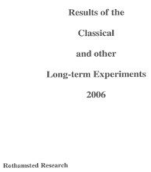
Results of the Classical and Other Long-term Experiments 2006



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Results of the Classical and Other Long-term Experiments 2006

Rothamsted Research

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Results of the

Classical

and other

Long-term Experiments

2006

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List of Experiments in the 2006 Yield Book

R/BK/1	Broadbalk
R/HB/2	Hoos Barley
R/WF/3	Wheat and Fallow
R/EX/4	Exhaustion Land
R/PG/5	Park Grass
R/GC/8	Garden Clover
R/CS/326	Amounts of Straw
R/CS/477	Continuous Maize
W/RN/3	Ley Arable
W/RN/12	Organic Manuring
W/CS/326	Amounts of Straw
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

CopperMan	25% w/w soluble manganese (as Mn) + 5% w/w soluble copper (as Cu) + 43.3% w/w soluble sulphur (as SO_3) + 17.4% w/w soluble (as S)
Double Top	27% nitrogen and 30% SO_3
Epsom salts	$MgSO_4.7H_2O$ 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	$MgSO_4H_2O$ 17.7% magnesium and 23.3% sulphur
Mancozin	18.8% w/w Manganese + 6.3% w/w Copper + 4.8% w/w Zinc
Manganese sulphate	$Mn_2(SO_4)_3$ 27% manganese and 24% sulphur
Mantrac 500	7% w/w Manganese
Muriate of potash	60% K_2O
Nitrate of soda	$NaNO_3$ 16% nitrogen and 27% sodium
Pelleted poultry manure	3.5% N
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

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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	**TR**	Trace elements

TRADE NAME	**FUNCTION**	**ACTIVE INGREDIENT**
Acanto	**F**	250 g/l picoxystrobin
Ally Max SX	**H**	14.3:14.3 % w/w metsulfuron-methyl + tribenuron-methyl
Alpha IPU 500	**H**	500 g/l isoproturon
Amistar	**F**	250 g/l azoxystrobin

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Amistar Opti	F	80:400 g/l azoxystrobin + chlorothalonil
Aphox	I	50% pirimicarb
Azural	H	360 g/l glyphosate
Bravo 500	F	500 g/l chlorothalonil
Corbel	F	750 g/l fenpropimorph
Crystal	H	60:300 g/l flufenacet + pendimethalin
Decis	I	25 g/l deltamethrin
Decoy Wetex	M	2% w/w methiocarb
Duplosan KV	H	600 g/l mecoprop-P
Fandango	F	100:100 g/l fluoxastrobin + prothioconazole
Flexity	F	300 g/l metrafenone
Fludioxonil	F	fludioxonil seed treatment
Folicur	F	250 g/l tebuconazole
Griffin Gex 1664	Ad	900 g/l ethylene oxide concentrate
Hallmark with Zeon Technology	I	100 g/l lambda-cyhalothrin
Ice	H	60:300 g/l flufenacet + pendimethalin
IPU 500	H	500 g/l isoproturon
Jester	H	60:3% w/w bromoxynil + prosulfuron
Lexus Class	H	33.3:16.7% w/w carfentrazone-ethyl + flupyrsulfuron-methyl
Mesurol	M,I	methiocarb seed treatment
Metalaxyl-M	F	phenlyamide seed treatment
Methiocarb	M,I	methiocarb seed treatment
Moddus	GR	250 g/l trinexapac-ethyl
Opus	F	125 g/l epoxiconazole
Premis		Propyzamide seed dressing
Quantum SX	H	50% w/w tribenuron-methyl
Raxil Pro	F	Prothioconazole + tebuconazole + triazoxide seed dressing
Redigo Twin		Prothioconazole + fluoxastrobin seed dressing
Robust		Imazalil and triticonazole seed dressing
Samson	H	4% nicosulphuron
Sibutol		140:8.6:87.5 g/l bitertanol + fuberidazole
Sibutol Secur		140:8.6:87.5 g/l bitertanol + fuberidazole + imidacloprid
Starane 2	H	200 g/l fluroxypyr
Stomp 400 SC	H	400 g/l pendimethalin
Thiram	F	600 g/l thiram seed treatment
Unix	F	75% w/w cyprodinil
Vivid	F	250 g/l pyraclostrobin
Weedazol-TL	H	225 g/l amitrole

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06/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 162nd 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 74-05R//BK/1.

Areas harvested:

	Section	
Wheat:	0	0.00320
	1	0.00589
	2,4,6 and 7	0.00487 (* see note 4, below)
	8,9	0.00512
Oats:	3	0.00487
Maize:	5	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 Kg
10N4	10	N4
11N4PMg	11	N4 P Mg
12N1+3+1(P)K2Mg2	12	N1+3+1 (P) K2 Mg2 (2)
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
(2) N1+3+1 (P)KMg since 2006

06/R/BK/1

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 2010/11.

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 2010/11.

FYM: Farmyard manure at 35 t

Previous treatment: -

Whole plots

PLOT		Fertilizers and organic manures:-		
	Plot	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

\+ 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, the experiment was divided into 10 sections with the following cropping:-

SECTION										
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	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

06/R/BK/1

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
2006	W	W	W	W	W	M	O	W	W	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*.
(4) Plots 2.2, 06, 09 and 14 on Section 4 used for a nutrition trial with the application of urea. 5m was cut off the end of these plots before the yield measurement was taken.

Experimental diary:

All sections:

27-Aug-05		Weedazol-TL at 20 l in 200 L (excluding Sections 4 and 8).
27-Sep-05	P	TSP at 171 kg, strips 11, 13, 14, 17, & 18.
28-Sep-05	K*	Muriate of potash at 181 kg, strip 14.
28-Sep-05	FYM	FYM at 35.0 tonnes, strips 2.1 & 2.2, not to Section 3.
29-Sep-05		Ploughed 25 cm wide furrows.
10-Oct-05		Cultipressed.
13-Mar-06	MG	Kieserite at 80 kg, strips 5 - 9, 11, 12, 15 - 20.
	K	Sulphate of potash at 217 kg, strips 5 - 9, 12, 13, 15 - 20.
18-Mar-05		Rolled, not to Section 4.

06/R/BK/1

Experimental diary:

Cropped sections:

Winter wheat

11-Oct-05	Combination drilled, Hereward, tr. Sibutol Secur, at 350 seeds/m^2 with the Accord drill and rolled.
17-Oct-05	Ice at 4.00 l in 200 l, excluding Section 8.
27-Oct-05	Decoy Wetex at 5.0 kg
07-Dec-05	Hallmark with Zeon Technology at 50 ml in 200 l.
21-Dec-05	Decoy Wetex at 5.0 kg
14-Jan-05	IPU 500 at 5.0 l in 200 l, excluding Section 8 (2.9m on east end of plot 218 sprayed in error).
13-Mar-06	1st split N applied.
17-Apr-06	tm)Bravo 500 at 1.0 l in 200 l, excluding Section 6. tm)Flexity at 0.2 l in 200 l, excluding Section 6. tm)Opus at 0.75 l in 200 l, excluding Section 6.
20-Apr-06	Main N and 2nd split N applied.
12-May-06	Ally Max SX at 42 g in 200 l, excluding Section 8.
17-May-06	3rd split N applied.
28-May-06	Starane 2 at 0.75 l in 200 l, excluding Section 8.
01-Jun-06	tm)Vivid at 0.4 l in 200 l, excluding Section 6. 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.
06-Aug-06	Combine harvested discards, baled straw.
23-Aug-06	Combine harvested plots for yield, swathed straw, sampled and weighed straw.
25-Aug-06	Combine harvested discards, swath and baled straw.

W. oats

11-Oct-05	Combination drilled, Gerald, tr. Sibutol, at 350 seeds/m^2 with the Accord drill and rolled.
27-Oct-05	Decoy Wetex at 5.0 kg
14-Nov-05	Lexus Class at 60 g in 200 l. Hallmark with Zeon Technology at 50 ml in 200 l.
21-Dec-05	Decoy Wetex at 5.0 kg
12-May-06	Ally Max SX at 42 g in 200 l.
28-May-06	Starane 2 at 0.75 l in 200 l.
02-Jun-06	tm)Amistar at 0.6 l in 200 l. tm)Opus at 0.4 l in 200 l. tm)Flexity at 0.2 l in 200 l.
25-Jul-06	Combine harvested plots for yield, swathed straw. Combined discards, swathed straw.
26-Jul-06	Sampled and weighed straw. Baled straw.

Forage maize

26-Apr-06	Azural at 3.0 l in 200 l.
10-May-06	Main N and 1st split N applied. Flexitined twice.
11-May-06	Power harrowed, drilled, Hudson, tr. Thiram, Methiocarb, Fludioxonil, Metalaxyl-M at 10.2 seeds/m^2, with the Nodet Gougis drill.
05-Jun-06	2nd split N applied.
08-Jun-06	Samson at 1.5 l in 200 l.
25-Sep-06	Cut sample areas by hand, weighed, and sampled.
29-Sep-06	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.

NOTE: STRAW DRY MATTER %

Due to an error while weighing sub samples (fresh and dry) an average dry matter percent was calculated for each section. The values for sections 1, 4, 8 were 85.8, 86.1 and 76.3 respectively.

06/R/BK/1

WHEAT

GRAIN TONNES/HECTARE

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

SECTION / PLOT	4/W1	7/W2	2/W3	8/W5	6/W29	0/W2	1/W40	9/W48
01(FYM)N4	10.10	9.51	6.94	*	7.84	*	*	*
21FYMN3	9.72	9.16	8.18	2.44	7.58	8.09	7.85	7.66
22FYM	6.40	6.05	5.84	2.99	5.82	5.50	5.65	6.20
03Nil	1.79	1.31	1.26	0.83	1.50	1.14	1.11	0.69
05(P)KMg	1.96	1.47	1.19	1.20	1.33	1.20	1.26	1.13
06N1(P)KMg	4.41	3.83	3.01	1.17	3.17	2.95	3.19	3.31
07N2(P)KMg	7.07	5.87	4.43	1.55	4.65	4.52	5.59	5.05
08N3(P)KMg	8.82	7.66	5.21	2.28	6.38	6.07	6.16	6.62
09N4(P)KMg	9.53	8.12	6.73	2.79	7.64	7.57	7.31	7.16
10N4	6.15	2.36	3.70	0.89	1.81	1.39	3.04	0.66
11N4PMg	5.84	6.10	5.28	1.11	5.61	6.48	5.54	5.68
12N1+3+1(P)KMg	9.59	9.69	7.03	1.17	8.64	8.33	8.22	8.43
13N4PK	9.53	7.66	5.98	2.68	6.62	6.68	7.03	7.28
14N4PK*(Mg*)	9.58	7.81	5.73	1.78	6.93	7.63	7.52	7.38
15N5(P)KMg	9.94	8.53	6.05	1.48	7.34	7.04	7.46	6.33
16N6(P)KMg	9.50	8.91	6.87	1.28	8.21	8.33	8.15	7.47
17N1+4+1PKMg	9.25	8.97	8.08	0.57	7.63	7.93	7.34	6.88
18N1+2+1PKMg	9.53	8.91	7.06	1.19	7.76	7.32	6.69	5.81
19N1+1+1KMg	8.35	7.28	5.37	1.08	6.08	6.44	6.32	4.81
20N4KMg	*	*	*	*	*	0.89	1.17	*

GRAIN MEAN DM% 83.7

ESTIMATED STRAW TONNES/HECTARE

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

SECTION / PLOT	4/W1	8/W5	1/W40
01(FYM)N4	6.04	*	*
21FYMN3	6.31	5.10	6.24
22FYM	4.12	5.69	4.70
03Nil	0.54	1.93	0.41
05(P)KMg	0.67	3.28	0.29
06N1(P)KMg	1.97	3.89	1.22
07N2(P)KMg	3.54	3.98	2.59
08N3(P)KMg	4.12	3.84	2.90
09N4(P)KMg	5.31	4.38	3.43
10N4	1.92	3.07	1.22
11N4PMg	2.12	2.56	2.14
12N1+3+1(P)KMg	4.85	3.01	4.49
13N4PK	4.44	4.29	3.57
14N4PK*(Mg*)	3.96	4.14	3.34
15N5(P)KMg	5.25	3.94	3.77
16N6(P)KMg	4.75	3.05	4.37
17N1+4+1PKMg	4.89	2.02	4.06
18N1+2+1PKMg	5.05	2.82	3.43
19N1+1+1KMg	3.89	3.52	3.05
20N4KMg	*	*	0.46

STRAW MEAN DM% 82.7

06/R/BK/1

W. OATS

TONNES/HECTARE

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

PLOT	GRAIN	STRAW
01(FYM)[N4]	6.97	3.05
21[FYMN2]	8.92	4.50
22[FYM]	8.00	4.02
03Nil	1.95	0.35
05(P)KMg	2.16	0.35
06[N1](P)KMg	2.47	0.40
07[N2](P)KMg	2.83	0.37
08[N3](P)KMg	3.43	0.82
09[N4](P)KMg	3.36	0.68
10[N4]	5.09	1.86
11[N4]PMg	6.72	2.85
12[N1+3+1](P)KMg	3.13	0.59
13[N4]PK	3.11	0.63
14[N4]PK*(Mg*)	3.04	0.74
15[N5](P)KMg	5.04	1.58
16[N6](P)KMg	6.31	2.60
17[N1+4+1]PKMg	5.27	1.78
18[N1+2+1]PKMg	2.90	0.49
19[N1+1+1]KMg	2.60	0.39
MEAN DM%	90.8	82.0

FORAGE MAIZE

WHOLE CROP (100% DM) TONNES/HECTARE

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

PLOT	WHOLE CROP
01(FYM)N4	13.03
21FYMN3	17.14
22FYM	11.80
03Nil	4.25
05(P)KMg	2.36
06N1(P)KMg	6.55
07N2(P)KMg	9.98
08N3(P)KMg	11.23
09N4(P)KMg	10.92
10N4	3.90
11N4PMg	3.10
12N2+3(P)KMg	7.33
13N4PK	7.69
14N4PK*(Mg*)	7.60
15N5(P)KMg	8.23
16N6(P)KMg	9.74
17N2+4PKMg	9.27
18N2+2PKMg	10.52
19N2+1KMg	7.75
CROP MEAN DM%	36.0

06/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 155th year, s. barley.

For previous years see 'Details' 1967 and 1973, Station Report for 1966 and 74-05/R/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 magnesia 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

06/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.

06/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:

09-Sep-05	B		Weedazol-TL at 20.0 l in 200 l, Series O only.
16-Nov-05	T		P, K, Mg (to plot 63) applied.
17-Nov-05	T		Si applied.
	B		Azural at 2.0 l in 200 l.
21-Nov-05	T		FYM applied.
23-Nov-05	B		Ploughed 25 cm wide furrow.
03-Feb-06	B		Cultipressed, combination drilled, Optic, tr. Raxil Pro, at 375 seeds/m^2 with the Accord drill, rolled.
25-Apr-06	T		N (27% N) to Main plots (old Series O, A) and plots 6 and 7 Series AA.
26-Apr-06	T		N (34.5% N) to remainder.
17-May-06	B		tm)Acanto at 0.5 l in 200 l.
	B		tm)Unix at 0.5 kg in 200 l.
	B		tm)Quantum SX at 30 g in 200 l.
	B		tm)Duplosan KV at 2.3 l in 200 l.
16-Jun-06	B		Fandango at 1.25 l in 200 l.
17-Jul-06			Hand rogued wild oats.
11-Aug-06	B		Combine harvested discards, swathed straw, baled.
16-Aug-06	B		Combine harvested plots for yield.
	B		Sampled and weighed straw, baled straw.
	B		Combine harvested remaining discards, swathed straw. Baled straw.

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

06/R/HB/2

MAIN PLOTS

GRAIN TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	0.53	0.74	0.99	0.86	0.78
-P-	2.42	3.25	3.36	2.81	2.96
--K	0.62	1.49	1.65	1.45	1.30
-PK	2.12	3.64	5.55	5.65	4.24
A--	0.74	0.74	0.57	0.71	0.69
AP-	2.21	2.97	2.85	3.02	2.76
A-K	0.52	0.84	1.20	0.94	0.88
APK	2.21	3.89	4.45	5.03	3.89
D1852	5.97	6.86	7.08	6.86	6.69
(D)	0.81	1.48	4.76	3.39	2.61
(A)	0.95	1.84	1.50	1.64	1.48
-	0.53	0.92	1.24	1.23	0.98
D2001	5.40	6.80	6.46	6.69	6.34
P2KMg	2.77	4.57	5.32	5.95	4.65
Mean	1.99	2.86	3.36	3.30	2.88

GRAIN MEAN DM% 75.9

STRAW TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	0.25	0.42	0.54	1.90	0.78
-P-	0.87	1.49	1.50	1.44	1.33
--K	0.34	0.58	0.80	0.64	0.59
-PK	0.75	1.42	2.74	3.02	1.98
A--	0.38	0.31	0.23	0.33	0.31
AP-	1.00	1.55	1.46	1.89	1.48
A-K	0.25	0.56	0.60	0.33	0.44
APK	0.97	1.77	2.49	2.82	2.01
D1852	0.27	3.91	4.71	4.51	3.35
(D)	0.58	1.16	1.98	1.65	1.34
(A)	0.49	0.87	0.80	0.87	0.76
-	0.26	0.44	0.43	0.41	0.39
D2001	2.15	3.80	3.70	4.16	3.45
P2KMg	0.97	2.05	2.44	2.90	2.09
Mean	0.68	1.45	1.74	1.92	1.45

STRAW MEAN DM% 81.2

06/R/HB/2

SILICATE PLOTS

GRAIN TONNES/HECTARE

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

PK Silicate	N3--	N3P-	N3-K	N3PK
(-)-	1.64	3.45	1.15	5.58
(Si)-	2.02	3.78	2.63	5.63
(-)Si	2.05	5.00	2.38	5.79
(Si)Si	2.04	4.32	2.81	5.76

GRAIN MEAN DM% 83.4

PHOSPHATE PLOTS

GRAIN TONNES/HECTARE

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

PLOTS	
142	2.90
143	2.67
144	2.62
242	5.27
243	5.29
244	4.62
341	3.63
342	4.00
343	3.92
344	4.08
441	5.36
442	5.31
443	5.27
444	4.88
551	4.57
552	4.35
561	5.03
562	3.93
571	2.86
572	3.28
581	0.99
582	0.82
Mean	3.89

GRAIN MEAN DM% 83.1

06/R/WF/3

WHEAT AND FALLOW

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

The 151st year, w. wheat.

For previous years see 'Details' 1967, 1973 and 74-05/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-05	:	Ploughed, 25 cm wide furrows.
04-Oct-05	:	Cultipressed
07-Oct-05	:	cultipressed, combination drilled, Hereward, tr. Sibutol Secur, at 350 seeds/m^2 with the Accord drill, rolled.
17-Oct-05	:	Ice at 4.0 l in 200 l to wheat plot.
05-Dec-05	:	Hallmark with Zeon Technology at 50 ml in 200 L to wheat plot.
07-Apr-06	:	Springtined fallow plot.
21-Apr-06	:	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)Flexity at 0.2 L in 200 L to wheat plot.
17-May-06	:	Power harrowed fallow plot.
21-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)Vivid at 0.4 l in 200 l to wheat plot.
	:	tm)Starane 2 at 0.75 l in 200 l to wheat plot.
	:	tm)Ally Max SX at 42 g in 200 l to wheat plot.
23-Jun-06	:	Rotovated fallow plot.
06-Aug-06	:	Combine harvested discards, baled straw.
23-Aug-06	:	Combine harvested, plot for yield, swathed straw.
	:	Sampled and weighed straw.
25-Aug-06	:	Combine harvested remaining discards, baled straw.

NOTE: Unground grain and straw was archived.

NOTE: Due to an error in weighing it was not possible to obtain a straw DM% and the yield calculation assumes a dry matter of 85%

GRAIN AND STRAW YIELDS TONNES/HECTARE

	GRAIN	STRAW
YIELD	2.58	1.46+
MEAN DM%	84.3	*

+ assuming 85% dry matter

PLOT AREA HARVESTED 0.04431

https://doi.org/10.23637/ERADOC-1-263

06/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 151st year, w. wheat.

For previous years see 'Details' 1977, 1973 and 74-05/R/EX/4.

Treatments: All combinations of:-

Whole plots (P test)

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

0	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
0	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:

0	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, 200 kg 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:

27-Sep-05 : **T** : P : P basal:(triple superphosphate at 98 kg), plots 2, 4, 6, 8 & 10.

P test:

27-Sep-05 : **T** : P : P test:(triple superphosphate at 98 kg), plots 011-013, 031-033, 051-053, 071-073, & 091-093.

```
   28-Sep-05 : T : K    : K basal/124.5 kg (muriate of potash at 250 kg)*,
                          plots 1, 3, 5, 7 & 9.
All plots
   29-Sep-05 : B :      : Keiserite (30 kg Mg)
                          Ploughed 25 cm wide furrows.
   04-Oct-05 : B :      : Cultipress.
   07-Oct-05 : B :      : Cultipressed, combination drilled, Xi19, tr.
                            Redigo Twin at 350 seeds/m², rolled.
   17-Oct-05 : B :      : Ice at 4.0 l in 200 l.
   05-Dec-05 : B :      : Hallmark with Zeon Technology at 50 ml in 200 l.
   13-Mar-06 : B :      : Ammonium sulphate (21% N) at 238 kg
   18-Apr-06 : B :      : 34.5% N at 580 kg.
   21-Apr-06 : B :      : tm)Opus at 0.75 l in 200 l.
             : B :      : tm)Bravo 500 at 1.0 l in 200 l.
             : B :      : tm)Flexity at 0.2 l in 200 l.
   17-May-06 : B :      : 34.5% N at 145 kg.
   21-May-06 : B :      : tm)Bravo 500 at 1.0 l in 200 l.
             : B :      : tm)Opus at 0.75 l in 200 l.
             : B :      : tm)Vivid at 0.4 l in 200l.
             : B :      : tm)Starane 2 at 0.75 l in 200 l.
             : B :      : tm)Ally Max SX at 42 g in 200 l.
   06-Aug-06 : B :      : Combine harvested discards, baled straw.
   23-Aug-06 : B :      : Combine harvested, plots for yield, straw swathed.
             : B :      : Straw sampled and weighed.
   25-Aug-06 : B :      : Combine harvested discards, swathed and baled
                          straw.
      * 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.

NOTE:
STRAW DRY MATTER
Due to an error while weighing sub samples (fresh and dry) an average dry matter percent was calculated. The value was 87.8% (P TEST) and 87.7% (K TEST).

P TEST

GRAIN TONNES/HECTARE

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

P_RES	0	P(P1)	P(P2)	P(P3)	Mean
OLD_RES					
0	1.74	7.88	8.34	8.01	6.49
D	4.72	8.85	8.45	8.36	7.60
N	1.20	7.77	8.92	8.12	6.50
P	4.87	8.56	8.66	8.00	7.52
NPKNAMG	3.75	8.38	7.82	8.80	7.19
Mean	3.26	8.29	8.44	8.26	7.06

GRAIN MEAN DM% 85.1

ESTIMATED STRAW TONNES/HECTARE

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

P_RES	0	P(P1)	P(P2)	P(P3)	Mean

OLD_RES					
O	0.85	5.17	6.00	6.21	4.56
D	2.83	6.19	6.43	6.51	5.49
N	0.77	5.19	6.29	6.10	4.59
P	2.89	6.10	6.19	5.90	5.27
NPKNAMG	2.30	6.17	6.19	6.37	5.26
Mean	1.93	5.77	6.22	6.22	5.03

STRAW MEAN DM% 87.8

PLOT AREA HARVESTED 0.00525

06/R/EX/4

K TEST

GRAIN TONNES/HECTARE

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

OLD_RES	
O	6.51
D	6.92
N*	7.18
PK	7.39
N*PK	7.08
Mean	7.02

GRAIN MEAN DM% 84.9

ESTIMATED STRAW TONNES/HECTARE

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

OLD_RES	
O	4.49
D	4.90
N*	4.93
PK	5.50
N*PK	4.88
Mean	4.94

STRAW MEAN DM% 87.7

PLOT AREA HARVESTED 0.00525

06/R/PG/5

PARK GRASS

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

The 151st year, hay.

For previous years see 'Details' 1977 and 1973 and 74-05/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
N2PNaMg	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 (FYM/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)

06/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 1920-1964. 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 97-05/R/PG/5 Yield book entries.]

Experimental diary:
The amount of chalk applied in t/ha.

Plot	a	b	c
1	1.5	0.75	0.75
2/1	0.75	0.75	0.3
2/2	0	0.3	0
3	0.5	0	0
4/1	1.5	0.3	0
4/2	4.0	1.0	1.0
6	3.0	2.0	0
7	2.0	1.5	0.3
8	2.0	0.5	0
9/1	3.0	0.75	0
9/2	3.0	3.0	1.0
10	3.0	0	0.5
11/1	5.0	1.0	1.5
11/2	4.0	1.0	1.5
12	1.5	0.75	0

13/1	1.5	0.75	0.3
13/2	2.0	0.3	0
14/1	2.0	1.5	0
14/2	2.0	0	0
15	3.0	1.5	0.3
16	3.0	0	0
17	1.5	0	0
18	4.0	1.0	1.0

21-Nov-05	T		Chalk applied
22-Nov-05	**T**		P applied.
29-Nov-05	**T**		K, Si, Na, Mg applied.
07-Feb-06	B		Rolled.
12-Apr-06	**T**		N applied (except to plots 14/2, 16 and 17).
13-Apr-06	**T**		Remaining N applied.
26-Apr-06			Cut paths.
23-May-06			Cut paths.
12-Jun-06	**T**		Cut sample areas for yield, sampled and weighed, and carted cut grass.
13-Jun-06	**T**		Finished cutting sample areas for yield, sampled and weighed. Cut discards.
14-Jun-06	B		Turned hay.
15-Jun-06	B		Turned hay.
16-Jun-06	B		Turned hay.
17-Jun-06	B		Turned hay, rowed up and baled hay.
04-Sep-06	B		Cut paths.
07-Nov-06	B		Cut paths.
13-Nov-06	**T**		Cut sample areas for yield, sampled and weighed.
14-Nov-06	T		Finished cutting sample areas for yield, sampled and weighed, cut discards and rowed up
15-Nov-06	B		Rowed up and baled.

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

06/R/PG/5

1ST CUT (12-13/6/06) DRY MATTER TONNES/HECTARE

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

Manure	Lime	a	b	c	d	Mean
N1	1	2.00	1.91	1.72	1.17	1.70
K	2/1	1.73	2.29	1.08	1.18	1.57
None(FYM)	2/2	2.37	2.36	1.15	1.28	1.79
None	3	2.22	1.95	1.18	1.21	1.64
P	4/1	2.37	2.35	1.82	1.71	2.06
N2P	4/2	2.50	2.74	2.52	1.16	2.23
N1PKNaMg	6	4.70	4.19			4.45
PKNaMg	7	3.80	3.98	3.56	2.54	3.47
PNaMg	8	2.15	2.00	2.28	2.14	2.14
PKNaMg(N2)	9/1	3.59	3.19	3.94	1.74	3.12
N2PKNaMg	9/2	4.85	4.36	4.43	3.00	4.16
N2PNaMg	10	2.71	2.81	2.86	1.43	2.45
N3PKNaMg	11/1	5.89	5.23	4.95	1.94	4.50
N3PKNaMgSi	11/2	5.73	5.36	5.83	3.62	5.14
None	12	1.37	1.77	1.32	1.32	1.45
(FYM/F)	13/1	1.96	2.37	1.83	1.95	2.03
FYM/PM	13/2	2.92	3.46	3.53	2.78	3.17
PKNaMg(N2*)	14/1	3.01	3.61	3.26	2.65	3.14
N2*PKNaMg	14/2	3.15	4.18	4.32	4.32	3.99
PKNaMg(N2*)	15	3.67	4.03	3.12	2.25	3.27
N1*PKNaMg	16	3.59	3.17	2.73	3.00	3.12
N1*	17	2.64	2.59	2.73	2.45	2.60
N2KNaMg	18	1.74	2.61	2.07	0.28	1.67
N2KNaMg	18/2					2.17
FYM	19/1					3.02
FYM	19/2					3.47
FYM	19/3					3.11
FYM/N*PK	20/1					3.63
FYM/N*PK	20/2					4.52
FYM/N*PK	20/3					3.77

1ST CUT MEAN DM% 25.9

06/R/PG/5

2ND CUT (13-14/11/06) DRY MATTER TONNES/HECTARE

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

Manure		Lime	a	b	c	d	Mean
N1	1		1.11	1.23	0.87	0.34	0.89
K	2/1		0.84	0.82	0.38	0.50	0.64
None(FYM)	2/2		0.91	0.95	0.62	0.72	0.80
None	3		0.86	1.07	0.68	1.14	0.94
P	4/1		1.14	1.17	1.36	1.29	1.24
N2P	4/2		1.16	1.32	0.94	0.94	1.09
N1PKNaMg	6		1.48	1.56			1.52
PKNaMg	7		1.80	2.03	1.34	0.81	1.49
PNaMg	8		0.98	1.24	1.31	1.56	1.27
PKNaMg(N2)	9/1		1.82	1.57	0.96	0.39	1.18
N2PKNaMg	9/2		1.44	1.49	1.35	2.00	1.57
N2PNaMg	10		1.19	1.59	1.55	1.90	1.56
N3PKNaMg	11/1		2.19	2.08	2.00	1.97	2.06
N3PKNaMgSi	11/2		2.56	2.07	1.87	2.52	2.26
None	12		0.93	0.78	0.69	0.79	0.80
(FYM/F)	13/1		1.90	2.10	1.46	0.88	1.59
FYM/PM	13/2		1.64	2.45	1.99	2.02	2.03
PKNaMg(N2*)	14/1		1.53	1.79	1.73	2.24	1.82
N2*PKNaMg	14/2		1.53	1.88	1.85	2.08	1.83
PKNaMg(N2*)	15		1.72	1.91	0.93	0.76	1.33
N1*PKNaMg	16		3.02	1.63	1.41	1.10	1.79
N1*	17		1.68	1.44	1.34	1.28	1.44
N2KNaMg	18		1.08	1.01	0.72	0.17	0.74
N2KNaMg	18/2						1.09
FYM	19/1						1.65
FYM	19/2						2.02
FYM	19/3						1.84
FYM/N*PK	20/1						1.80
FYM/N*PK	20/2						2.02
FYM/N*PK	20/3						1.80

2ND CUT MEAN DM% 26.9

06/R/PG/5

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

Manure	Lime	a	b	c	d	Mean
N1	1	3.11	3.14	2.60	1.51	2.59
K	2/1	2.57	3.12	1.46	1.68	2.21
None(FYM)	2/2	3.29	3.30	1.77	2.00	2.59
None	3	3.07	3.02	1.86	2.35	2.57
P	4/1	3.51	3.52	3.19	3.00	3.30
N2P	4/2	3.66	4.06	3.46	2.10	3.32
N1PKNaMg	6	6.18	5.75			5.96
PKNaMg	7	5.60	6.01	4.90	3.35	4.96
PNaMg	8	3.13	3.24	3.59	3.70	3.41
PKNaMg(N2)	9/1	5.40	4.76	4.90	2.14	4.30
N2PKNaMg	9/2	6.29	5.85	5.79	5.00	5.73
N2PNaMg	10	3.89	4.40	4.41	3.33	4.01
N3PKNaMg	11/1	8.08	7.31	6.94	3.91	6.56
N3PKNaMgSi	11/2	8.29	7.43	7.70	6.14	7.39
None	12	2.30	2.55	2.02	2.11	2.24
(FYM/F)	13/1	3.86	4.47	3.29	2.84	3.61
FYM/PM	13/2	4.57	5.91	5.52	4.80	5.20
PKNaMg(N2*)	14/1	4.55	5.40	4.99	4.89	4.96
N2*PKNaMg	14/2	4.67	6.06	6.17	6.40	5.83
PKNaMg(N2*)	15	5.39	5.93	4.05	3.02	4.60
N1*PKNaMg	16	6.61	4.80	4.13	4.10	4.91
N1*	17	4.32	4.02	4.07	3.73	4.04
N2KNaMg	18	2.81	3.62	2.79	0.45	2.42
N2KNaMg	18/2					3.26
FYM	19/1					4.67
FYM	19/2					5.49
FYM	19/3					4.95
FYM/N*PK	20/1					5.44
FYM/N*PK	20/2					6.54
FYM/N*PK	20/3					5.56

TOTAL OF 2 CUTS MEAN DM% 26.4

06/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 69th year, leys, w. beans, w. wheat, w. rye, forage maize.

For previous years see 'Details' 1967 & 1973 and 74-05/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

06/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: Split N *v* single N dressing to wheat, tested 2001-5

   Nsplit(noFYM)
   Nsingle(FYM)

1/8 plots:

3. **N** Nitrogen fertilizer as single dressing in spring 2006 (kg N) as 34.5% N:

   0
   70
   140
   210

06/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 2005(noFYM)
   Nsingle to wheat in 2005 (FYM)

1/8 plots:

3. **N** Nitrogen fertilizer in spring 2006(kg N) as 34.5% 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 K_2O) as muriate of potash, applied where necessary to first test crop w. wheat and long-term leys in the wheat block, applied 8 October 2005.

Continuous rotations before wheat	No FYM half plots	FYM Res half plots
ABe	230	330
AM	190	190

None to other plots.

06/W/RN/3

Experimental diary:

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

21-Sep-05	Azural @ 3.0 l in 200 l.
08-Oct-05	Triplesuperphosphate at 213 kg Potassium sulphate at 140 kg.
10-Oct-05	Ploughed 35cm wide furrows.
11-Oct-05	Rolled.
14-Oct-05	Power harrowed. Drilled Promesse Timothy + Tyko Fescue, 50:50, @ 30 kg and Promesse Timothy + Tyko Fescue + Chieftan White Clover, 44:44:12 @ 30 kg with the Accord drill.
18-Oct-05	Rolled.
02-Nov-05	27.0% N at 93 kg, 1st year grass/clover leys; at 185 kg, 1st year grass leys.
02-Mar-06	Muriate of potash at 167 kg.
17-Mar-06	34.5% N at 218 kg.
28-Jun-06	Cut yield strips, weighed and sampled.
29-Jun-06	Baled.
03-Jul-06	Muriate of Potash at 83 kg to all leys. 34.5% N at 218 kg to grass leys only.

Note: Due to poor re-growth the scheduled second grass or grass/clover ley cut was abandoned.

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

01-Mar-06	Potassium sulphate at 140 kg, Triple superphosphate at 213 kg.
02-Mar-06	Muriate of potash at 167 kg.
17-Mar-06	34.5% N at 203 kg
28-Jun-06	Cut yield strips, weighed and sampled.
29-Jun-06	Baled.
03-Jul-06	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.

Note: Due to poor re-growth the scheduled second grass ley cut was abandoned.

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

01-Mar-06	Potassium sulphate at 140 kg, Triple superphosphate at 213 kg.
02-Mar-06	Muriate of potash at 167 kg.
28-Jun-06	Cut yield strips, weighed and sampled.
29-Jun-06	Baled.
03-Jul-06	Muriate of Potash at 83 kg.
18-Jul-06	Azural at 5.0 l in 200 l to ley plots going into wheat.

Note: Due to poor re-growth the scheduled second grass/clover ley cut was abandoned.

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

08-Oct-05	Triple superphosphate at 127 kg.
20-Oct-05	Broadcast, Wizard, recleaned at 20 seeds/m^2. Ploughed 35 cm wide furrows, springtine.
27-Oct-05	Stomp 400 SC at 3.3 l.
01-Mar-06	Potassium sulphate at 140 kg.
16-May-06	tm)Bravo 500 at 1.0 l in 200 l. tm)Folicur at 0.5 l in 200 l. tm)Decis at 0.3 l in 200 l.

tm) Mancozin at 1.0 l in 200 l.
18-Jun-06 tm) Bravo 500 at 2.0 in 200 l.
tm) Folicur at 0.75 in 200 l.
tm) Aphox at 0.28 g in 200 l.
27-Aug-06 Combine harvested plots for yield. Straw swathed.
Combine harvested discards. Straw swathed.

Forage maize, 2nd and 3rd treatment crop (**ROTATION** ABe and AM)
08-Oct-05 Triple superphosphate at 127 kg.
10-Oct-05 Ploughed 35 cm wide furrows.
01-Mar-06 Potassium sulphate at 140 kg.
11-May-06 Flexitined and power harrowed.
12-May-06 Drilled, Hudson, tr. Thiram + Methiocarb + fludioxonil + metalaxyl M, at 10.2 seeds/m^2 with the Nodet drill.
34.5% N at 290 kg.
07-Jun-06 tm) Jester at 0.5 l in 200 l.
tm) Griffin Gex 1664 at 0.2 l in 200 l.
05-Oct-06 Cut sampled and weighed.

W. wheat, 1st test crop (W)
10-Aug-05 Azural at 4.0 l in 200 l
08-Sep-05 Baled
08-Oct-05 Triple superphosphate at 127 kg.
Muriate of potash (corrective K) at 190 kg K_2O to plots 39 and 40, 230 kg to 45 and 330 kg to 46.
10-Oct-05 Ploughed 35 cm wide furrows.
11-Oct-05 Rolled.
14-Oct-05 Power harrowed. Drilled Hereward, tr. Sibutol Secur, at 350 seeds/m^2 with the Accord drill. Rolled.
13-Nov-05 tm) Alpha IPU 500 at 2.0 l in 200 l.
tm) Stomp 400 SC at 2.5 l in 200 l.
tm) Hallmark with Zeon Technology at 50 ml in 200 l.
tm) Mantrac 500 at 1.0 l in 200 l.
01-Mar-06 Potassium sulphate at 140 kg
19-Apr-06 34.5% N treatments.
24-Apr-06 tm) Opus at 0.75 l in 200 l.
tm) Bravo 500 at 1.25 l in 200 l.
tm) Mantrac 500 at 1.25 l in 200 l.
16-May-06 tm) Quantum SX at 30 g in 200 l.
tm) Copper Man at 2.0 kg in 200 l.
tm) Opus at 0.75 l in 200 l.
07-Jun-06 tm) Opus at 0.75 l in 200 l.
tm) Bravo 500 1.0 l in 200 l.
tm) Vivid 0.4 l in 200 l.
27-Aug-06 Combine harvested plots for yield. Straw swathed.

W. rye, 2nd test crop and 1st treatment crop (**ROTATION** ABe and AM)
21-Sep-05 Azural @ 3.0 l in 200 l.
08-Oct-05 Chalk at 5.0 t, (not to ROTATION ABe and AM plots).
Triple superphosphate at 127 kg.
10-Oct-05 Ploughed 35 cm wide furrows.
11-Oct-05 Rolled.
18-Oct-05 Power harrowed. Drilled, Matador, tr. Robust and Premis, at 125 kg/ha with the Accord drill. Rolled.
13-Nov-05 Stomp 400 SC at 2.5 l in 200 l.
tm) Hallmark with Zeon Technology at 50 ml in 200 l.
tm) Mantrac 500 at 1.0 l in 200 l.
01-Mar-06 Potassium sulphate at 140 kg
19-Apr-06 34.5% N treatments to 2nd test crop only.
24-Apr-06 Opus at 0.75 l in 200 l.
Moddus at 0.2 l in 200 l.

26 Apr-06`	34.5% N at 232 kg to 1st treatment crops.
16-May-06	tm)Quantum SX at 30 g in 200 l.
	tm)Copper Man at 2.0 kg in 200 l.
27-Aug-06	Combine harvested plots for yield. Straw swathed.

Note: Samples of grain, forage maize, herbage taken for chemical analysis

06/W/RN/3

LEYS

1ST (AND ONLY) CUT (28/6/06) DRY MATTER TONNES/HECTARE

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

FYM_RES	NONE	FYM	Mean
LEY			
LC1	3.53	3.54	3.54
LC2	4.48	4.75	4.61
LC3	6.16	5.24	5.70
LN1	6.60	6.77	6.68
LN2	8.84	8.64	8.74
LN3	7.43	8.56	8.00
LLC1	4.39	3.81	4.10
LLC2	3.74	3.36	3.55
LLC3	6.74	7.15	6.95
LLC4	4.54	5.20	4.87
LLC5	4.49	3.87	4.18
LLC6	4.70	4.40	4.55
LLC7	4.23	3.99	4.11
LLC8	5.31	5.06	5.19
LLN1	5.97	6.07	6.02
LLN2	7.51	6.92	7.21
LLN3	6.49	7.18	6.83
LLN4	6.69	7.45	7.07
LLN5	7.00	6.49	6.75
LLN6	6.08	6.21	6.15
LLN7	6.83	6.73	6.78
LLN8	7.85	6.74	7.29
Mean	5.89	5.82	5.86

1ST CUT MEAN DM% 35.2

PLOT AREA HARVESTED 0.00200

06/W/RN/3

ARABLE TREATMENT CROPS

RYE

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

FYMRES / ROTATION	NONE	FYM	Mean
AM	5.22	4.71	4.96
ABe	4.96	5.36	5.16
Mean	5.09	5.03	5.06

GRAIN MEAN DM% 81.5

PLOT AREA HARVESTED 0.00413

MAIZE

WHOLE CROP (100% DRY MATTER) TONNES/HECTARE

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

FYMRES / ROTATION	NONE	FYM	Mean
AM	15.64	14.52	15.08
ABe	15.29	14.14	14.72
Mean	15.47	14.33	14.90

GRAIN MEAN DM% 42.5

PLOT AREA HARVESTED 0.00108

BEANS

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

FYMRES / ROTATION	NONE	FYM	Mean
AM	1.60	3.10	2.35
ABe	3.62	2.67	3.15
Mean	2.61	2.88	2.75

GRAIN MEAN DM% 81.9

PLOT AREA HARVESTED 0.00413

06/W/RN/3

W. WHEAT

GRAIN TONNES/HECTARE

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

FYMRES	none	FYM	Mean
ROTATION			
LLN 8	6.80	8.16	7.48
LN 3	7.76	7.29	7.52
LLC 8	7.42	7.86	7.64
LC 3	7.46	7.61	7.53
AM	5.43	5.96	5.69
ABe	7.03	7.97	7.50
Mean	6.98	7.47	7.23

N	0	70	140	210	Mean
ROTATION					
LLN 8	6.80	8.19	7.20	7.73	7.48
LN 3	5.80	8.06	8.34	7.90	7.52
LLC 8	6.79	7.78	8.23	7.77	7.64
LC 3	6.10	8.11	8.41	7.50	7.53
AM	1.84	5.90	7.11	7.93	5.69
ABe	4.04	7.96	8.65	9.34	7.50
Mean	5.23	7.67	7.99	8.03	7.23

N	0	70	140	210	Mean
FYMRES					
none	4.85	7.53	7.76	7.79	6.98
FYM	5.61	7.80	8.22	8.27	7.47
Mean	5.23	7.67	7.99	8.03	7.23

N		0	70	140	210
ROTATION	FYMRES				
LLN 8	none	5.70	7.95	6.22	7.34
	FYM	7.90	8.43	8.17	8.12
LN 3	none	5.58	8.39	9.03	8.05
	FYM	6.02	7.74	7.65	7.74
LLC 8	none	6.40	7.49	7.98	7.80
	FYM	7.17	8.07	8.48	7.74
LC 3	none	6.32	8.27	8.25	6.98
	FYM	5.89	7.95	8.58	8.03
AM	none	1.40	5.66	6.93	7.71
	FYM	2.28	6.14	7.28	8.14
ABe	none	3.68	7.42	8.15	8.86
	FYM	4.40	8.50	9.15	9.82

GRAIN MEAN DM% 80.7

PLOT AREA HARVESTED 0.00183

06/W/RN/3

W. RYE

GRAIN TONNES/HECTARE

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

NSPLITFYM / **ROTATION**	Nsplit(noFYM)	Nsingle(FYM)	Mean
LLN 8	4.36	4.96	4.66
LN 3	6.32	5.98	6.15
LLC 8	6.46	5.92	6.19
LC 3	6.43	5.82	6.13
AM	4.48	4.59	4.54
ABe	5.57	5.47	5.52
Mean	5.60	5.46	5.53

N / **ROTATION**	0	40	80	120	Mean
LLN 8	3.33	4.43	5.03	5.87	4.66
LN 3	4.94	6.26	6.31	7.09	6.15
LLC 8	5.27	6.10	6.65	6.73	6.19
LC 3	4.77	6.48	6.67	6.58	6.13
AM	2.30	4.05	5.71	6.09	4.54
ABe	3.57	5.01	6.13	7.37	5.52
Mean	4.03	5.39	6.08	6.62	5.53

N / **NSPLITFYM**	0	40	80	120	Mean
Nsplit(noFYM)	4.21	5.44	6.29	6.48	5.60
Nsingle(FYM)	3.85	5.34	5.88	6.76	5.46
Mean	4.03	5.39	6.08	6.62	5.53

N		0	40	80	120
ROTATION	**NSPLITFYM**				
LLN 8N	split(noFYM)	3.43	3.76	4.55	5.73
	Nsingle(FYM)	3.23	5.09	5.52	6.01
LN 3N	split(noFYM)	4.96	6.53	6.63	7.17
	Nsingle(FYM)	4.93	5.98	6.00	7.00
LLC 8N	split(noFYM)	5.63	6.19	7.26	6.76
	Nsingle(FYM)	4.92	6.02	6.04	6.70
LC 3N	split(noFYM)	5.08	7.04	7.45	6.16
	Nsingle(FYM)	4.47	5.93	5.89	6.99
AM	Nsplit(noFYM)	2.32	4.01	5.88	5.72
	Nsingle(FYM)	2.27	4.09	5.54	6.45
Abe	Nsplit(noFYM)	3.83	5.10	5.99	7.35
	Nsingle(FYM)	3.30	4.92	6.27	7.39

GRAIN MEAN DM% 81.1

PLOT AREA HARVESTED 0.00183

06/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 42nd year, w. wheat.

For previous years see 'Details' 1973 and 74-05/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.

06/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.

Nitrogen

In 2006 all plots, except Lc (permanent grass/clover), split into 6 to test rates of N. For crops receiving nitrogen rates rotate as follows:

N0 > N1 > N2 > N3 > N4 > N5 > N0 etc.

For 2006 wheat crop nitrogen rates (kg N/ha) were:
0, 50, 100, 150, 200, 250 as nitro-chalk (27% N), split 50 kg N late February/early March and the remainder in mid=April.

Experimental diary:

21-Sep-05	: B :	:	Azural at 3.0 l in 200 l.
11-Oct-05	: **T** :	:	Chopped wheat straw applied at 7.5 t to St plots.
	: 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.
	: B :	:	Ploughed 35cm wide furrows and rolled wheat plots.
14-Oct-05	: B :	:	Power harrowed.
15-Oct-05	: B :	:	Power harrowed, combination drilled Hereward, tr. Sibutol Secur at 350 seeds/m^2, wheat plots.
13-Nov-05	: B :	:	tm)Alpha IPU 500 at 2.0 l in 200 l
	B		tm)Stomp 400 SC at 2.5 l in 200 l
	B		tm)Hallmark with Zeon Technology at 50 ml in 200 l
	B		tm)Mantrac 500 at 1.0 l in 200 l, to wheat plots.
01-Mar-06	**T** :	:	Sulphate of Potash at 200 kg (not to Dg25).
	T :	:	Triple Superphosphate at 97.5 kg (not to Dg25).
13-Mar-06			1^{st} N applied as 27% N to wheat plots.
20-Apr-06			Main dressing applied as 27% N to wheat plots.
24-Apr-06	: B :	:	tm)Bravo 500 at 1.25 l in 200 l
	: B :	:	tm)Opus at 0.75 l in 200 l
	B		tm)Mantrac 500 at 1.25 l in 200 l to wheat plots.
16-May-06			tm)Quantum SX at 30 g in 200 l
			tm)Copper Man at 2.0 kg in 200 l to wheat plots.
07-Jun-06	: B :	:	tm)Bravo 500 at 1.0 l in 200 l
	: B :	:	tm)Opus at 0.75 l in 200 l
	B		tm)Vivid at 0.4 l in 200 l to wheat plots.
28-Jun-06			1^{st} cut yield strips Lc plots only, weighed and sampled. Mowed discards.
29-Jun-06			Baled.
25-Aug-06	: **T** :	:	Combine harvested, wheat plots for yield, swathed straw. Combine harvested discards, swathed straw.

NOTE: Samples of grain were taken for chemical analysis.
Due to poor re-growth the scheduled second grass cut was abandoned.

06/W/RN/12

GRAIN TONNES/HECTARE

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

Nitrogen / **Treatment**	0	50	100	150	200	250	Mean
F(Fd)	2.34	4.21	5.41	5.48	5.59	5.68	4.79
F(Ln,Lc6)	3.40	5.13	6.35	7.20	6.84	6.36	5.88
St(St)	2.80	4.99	6.56	6.68	6.84	6.56	5.74
CC(Gm,Lc8)	3.04	5.17	6.28	6.41	6.61	5.87	5.56
Co(Pt,Lc8)	4.51	5.95	6.43	6.37	6.62	5.70	5.93
Dg10(Fs)	2.77	5.20	5.93	6.38	6.53	5.91	5.45
Dg25(Dg)	4.71	5.81	7.05	7.20	6.46	6.10	6.22
Mean	3.37	5.21	6.29	6.53	6.50	6.03	5.65

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

Table	**Treatment**	**Nitrogen**	**Treatment** **Nitrogen**
s.e.d.	0.343	0.136	0.475
Except when comparing means with the same level(s) of **Treatment**			0.359

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

Stratum	d.f.	s.e.	cv%
Blocks.Plots	18	0.485	8.6
Blocks.Plots.Subplots	105	0.508	9.0

GRAIN MEAN DM% 85.2

PLOT AREA HARVESTED 0.00183

06/R/CS/326 and 06/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 20th year, w. wheat.

For previous years see 87-05/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 (t/ha), cumulative to previous annual dressings:

		R	W
NONE	None	-	-
NORMAL	Normal	5.19	3.20
2 NORMAL	Twice normal	10.38	6.40
4 NORMAL	Four times normal	20.76	1280

Experimental diary:
Great Knott III (R):

18-Aug-05	**T**	:	Straw treatments applied, baled remaining straw.
26-Sep-05	B	:	Ploughed 35 cm furrows.
28-Sep-05	B	:	Cultipress, combination drilled, Hereward, tr. Sibutol Secur, at 350 seeds/m^2, rolled.
03-Oct-05	B	:	Crystal at 4.0 l in 200 l.
05-Dec-05	B	:	Hallmark with Zeon Technology at 50 ml in 200 l.
15-Mar-06	B	:	Double Top at 185 kg. (50 kg N).
21-Apr-06	B	:	tm)Opus at 0.75 l in 200 l.
	B	:	tm)Bravo 500 at 1.0 l in 200 l.
	B	:	tm)Flexity at 0.2 l in 200 l.
24-Apr-06	B	:	Double Top at 435 kg. (140 kg N).
16-May-06	B	:	tm)Ally Max SX at 42 g in 200 l.
	B	:	tm)Starane 2 at 0.75 l in 200 l.
02-Jun-06	B	:	tm)Opus at 0.75 l in 200 l.
	B	:	tm)Bravo 500 at 1.0 l in 200 l.
	B	:	tm)Vivid at 0.4 l in 200 l.
16-Aug-06	B	:	Combine harvested plots for yield, combined discards, swathed straw, sample and weighed.

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06/R/CS/326 and 06/W/CS/326

Experimental diary:

Far Field I (W):

07-Sep-05	**T**	Straw treatments applied. Remaining straw baled and removed.
22-Sep-05	B	Azural at 3.0 l in 200 l.
01-Oct-05	B	Ploughed 35 cm furrows.
08-Oct-05	B	Rolled.
12-Oct-05	B	Combination drilled, Hereward, tr. Sibutol Secur at 350 seeds/m^2 with the Accord drill.
14-Oct-05	B	Rolled.
13-Nov-05	B	tm)Alpha IPU 500 at 2.0 l in 200 l.
	B	tm)Hallmark with Zeon Technology at 50 ml in 200 l.
	B	tm)Mantrac 500 at 1.0 l in 200 l.
	B	tm)Stomp 40 SC at 2.5 l in 200 l.
17-Mar-06	B	N Sulphur 30% N, 7.6% S at 185 kg.
07-Apr-06	B	tm)Pacifica at 0.4 kg in 200 l.
	B	tm)Biopower at 1.0 l in 200 l.
	B	tm)Duplosan KV at 2.0 l in 200 l.
	B	tm)Biopower at 1.0 l in 200 l.
24-Apr-06	B	tm)Opus at 0.75 l in 200 l.
	B	tm)Bravo 500 at 1.25 l in 200 l.
	B	tm)Mantrac 500 at 1.25 l in 200 l.
25-Apr-06	B	Double Top 27% N, 12 S at 481 kg.
16-May-06	B	tm)Quantum SX at 30 g in 200 l.
	B	tm)Copper Man at 2.0 l in 200 l.
07-Jun-06	B	tm)Bravo 500ar at 1.0 l in 200 l.
	B	tm)Opus at 0.75 l in 200 l.
	B	tm)Vivid at 0.4 l in 200 l.
27-Aug-06	**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.

06/R/CS/326

GRAIN TONNES/HECTARE

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

STRAW	
NONE	7.95
NORMAL	7.21
2 NORMAL	7.09
4 NORMAL	6.72
Mean	7.24

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

STRAW
0.312

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

Stratum	d.f.	s.e.	cv%
Blocks.Plots	9	0.442	6.1

GRAIN MEAN DM% 85.4

STRAW TONNES/HECTARE

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

STRAW	
NONE	5.84
NORMAL	6.04
2 NORMAL	5.94
4 NORMAL	6.69
Mean	6.13

STRAW MEAN DM% 92.3

PLOT AREA HARVESTED 0.00278

06/W/CS/326

GRAIN TONNES/HECTARE

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

STRAW	
NONE	7.74
NORMAL	7.42
2 NORMAL	7.38
4 NORMAL	7.58
Mean	7.53

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

STRAW
0.287

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

Stratum	d.f.	s.e.	cv%
Blocks.Plots	6	0.351	4.7

GRAIN MEAN DM% 81.2

STRAW TONNES/HECTARE

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

STRAW	
NONE	5.53
NORMAL	5.14
2 NORMAL	5.36
4 NORMAL	5.31
Mean	5.34

STRAW MEAN DM% 87.7

PLOT AREA HARVESTED 0.00305

06/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 10th year, forage maize and s. barley.

For previous years see 97-05/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:

19-Oct-05	**T**	BT, MT	Maize tops at 10 t
08-Nov-05	B		Muriate of potash at 180 kg.
	B		Triple superphosphate at 170 kg.
09-Nov-05	B		Ploughed 25 cm wide furrows.
03-Apr-06	B		Springtined.
05-Apr-06	**T**	(M)B, BT, B	Combination drilled, Optic, tr. Raxil Pro, at 350 seeds/m^2 with the Accord drill.
	T	(M)B, BT, B	Rolled.
26-Apr-06	B		Double Top (27% N, 12% S) at 355 kg.
10-May-06	**T**	(B)M, MT, M	Flexitined
11-May-06	**T**	(B)M, MT, M	Flexitined, drilled, Hudson, tr. Thiram, Methiocarb, Fludioxonil, Metalaxyl M, at 10.2 seeds/m^2 with the Nodet Gougis drill.
17-May-06	**T**	(M)B, BT, B	tm)Acanto at 0.5 l in 200 l tm)Unix at 0.5 l in 200 l tm)Quantum SX at 30 g in 200 l tm)Duplosan KV at 2.0 l in 200 l
08-Jun-06	**T**	(B)M, MT, M	tm)Jester at 0.5 kg in 200 l. tm)Griffin Gex 1664 at 0.2 l in 200 l.
11-Aug-06		(M)B, BT, B	Combine harvested discards, swathed straw, baled.
16-Aug-06	**T**	(M)B, BT, B	Combine harvested plots for yield, swathed straw. Combined remaining barley, swathed straw. Baled.
28-Sep-06	**T**	(B)M, MT, M	Cut sample areas by hand, weighed and sampled.
30-Sep-06	**T**	(B)M, MT, M	Harvested discards.

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

06/R/CS/477 MAIZE

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

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

CROP	
M	7.39
(B)M	9.69
MT	7.15
Mean	8.08

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

CROP
1.039

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

Stratum	d.f.	s.e.	cv%
Blocks.Plots	4	1.272	15.7

MEAN DM% 35.6

PLOT AREA HARVESTED 0.00108

SPRING BARLEY

GRAIN TONNES/HECTARE

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

CROP	
(M)B	4.57
BT	4.47
B	4.38
Mean	4.47

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

CROP
0.304

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

Stratum	d.f.	s.e.	cv%
Blocks.Plots	4	0.373	8.3

GRAIN MEAN DM% 85.4

PLOT AREA HARVESTED 0.00525

06/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 10th year, forage maize and s. barley.

For previous years see 97-05/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:

09-Nov-05	**T**	BT, MT	Maize tops applied at 10 tonnes.
16-Nov-05	B		Muriate of potash at 181 kg.
	B		Triple superphosphate at 171 kg.
	B		Ploughed 30 cm wide furrows.
05-Apr-06	B		Flexitined.
	T	(M)B, BT, B	Drilled, Optic, tr. Raxil Pro, at 350 seeds/m^2, rolled.
11-May-06	B		Double Top (27% N, 12% S) at 356 kg.
	T	(B)M, MT, M	Power harrowed.
12-May-06	**T**	(B)M, MT, M	Drilled, Hudson, tr. Thiram, Methiocarb, Fludioxonil, Metalaxyl M, at 10.2 seeds/m^2
17-May-06	B	(M)B, BT, B	tm)Quantum SX at 30.0 g in 200 l.
	B		tm)Acanto at 0.5 l in 200 l.
	B		tm)Corbel at 0.5 l in 200 l.
	B		tm)Manganese 15% Mn at 3.0 l in 200 l.
	B		tm)Unix at 0.5 kg in 200 l.
	B		tm)Duplosan KV at 2.0 l in 200 l.
07-Jun-06	**T**	(B)M, MT, M	tm)Jester at 0.5 kg in 200 l. tm)Griffin Gex 1664 at 0.2 l in 200 l.
27-Aug-06	**T**	(M)B, BT, B	Combine harvested plots for yield, swathed straw.
	T	(M)B, BT, B	Combine harvested discards, swathed straw.
	T	(M)B, BT, B	Baled.
05-Oct-06	**T**	(B)M, MT, M	Cut sample areas, weighed, and sampled.
16-Oct-06	**T**	(B)M, MT, M	Cut discards.

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

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06/W/CS/478

MAIZE

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

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

	CROP
M	11.24
MT	11.86
(B)M	9.86
Mean	10.99

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

CROP
1.216

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

Stratum	d.f.	s.e.	cv%
Blocks.Plots	4	1.490	13.6

MEAN DM% 42.1

PLOT AREA HARVESTED 0.00108

SPRING BARLEY

GRAIN TONNES/HECTARE

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

	CROP
(M)B	2.46
BT	3.32
B	2.58
Mean	2.79

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

CROP
0.149

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

Stratum	d.f.	s.e.	cv%
Blocks.Plots	4	0.183	6.6

MEAN DM% 86.0

AVERAGE PLOT AREA HARVESTED 0.00513

Rothamsted Experimental Station

The Weather : Monthly Summary : 2006

(Departure from 30-year means (1971 - 2000) in brackets)

	Sunshine		Mean temperatures oC								Rain			Drainage	Wind
			Maximum		Minimum		Dew	Ground	In ground under grass		Total mm		Rain	20 inch	***
	Hours	( )		( )		( )	point	frosts *	30 cm	100 cm	5" turf wall		days **	mm	km/hr
January	58.0	(+2.9)	6.17	(-0.17)	1.83	(+0.97)	1.92	15	5.08	7.01	29.2	(-40.5)	19	19.7	9.7
February	80.2	(+9.5)	5.73	(-0.98)	0.57	(-0.17)	0.11	18	4.44	6.12	41.4	(-7.4)	14	17.3	11.4
March	115.2	(+8.0)	7.93	(-1.56)	1.50	(-0.83)	1.24	16	4.56	5.64	49.5	(-4.4)	13	18.5	12.8
April	141.8	(-5.0)	12.47	(+0.53)	4.52	(+0.9)	4.12	8	8.65	7.82	51.0	(-2.5)	21	6.4	10.3
May	161.6	(-33.3)	16.43	(+0.68)	8.29	(+1.97)	9.55	1	13.13	11.04	89.0	(+39.3)	22	30.5	9.3
June	265.9	(+75.6)	21.55	(+2.95)	10.66	(+1.54)	11.1	0	16.48	13.82	15.0	(-45.2)	9	0.6	7.4
July	275.1	(+71.7)	26.15	(+4.73)	14.48	(+3.12)	13.6	0	18.94	16.28	35.6	(-6.5)	12	0.2	8.0
August	154.2	(-42.6)	20.34	(-1.00)	12.39	(+1.04)	11.9	0	17.42	16.66	110.0	(+56.3)	22	35.7	8.8
September	154.2	(+11.9)	21.35	(+3.36)	13.40	(+3.96)	13.8	0	17.06	16.22	54.2	(-6.8)	16	2.9	8.2
October	105.1	(-7.0)	16.48	(+2.74)	9.94	(+3.29)	10.9	0	14.50	15.08	105.0	(+30.3)	24	57.7	9.0
November	113.0	(+42.9)	11.51	(+2.13)	4.35	(+1.02)	5.2	12	9.85	12.12	104.4	(+38.2)	22	63.4	9.9
December	65.6	(+17.5)	8.77	(+1.58)	3.36	(+1.44)	3.97	9	7.49	9.75	95.0	(+24.9)	22	45.1	12.0
Year	1689.9		14.57		7.11			79			779.3		216	298.0	

* Number of nights grass minimum was below 0.0 oC

** Number of days rain was 0.2 mm or more

*** At 2 metres above ground

Woburn Experimental Farm

The Weather : Monthly Summary : 2006

(Departure from 30-year means (1971 - 2000) in brackets)

	Sunshine		Mean temperatures oC								Rain			Wind
			Maximum		Minimum		Dew	Ground	In ground under grass		Total mm		Rain	***
	Hours	( )		( )		( )	point	frosts *	30 cm	100 cm	Tipping bucket		days **	km/hr
												( )		
January	51.80	(+3.3)	6.22	(-0.5)	1.33	(+0.29)	2.38	15	5.14	7.38	20.8	(-34.5)	18	5.86
February	74.20	(+10.2)	6.02	(-1.07)	0.54	(-0.28)	0.42	17	4.40	6.35	31.6	(-9.0)	15	8.14
March	104.00	(+2.7)	8.32	(-1.56)	1.51	(-0.88)	2.70	16	4.70	5.81	42.4	(-7.2)	19	9.98
April	146.80	(+11.0)	13.02	(+0.77)	4.56	(+1.15)	4.40	7	8.79	7.60	38.4	(-14.3)	14	8.62
May	170.60	(-12.5)	16.98	(-0.94)	8.00	(+1.86)	9.14	1	12.25	9.98	79.0	(+26.3)	19	7.53
June	261.70	(+84.8)	22.25	(+3.31)	9.71	(+0.70)	11.88	0	14.69	11.85	9.0	(-49.8)	7	4.79
July	249.00	(+55.4)	26.78	(+5.06)	13.03	(+1.85)	14.21	0	17.06	14.13	66.2	(+20.6)	11	5.75
August	355.70	(+171.1)	21.03	(-0.56)	11.71	(+0.61)	12.40	0	16.37	15.27	57.6	(+3.1)	19	6.83
September	309.60	(+178.4)	21.80	(+3.55)	12.71	(+3,42)	14.77	0	16.08	15.16	70.4	(+12.3)	17	6.29
October	308.30	(+204.5)	16.87	(+2.82)	9.75	(+3.27)	12.23	0	13.91	14.46	92.8	(+28.4)	23	7.61
November	221.30	(+157.9)	11.74	(+2.11)	4.53	(+1.14)	7.66	2	9.68	12.16	51.6	(-5.6)	25	9.43
December	107.10	(+65.5)	8.88	(+1.37)	3.47	(+1.56)	4.98	5	7.63	10.24	50.0	(-9.5)	24	11.40
Year	2360.1							63			609.8		211	

* Number of nights grass minimum was below 0.0 oC

** Number of days rain was 0.2 mm or more

*** At 2 metres above ground