE: Forage maize and barley grain samples were taken for N analysis.

MAIZE

WHOLE CROP (AT 100% DRY MATTER) TONNES/HECTARE

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

CROP	
M	9.68
MT	7.12
(B)M	8.42
Mean	8.41

*** Standard errors of differences of means ***

CROP
1.788

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
Blocks.Plots	4	2.190	26.0

MEAN DM% 37.8

PLOT AREA HARVESTED 0.00108

SPRING BARLEY

GRAIN TONNES/HECTARE

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

CROP	
(M)B	2.88
BT	2.26
B	2.20
Mean	2.45

*** Standard errors of differences of means ***

CROP
0.179

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
Blocks.Plots	4	0.219	9.0

GRAIN MEAN DM% 86.9

PLOT AREA HARVESTED 0.00525

Woburn Experimental Farm														
The Weather : Monthly Summary : 2005														
(Departure from 30-year means (1971 - 2000) in brackets)														
	Sunshine		Mean temperatures °C							Rain		Wind		
	Hours	()	Maximum	Minimum	Dew	Ground	In ground under grass	Total mm	Rain	***				
			()	()	point	frosts *	30 cm	100 cm	Tipping bucket	days **	km/hr			
									()					
January	68.00	(+19.5)	8.64	(+1.92)	2.49	(+1.45)	2.75	10	5.89	7.86	23.4	(-31.9)	18	12.9
February	60.30	(-3.7)	6.70	(-0.39)	1.00	(+0.18)	1.22	17	5.48	7.23	33.6	(-7.0)	19	7.8
March	91.00	(-10.3)	10.33	(+0.45)	3.15	(+0.76)	4.24	10	6.15	6.59	45.0	(-4.6)	15	7.7
April	158.30	(+22.5)	13.76	(+1.51)	4.26	(+0.85)	5.90	4	8.87	8.30	33.4	(-19.3)	19	7.4
May	215.60	(+32.5)	16.48	(+0.44)	6.18	(+0.14)	7.32	2	10.38	9.46	27.0	(-25.7)	17	8.1
June	214.70	(+37.8)	21.18	(+2.24)	9.94	(+0.93)	11.66	0	13.40	11.25	42.8	(-16.0)	10	6.6
July	169.50	(-24.1)	21.27	(-0.45)	12.28	(+1.10)	12.21	0	16.79	13.86	51.0	(+5.4)	13	6.3
August	200.40	(+15.8)	21.89	(+0.30)	10.53	(-0.57)	12.07	0	16.45	14.90	48.0	(-6.5)	11	6.2
September	146.40	(+15.2)	20.17	(+1.92)	10.70	(+1.41)	12.46	1	16.05	15.20	69.0	(+10.9)	18	6.2
October	93.30	(-10.5)	16.73	(+2.68)	9.81	(+3.33)	11.41	0	13.46	13.89	66.0	(+1.6)	19	6.1
November	96.90	(+33.5)	9.68	(+0.05)	2.02	(-1.37)	3.36	14	9.07	12.07	35.0	(-22.2)	20	7.6
December	72.10	(+30.5)	7.30	(-0.21)	1.15	(-0.76)	2.69	16	5.95	8.80	28.8	(-30.7)	16	7.7
Year	1586.5	(+158.7)	14.51	(+0.87)	6.13	(+0.62)	7.27	74	10.66	10.78	503	(-146)	195	7.5
* Number of nights grass minimum was below 0.0 °C														
** Number of days rain was 0.2 mm or more														
*** At 2 metres above ground														

Rothamsted Experimental Station															
The Weather : Monthly Summary : 2005															
(Departure from 30-year means (1971 - 2000) in brackets)															
	Sunshine		Mean temperatures °C							Rain		Drainage	Wind		
	Hours	()	Maximum	Minimum	Dew point	Ground frosts *	In ground under grass	Total mm	Rain	20 inch	***				
		()	()	()	()	30 cm	100 cm	5" turf wall	days **	mm	km/hr				
January	81.3	(+26.2)	8.34	(+2.00)	2.46	(+1.60)	2.4	20	5.76	7.26	33.8	(-35.9)	22	11.5	14.6
February	66.3	(-4.4)	6.13	(-0.58)	1.22	(+0.48)	0.8	20	5.20	6.66	36.2	(-12.6)	23	17.5	11.3
March	99.3	(-7.9)	10.01	(+0.52)	3.20	(+0.87)	3.9	14	5.93	6.12	43.2	(-10.7)	17	14.2	10.3
April	149.5	(+2.7)	13.08	(+1.14)	4.72	(+1.10)	5.3	5	9.43	8.56	65.6	(+12.1)	21	24.5	9.4
May	214.4	(+19.5)	15.75	(+0.0)	6.95	(+0.63)	6.9	8	12.11	10.44	44.4	(-5.3)	19	6.1	9.9
June	219.4	(+29.1)	20.62	(+2.02)	10.73	(+1.52)	11.3	3	15.54	12.91	44.0	(-16.2)	11	0.2	8.3
July	176.5	(-26.8)	20.90	(-0.52)	12.57	(+1.21)	12.1	0	16.98	14.96	39.0	(-3.1)	14	0.1	8.6
August	205.3	(+8.5)	21.31	(-0.12)	10.98	(-0.37)	11.7	0	16.41	15.26	58.6	(+4.9)	12	1.5	7.7
September	149.4	(+7.1)	19.7	(+1.71)	10.87	(+1.43)	12.2	1	16.16	15.37	65.0	(+4.0)	19	11.0	7.6
October	94.2	(-17.9)	16.39	(+2.65)	10.10	(+3.45)	11.1	0	13.63	13.81	88.4	(+13.7)	19	43.6	8.5
November	96.1	(+26.0)	9.34	(-0.04)	2.29	(-1.04)	3.6	18	9.28	11.66	53.2	(-13.0)	24	30.9	9.6
December	82.0	(+33.9)	6.82	(-0.37)	1.09	(-0.83)	2.1	20	5.81	8.31	53.0	(-21.5)	20	37.8	9.6
Year	1633.7	(+96.0)	14.03	(+0.70)	6.43	(+0.84)	6.9	109	11.02	10.94	624.4	(-83.6)	221	198.9	9.6
* Number of nights grass minimum was below 0.0 °C															
** Number of days rain was 0.2 mm or more															
*** At 2 metres above ground															