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Yields of the Field Experiments 2013

Full Table of Content

Results of the Classical and Other Long-term Experiments

Rothamsted Research

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ROTHAMSTED RESEARCH

Results of the

Classical and other

Long-term Experiments

2013

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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 calcium ammonium nitrate or ammonium nitrate.

Anhydrous Sulphate of Soda	
Chalk	
Compost	
Double Top	27% nitrogen and 30% SO_3
FYM	Farmyard manure (from bullocks)
Headland Manganese 500	500 g/l 27.5% w/w manganese carbonate
Kieserite	$MgSO_4H_2O$ 17.7% magnesium and 23.3% sulphur
Maize Tops	
Manganese sulphate	$Mn_2 (SO_4)_3$ 27% manganese and 24% sulphur
Magnesium sulphate	$MgSO_4$ H_2O 17.7% magnesium and 23.3% sulphur
Muriate of potash (MOP)	60% K_2O as Potassium Chloride (KCl)
Nitram	34.5% N
Nitraprill	34.5% N
Nitrate of soda	$NaNO_3$ 16% nitrogen and 27% sodium

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Nitro-Chalk	Calcium Ammonium Nitrate 27% N
Silicate of soda	Na_2SiO_3 37% sodium and 23% silica
Sodium Sulphate	99.9% SO_4
Sulphate of ammonia	$(NH_4)_2SO_4$ 21% nitrogen 24% sulphur
Sulphate of potash (SOP)	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 12.5cm 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
Plough/N	Furrow slice turned to the North (-/S = South, -/E = East, -/W = West)
Shakerator	Deep tine cultivator with vibrating tines 60cm apart and 45 cm deep
Subsoiler	Deep tine cultivator with vibrating tines 60cm apart and 45 cm deep

Application code: This is used to identify the kind of application
a = application (cultivations, harvest, etc.), p = pesticide, f = fertilizer and s = seed.

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 DM%:	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.

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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

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
Ally Max SX	h	metsulfuron-methyl + tribenuron-methyl (14.3:14.3 % w/w)
Amistar	f	azoxystrobin (250 g/l)
Atlantis	h	iodosulfuron-methyl-sodium + mesosulfuron-methyl (0.6:3.0% w/w)
Bassoon	f	epoxiconazole (83 g/l)
BioPower	ad	6.7% w/w 3,6-dioxaeicosylsulphate sodium salt and 20.2% w/w 3,6-dioxaoctadecylsulphate sodium salt.
Bravo 500	f	chlorothalonil (500 g/l)
Callisto	h	mesotrione (100 g/l)
Cello	f	prothioconazole + spiroxamine + tebuconazole (100:250:100 g/l)
Comet 200	f	pyraclostrobin (200 g/l)
Compitox Plus	h	mecoprop-P (600 g/l)
Cyflamid	f	cyflufenamid (50 g/l)
Folicur	f	tebuconazole (250g/l)
Foundation	h	dicamba + mecoprop-P
Gallup 360	h	glyphosate (360 g/l)
Gemstone	f	epoxiconazole + pyraclostrobin (62.5:80 g/l)
Gusto	m	metaldehyde (3% w/w)
Hadron	tr	Trace-element (N, P, Zn & Mn) foliar feed.
Hallmark with zeon tech	i	lambda-cyhalothrin (100 g/l)
Harmony M SX	h	metsulfuron-methyl + thifensulfuron-methyl (4:40 % w/w)
Hatchet xtra	h	fluroxypyr (200 g/l)
Ignite	f	epoxiconazole (83 g/l)
Kingdom	f	boscalid + epoxiconazole (140:50 g/l)
Kinto	f	prochloraz + triticonazole (60:20 g/l)
Kula	h	chlorotoluron + diflufenican
Liberator	h	difluenican + flufenacet (100:400 g/l)
Mesurol	i	methiocarb (500 g/l)
Mobius	f	prothioconazole + trifloxystrobin (175:150 g/l)
New 5C Cycocel	gr	chlormequat
Osarex	m	metaldehyde (3% w/w)
PDM 330 EC	h	pendimethalin (330 g/l)
Rancona	f	ipconazole (15 g/l)
Redigo Deter	f	prothioconazole + clothiandin (50:250 g/l)
Refine Max	h	metsulfuron-methyl + thifensulfuron-methyl (6.7:33.3 w/w)
Roundup Max	h	glyphosate (68 % w/w)
Samson	h	nicosulfuron (60 g/l)
San 703	f	chlorothanonil + cyproconazole (375:40 g/l)
Topik	h	clodinafop-propargyl (240g/l)

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Troy 480	h	bentazone (480 g/l)
Zarado	ad	70% w/w oil (rapeseed oil fatty acid esters)

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13/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 170th 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 Yield Books for 74-12/R/BK/1.

Areas harvested[a]:

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

[a] Harvest areas in the 2007-2010 yield books were incorrectly assigned, but yields were correct.

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 (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

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13/R/BK/1

(1) FYM N3 since 2005
(2) N1+3+1 (P) KMg since 2006

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 since 2001), to be reviewed in 2015/16.
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 60kg Mg, autumn 2000 only).
(Mg*):	(none since 2001), to be reviewed in 2015/16
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[P K Mg] (A)+
18N0+3FH	18	P K Na Mg (A)	N2 ½[P K (Na) Mg]	N0+3 ½[P K 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

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+ 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 1999-2002 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:	30kg 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
1989	W	W	W	W	W	W	W	P	F	W

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Section	1	9	0*	8+	6**	5	3	7	4	2
Year										
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
2007	W	W	W	W	W	W	M	W	W	O
2008	W	W	W	F	W	W	W	O	W	M
2009	W	W	W	W	W	W	W	M	O	W
2010	W	W	W	W	W	O	W	W	M	W
2011	W	W	W	W	W	M	O	W	W	W
2012	W	W	W	W	W	W	M	W	W	O
2013	W	W	W	W	W	W	W	O	W	M

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 2.9t 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 (omitted). No chalk was applied after autumn 1991 until autumn 2007 when differential amounts were applied to selected plots (see "Results 2008").

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

(4) In 2013 the wheat variety changed from Hereward to Crusoe, but it was sown very late (22nd February 2013) because of the very wet autumn and winter of 2012-13.

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13/R/BK/1

Experimental Diary:

All Sections

Date		Application	Rate	Units
28-Sep-12	f	Applied Triple Super Phosphate to plots 110 - 119, 130 - 139, 140 - 149, 170 - 179 and 180 - 189 on all sections	171	kg/ha
28-Sep-12	f	Spread Fertilizer MOP as on sheet onto Plots: 140 - 149	181	kg/ha
03-Oct-12	a	Applied fresh FYM to strip 2.1 and 2.2 (not section 7 oats)	35	t/ha
03-Oct-12	a	Ploughed (Soil thrown south)	—	—
11-Mar-13	f	Applied Kieserite	80	kg/ha
12-Mar-13	f	Applied Sulphate of Potash	217	kg/ha
03-Jun-13	p	Sprayed Refine Max, Competox+, Kingdom, Bravo 500 – Sections 0,1,3,4,5 & 9	ref@75 com@1.0 kin@1.25 bra@1.0	g/ha l/ha l/ha l/ha
04-Jun-13	a	Rotavated paths	—	—
04-Jun-13	p	Section 6 Sprayed Refine Max and Competox	ref@75 com@1.0	g/ha l/ha
13-Jun-13	a	Cut Paths	—	—
17-Jun-13	a	Rotavated Fallows	—	—
01-Jul-13	a	Rotavated Fallows	—	—
02-Jul-13	a	Rotavated Fallows	—	—
02-Jul-13	a	Cut Paths	—	—
10-Jul-13	a	Pulling Wild Oats in all plots - 71 counted	—	—
15-Jul-13	a	Put out White posts	—	—
19-Jul-13	a	Cut Paths	—	—
		Note Weedazol was not applied this year due to insufficient time available for it to take effect before cultivation		
W Wheat				
22-Feb-13	a	Drilled Crusoe trt Redigo Deter	450	seeds m^2
12-Mar-13	f	Applied Nitram on plots - 12, 17, 18 and 19.	139	kg/ha
24-Apr-13	f	Applied Nitram on plots -1, 2.1, 6,7,8,9,10,11,12,13,14,15,16,17,18,19.	139 278 417 556 696 835	kg/ha kg/ha kg/ha kg/ha kg/ha kg/ha
21-May-13	f	Applied Nitram to WW on plots 12, 17, 18 and 19.	139	kg/ha
03-Jun-13	p	Sprayed Kingdom and Bravo	kin@1.25 bra@1.0	l/ha l/ha
25-Jun-13	p	All wheat section (except 6)- sprayed Ignite, Bravo 500	Ig@1.1	l/ha

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		and Comet 200		Br@1.0	l/ha
				Co@1.25	l/ha
29-Aug-13	a	Sampo - Finished harvest of wheat plots		—	—
29-Aug-13	a	Baled, sampled and weighed wheat straw		—	—
W Oats					
23-Feb-13	a	Drilled Winter Oats var Gerald		400	seeds m^2
02-Jun-13	p	Sprayed Foundation, Hatchet, Cello		fou@1.25	l/ha
				hat@0.5	l/ha
				cel@0.8	l/ha
03-Sep-13	a	Sampo - Harvested Oats only		—	—
25-Sep-13	a	Baled, weighed and sampled straw - Oat Section 7		—	—
Maize					
17-May-13	a	Powerharrowed and Drilled Maize var Hudson		10.2	seeds m^2
21-May-13	f	Applied Nitram-N fert (pre-emergent) to Maize plots 1, 2.1, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 & 19.	139	278	kg/ha
				417	kg/ha
			556	696	kg/ha
				835	kg/ha
					kg/ha
					kg/ha
10-Jun-13	f	Applied Nitram-N fert (post-emergent) to Maize plots 12, 17, 18 & 19.	139	278	kg/ha
			417	556	kg/ha
					kg/ha
					kg/ha
26-Jun-13	p	Sprayed Samson and Callisto sprayed - maize plots only		Both @0.5	l/ha
25-Sep-13	a	Maize Harvested - all plots, as per plan		—	—
25-Sep-13	a	Cleared OE's Maize		—	—
26-Sep-13	a	Cut Maize OE's		—	—
Wilderness					
13-May-13	a	Cut grass on mown area		—	—
21-Jun-13	a	Cut grass on mown area		—	—
01-Aug-13	a	Cut grass on mown area		—	—
10-Oct-13	a	Low branches trimmed in edge of wilderness		—	—
19-Dec-13	A	Stubbed area cut			

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

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13/R/BK/1

WHEAT

GRAIN TONNES/HECTARE

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

SECTION PLOT	3/W1	5/W2	4/W3	6/W36	0/W9	1/W47	9/W55	8/W5	Mean
01(FYM)N4	7.92	7.38	7.50	6.63	*	*	*	*	7.35
21FYMN3	8.08	8.69	7.88	6.87	6.12	5.95	5.44	3.56	6.57
22FYM	7.45	5.82	5.24	5.44	4.43	4.84	6.00	2.88	5.26
03Nil	2.14	1.52	1.59	1.60	1.35	1.60	1.32	1.67	1.60
05(P)KMg	2.26	1.91	1.87	2.09	1.84	1.94	1.84	2.58	2.04
06N1(P)KMg	4.49	3.77	3.44	3.91	3.03	3.58	3.64	3.44	3.66
07N2(P)KMg	6.30	4.90	5.00	5.38	5.03	5.23	5.08	3.65	5.07
08N3(P)KMg	7.37	4.60	6.20	6.28	5.45	5.95	6.15	3.65	5.71
09N4(P)KMg	7.58	6.37	6.68	7.15	6.70	6.08	5.68	3.27	6.19
10N4	5.35	1.92	2.87	2.85	2.24	2.88	2.52	1.46	2.76
11N4PMg	3.57	4.19	4.61	4.17	5.36	4.34	3.62	2.55	4.05
12N1+3+1(P)KMg	7.54	6.91	6.89	7.45	6.60	5.87	5.93	3.59	6.35
13N4PK	7.82	6.34	6.79	7.61	6.64	5.84	6.09	1.91	6.13
14N4PK*(Mg*)	8.02	4.77	6.56	7.26	6.57	6.56	6.60	2.96	6.16
15N5(P)KMg	7.98	6.45	7.65	7.21	7.22	6.76	5.31	4.68	6.66
16N6(P)KMg	8.01	7.18	7.24	7.53	7.38	6.56	5.23	3.64	6.60
17N1+4+1PKMg	7.95	7.73	7.19	7.70	6.88	6.72	5.01	4.55	6.72
18N1+2+1PKMg	7.88	7.36	6.80	6.90	7.18	6.58	5.23	3.53	6.43
19N1+1+1KMg	7.01	4.27	4.60	5.71	5.13	4.94	4.31	2.30	4.78
20N4KMg	*	*	*	*	2.05	1.07	*	*	1.56
Mean	6.56	5.37	5.61	5.78	5.12	4.91	4.72	3.10	5.16

GRAIN MEAN DM% 86.1

STRAW TONNES/HECTARE

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

SECTION PLOT	3/W1	5/W2	4/W3	6/W36	0/W9	1/W47	9/W55	8/W5	Mean
01(FYM)N4	4.58	*	*	*	*	*	*	*	4.58
21FYMN3	5.24	*	*	*	*	2.65	*	4.58	4.16
22FYM	4.41	*	*	*	*	1.69	*	3.43	3.17
03Nil	0.70	*	*	*	*	0.34	*	1.03	0.69
05(P)KMg	0.75	*	*	*	*	0.48	*	2.30	1.17
06N1(P)KMg	2.28	*	*	*	*	1.12	*	2.80	2.06
07N2(P)KMg	3.35	*	*	*	*	1.77	*	2.99	2.70
08N3(P)KMg	3.58	*	*	*	*	2.59	*	4.12	3.43
09N4(P)KMg	4.63	*	*	*	*	2.54	*	4.03	3.73
10N4	2.31	*	*	*	*	0.58	*	1.33	1.41
11N4PMg	1.73	*	*	*	*	1.39	*	1.93	1.69
12N1+3+1(P)KMg	4.90	*	*	*	*	2.06	*	4.74	3.90
13N4PK	4.51	*	*	*	*	1.85	*	3.27	3.21
14N4PK*(Mg*)	4.14	*	*	*	*	2.15	*	3.79	3.36
15N5(P)KMg	5.27	*	*	*	*	2.98	*	5.03	4.43
16N6(P)KMg	5.44	*	*	*	*	2.19	*	4.17	3.93
17N1+4+1PKMg	5.39	*	*	*	*	3.20	*	3.96	2.40
18N1+2+1PKMg	5.36	*	*	*	*	2.84	*	3.03	3.74
19N1+1+1KMg	4.30	*	*	*	*	2.13	*	1.62	2.68
20N4KMg	*	*	*	*	*	0.13	*	*	0.13
Mean	3.55	*	*	*	*	1.82	*	3.23	2.86

STRAW MEAN DM% 80.5

The missing straw yield for plot 173 was estimated using the straw/grain ratio for plot 163.

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13/R/BK/1

OATS

TONNES/HECTARE (85% DM)

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

Units	PLOT	GRAIN	STRAW
17	01(FYM)[N4]	5.22	1.83
217	21[FYMN2]	6.58	2.64
227	22[FYM]	6.34	2.91
37	03Nil	2.14	0.47
57	05(P)KMg	2.38	0.43
67	06[N1](P)KMg	2.02	0.39
77	07[N2](P)KMg	1.78	0.25
87	08[N3](P)KMg	1.82	0.33
97	09[N4](P)KMg	2.13	0.48
107	10[N4]	2.37	0.51
117	11[N4]PMg	3.44	0.97
127	12[N1+3+1](P)KMg	2.37	0.61
137	13[N4]PK	1.78	0.38
147	14[N4]PK*(Mg*)	1.59	0.33
157	15[N5](P)KMg	1.91	0.60
167	16[N6](P)KMg	2.98	0.95
177	17[N1+4+1]PKMg	3.69	1.39
187	18[N1+2+1]PKMg	2.52	0.82
197	19[N1+1+1]KMg	2.32	0.51
	MEAN	2.91	0.88

PLOT AREA HARVESTED 0.00487

MAIZE

TONNES/HECTARE (100% DM)

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

PLOT	TPlDm
01(FYM)N4	4.09
21FYMN3	7.76
22FYM	10.21
03Nil	1.56
05(P)KMg	3.87
06N1(P)KMg	6.88
07N2(P)KMg	5.23
08N3(P)KMg	7.17
09N4(P)KMg	5.27
10N4	2.42
11N4PMg	5.09
12N2+3(P)KMg	7.60
13N4PK	10.26
14N4PK*(Mg*)	11.11
15N5(P)KMg	8.20
16N6(P)KMg	7.66
17N2+4PKMg	4.03
18N2+2PKMg	6.95
19N2+1KMg	3.61
MEAN	6.26
MEAN DM%	25.1

PLOT AREA HARVESTED 0.00162

ERRATUM
see 2016 page16 (supplied)

Note: Maize yields were adversely affected by the accidental application of residual herbicide (Topik). Therefore, yields are unreliable.

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Maize Yields (100% DM) shown in previous yield books (2009-2015) were found to be in error because an increase in the crop row spacing from 0.6m to 0.7m was not accounted for.
The corrected yields are given below:

Year	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***
Treatment/ Section	***7***	***4***	***5***	***3***	***2***	***7***	***4***
01(FYM)N4	11.81	14.37	8.67	14.32	3.51	13.30	14.31
21FYMN3	13.84	15.32	9.26	18.24	6.65	15.46	16.61
22FYM	12.37	12.78	11.95	11.21	8.75	15.87	12.12
03Nil	0.58	1.73	1.49	1.65	1.34	1.45	2.63
05(P)KMg	5.20	3.82	2.86	3.56	3.32	4.25	4.05
06N1(P)KMg	7.12	6.82	5.05	5.75	5.90	7.77	7.13
07N2(P)KMg	8.51	9.67	7.90	8.85	4.48	9.87	8.88
08N3(P)KMg	8.25	10.15	5.27	10.85	6.14	8.57	10.85
09N4(P)KMg	8.34	10.10	5.83	10.16	4.52	8.96	10.12
10N4	0.94	2.15	1.09	0.96	2.07	2.79	2.83
11N4PMg	5.19	6.97	3.88	5.44	4.36	4.36	7.71
12N2+3(P)KMg	8.55	12.42	7.32	9.33	6.52	11.11	14.64
13N4PK	8.89	11.21	7.20	10.72	8.80	9.58	15.00
14N4PK*(Mg*)	8.76	11.69	7.01	9.82	9.52	11.33	14.47
15N5(P)KMg	7.82	12.19	5.63	9.94	7.03	10.06	13.15
16N6(P)KMg	7.40	10.93	4.33	9.13	6.57	8.59	14.18
17N2+4PKMg	8.18	10.52	5.19	9.13	3.46	8.99	12.35
18N2+2PKMg	8.45	9.85	5.88	11.46	5.95	8.98	11.94
19N2+1KMg	3.49	4.28	2.56	5.43	3.10	4.53	5.10
Mean	7.56	9.31	5.70	8.73	5.37	8.73	10.42
Mean DM%	20.90	29.50	18.80	25.90	25.10	29.80	23.20
Plot Area Harvested	0.00189						

Note: In 2013 herbicide was applied accidentally to maize. Consequently, the maize yields given above for 2013 are unreliable.

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SECTION 8: CLEAN GRAIN, TONNES/HA AFTER REMOVING WEED SEEDS.

YEAR	2012	2013
SECTION	8/W2	8/W3
PLOT		
2.1 FYMN2	0.50	3.34
2.2 FYM	0.64	2.75
03 Nil	0.74	1.58
05 (P)KMg	0.49	2.47
06 N1(P)KMg	0.55	3.38
07 N2(P)KMg	1.15	3.51
08 N3(P)KMg	1.43	3.48
09 N4(P)KMg	1.60	3.21
10 N4	0.48	1.38
11 N4PMg	0.47	2.40
12 N1+3+1(P)K2Mg2	0.90	3.48
13 N4PK	1.56	1.77
14 N4PK*(Mg*)	1.09	2.43
15 N5(P)KMg	0.67	4.49
16 N6(P)KMg	0.35	3.55
17 N1+4+1PKMg	0.66	4.49
18 N1+2+1PKMg	0.75	3.22
19 N1+1+1KMg	1.25	1.07

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13/R/HB/2

HOOS BARLEY

Object: To study the effects of organic manures and inorganic fertilizers on continuous s. barley. From 1968 to 1978 a rotation of potatoes, beans and s. barley was practised on parts of the experiment. The rotation was discontinued in 1979 and the whole experiment reverted to continuous 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 162nd year, s. barley.

For previous years see 'Details' 1967 and 1973, Station Report for 1966 and Yield Books for 74-12/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 2013
P2: 44kg P as triple superphosphate
K: 90 kg K as sulphate of potash
(Na): (none), 16 kg Na as sulphate of soda until 1973
Mg: 35kg 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 2013

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D1852: Farmyard manure at 35t since 1852
D2001: Farmyard manure at 35t since 2001
(D): Farmyard manure 1852 – 1871 only
(Ashes): Weed ash 1852-1916, furnace ash 1917-1932, none since

Sub-Plots

(2) N — Nitrogen fertilizer (kg N), as 'Nitro-Chalk', since 1968 (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	Si omitted	N3(P) (Si)
N-KS-	334	K(Na)MgSi	Si omitted	N3 K(Mg)(Si)
NPKS-	434	PK(Na)MgSi	Si omitted	N3(P)K(Mg)(Si)
N---S	132	-	Si added	N3 Si
NP--S	232	P	Si added	N3(P) Si
N-K-S	332	K(Na)Mg	Si added	N3 K(Mg) Si
NPK-S	432	PK(Na)Mg	Si added	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

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13/R/HB/2

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 dressing 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 application 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 2014.

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 (i.e. K*) was stopped and the whole experiment reverted to K dressings of 90 kg K/ha/year.

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13/R/HB/2

Experimental Diary

Date		Application	Rate	Unit
20-Sep-12	p	Sprayed Whole field w/ Weedazol EW	20	l/ha
28-Sep-12	f	Spread Fert SOP as on sheet 631-634 411-444 311-344 241-244 141-144 + Strip 5	217	kg/ha
28-Sep-12	f	Spread Fert TSP and Kieserite as on sheet, sections 631-634	TSP@215 KIE@233	kg/ha kg/ha
01-Oct-12	f	Spread Soda Silicate onto plots 432-132, 433-133	450	kg/ha
03-Oct-12	a	Applied FYM to 734 to 731 and 724 to 721	35	t/ha
08-Oct-12	a	Ploughed	—	—
01-Mar-13	a	Drilling W Barley var Tipple	350	Seeds m^2
04-Mar-13	a	Ring Rolled	—	—
30-Apr-13	a	Rotated Paths	—	—
01-May-13	f	Applied N as Nitro Chalk		
		Plots 113,124,211,222,313,321,412,421,611,621, 631,712,721,732.	178	kg/ha
		Plots 112,123,212,223,314,324,414,422,613, 624,634,711,722,731.	356	kg/ha
		Plots 114,122,213,224,312,323,411,424,612, 622,632,714,723,733.	533	kg/ha
01-May-13	f	Applied Nitram - Plots: Series AA old plots, Series C and Strip 5, as per plan	417	kg/ha
02-Jun-13	p	Sprayed Mobius, Clyfamid	mo@0.6, cly@0.125	l/ha
26-Jun-13	p	Sprayed Mobius	0.4	l/ha
09-Jul-13	a	Cut/Cultivated Paths	—	—
10-Jul-13	a	Pulling Wild Oats, 7 in plots	—	—
12-Aug-13	a	Claas - Harvested (opened up exp)	—	—
27-Aug-13	a	Claas – Harvested discards	OE's	—
27-Aug-13	a	Sampo – Harvested for yield	All plots	—
28-Aug-13	a	Baled Sampled and Weighed	All Plots	—
28-Aug-13	a	Claas - Harvested opened up and cut OE's	—	—

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13/R/HB/2

MAIN PLOTS

Grain tonnes/hectare

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

N	0	48	96	144	Mean
MANURE					
---	1.20	1.73	1.75	1.91	1.65
-P-	1.72	3.85	4.11	4.10	3.44
--K	0.66	1.37	1.40	1.52	1.24
-PK	1.78	3.63	4.51	5.00	3.73
A--	1.18	1.65	1.44	1.66	1.48
AP-	2.24	3.52	3.71	3.95	3.36
A-K	0.33	0.80	1.35	0.82	0.83
APK	1.84	3.24	4.04	4.45	3.39
FYM1852onwards	6.31	7.00	7.23	7.37	6.98
FYM1852-1871	1.07	1.80	2.11	5.37	2.59
(A)	0.77	1.45	2.82	1.93	1.74
-	0.67	0.95	1.05	1.49	1.04
FYM2001onwards	4.40	5.73	6.77	6.27	5.79
P2K	1.61	3.76	4.11	5.63	3.78
Mean	1.84	2.89	3.32	3.68	2.93

Grain Mean DM% 86.3

Straw tonnes/hectare

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

N	0	48	96	144	Mean
MANURE					
---	0.23	0.59	0.50	0.60	0.48
-P-	0.30	1.07	1.16	1.31	0.96
--K	0.16	0.35	0.31	0.29	0.28
-PK	0.37	1.39	1.54	1.82	1.28
A--	0.30	0.42	0.36	0.48	0.39
AP-	0.35	1.00	1.29	1.36	1.00
A-K	0.10	0.24	0.24	0.17	0.18
APK	0.42	0.85	1.31	1.65	1.05
FYM1852onwards	2.11	2.77	3.46	3.53	2.97
FYM1852-1871	0.21	0.46	0.39	1.91	0.74
(A)	0.16	0.30	0.79	0.52	0.44
-	0.10	0.25	0.31	0.34	0.25
FYM2001onwards	1.43	2.35	2.73	2.72	2.31
P2K	0.30	1.06	1.51	2.44	1.33
Mean	0.47	0.94	1.14	1.37	0.98

Straw Mean DM% 82.5

Plot area harvested 0.0192, 0.00256

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13/R/HB/2

PHOSPHATE PLOTS

Grain tonnes/hectare

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

PLOTS	
142	2.41
143	2.19
144	2.20
242	5.76
243	5.43
244	5.16
341	2.27
342	2.66
343	3.02
344	3.58
441	4.91
442	5.51
443	5.62
444	5.34
551	4.90
552	5.02
561	4.88
562	4.82
571	2.24
572	3.03
581	0.91
582	1.00
Mean	3.77

Grain Mean DM% 83.4

Plot area harvested 0.00256

SILICATE PLOTS

Grain tonnes/hectare

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

PK	N3--	N3P-	N3-K	N3PK
Silicate				
(-)-	1.52	4.54	1.68	4.91
(Si)-	2.16	4.93	1.50	5.47
(-)Si	2.59	4.57	1.65	4.83
(Si)Si	2.59	4.61	1.54	4.38

Grain Mean DM% 83.0

Plot area harvested 0.00256

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13/R/WF/3

WHEAT AND FALLOW

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

The 158th year, w. wheat.
For previous years see 'Details' 1967, 1973 and Yield Books for 74-12/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

Date		Application	Rate	Units
22-Feb-13	a	Drilled Crusoe trt Redigo Deter	450	seeds m^2
01-Mar-13	p	Pre-em herbicide Defy & Stomp Aqua	Def@3.0 Stomp 2.9	l/ha l/ha
2-Apr-13	a	Springtined plot 1	—	—
26-May-13	p	Sprayed with Simba (metasulfuron-methyl -20%) and Vortex (nonylphenoxypolyethanoxyethanol)	30 1.5	g/ha l/ha
22-May-13	a	Rotavated Fallows	—	—
19-Jun-13	a	Cut Paths	—	—
04-Jul-13	a	Cut Paths	—	—
11-Jul-13	a	Rotavated Fallow	—	—
19-Jul-13	a	Cut Paths.	—	—
12-Aug-13	a	Claas - Harvested, opened up exp.	—	—
28-Aug-13	a	Sampo - Harvested all Plots	—	—
29-Aug-13	a	Sampo - Harvested	—	—
29-Aug-13	a	Baled Sampled and Weighed	—	—
31-Aug-13	a	Claas - Harvested OE's	—	—

Grain and straw tonnes/hectare

	Grain	Straw
Yield	1.580	0.4530
DM%	84.12	86.89

Plot area harvested 0.04431

Note: Unground grain and straw was archived.

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13/R/EX/4

EXHAUSTION LAND

Object: To study the residual effects of manures applied 1856 - 1901, and of additional phosphate applied since 1986 (P test) and of additional potassium since 2007 (K test); on the yield of continuous s. barley up to 1991, w. wheat since – Hoosfield.

The 158th year, w. wheat.

For previous years see 'Details' 1977, 1973 and Yield Books for 74-12/R/EX/4

Treatments: All combinations of:-

Whole plots (P test)

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

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

2. **P** 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:

	2000-12	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

1. 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

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13/R/EX/4

2. K Potassium applied annually from 2007 as muriate of potash

O	None
K1	75 kg K_2O (62.2 kg K)
K2	150 kg K_2O (124.5 kg K)

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

Date		Application	Rate	Units
20-Sep-12	p	Sprayed Whole field w/ Weedazol EW	20	l/ha
28-Sep-12	f	Spread MOP Fertilizer on plots - 103,83,63,43,23	125	kg/ha
28-Sep-12	f	Spread MOP Fertilizer as on sheet on plots 104-94,87-73,64-54,44-34,24-14	250	kg/ha
28-Sep-12	f	Spread TSP as on sheet on plots 101-93,81-73,61-53,41-33,21-13	75	kg/ha
15-Oct-12	a	Drilled WW Xi19	400	seeds m^2
15-Nov-12	p	Sprayed Liberator and PDM, also o+e's at each end of EX/4	Li@0.6 PDM@2.7	l/ha l/ha
15-Nov-12	p	Spread Slug Pellets (Gusto)	5	kg/ha
11-Mar-13	f	Applied Kieserite	80	kg/ha
12-Mar-13	f	Applied Ammonium Sulphate Fertiliser	238	kg/ha
25-Apr-13	f	Applied Nitram	580	kg/ha
16-May-13	p	Sprayed AllyMax, Kingdom, Bravo500, NewCycocel, HatchetExtra	AM@42 Ki@1.25 Br500@1.0 NCy@2.0 Hat@1.0	g/ha l/ha l/ha l/ha l/ha
21-May-13	f	Applied Nitram	145	kg/ha
06-Jun-13	p	Sprayed Ingite and Comet	ign@1.2 com@0.4	l/ha l/ha
18-Jun-13	p	Sprayed Cello	0.55	l/ha
19-Jun-13	a	Cut Paths	—	—
04-Jul-13	a	Cut Paths	—	—
19-Jul-13	a	Cut Paths.	—	—
12-Aug-13	a	Claas - Harvested	—	—
13-Aug-13	a	Sampo - Harvested	—	—
13-Aug-13	a	baled weighed and sampled plots	—	—
20-Aug-13	a	Claas - Harvested, OE's	—	—

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Note: Samples of grain and straw were taken for chemical analysis. The yield strips on plots 031, 034, 071, 074, 091 & 094 were made smaller this year to avoid areas where the crop had already been sampled by S. McGrath et al.

P TEST

Grain tonnes/hectare

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

P_RES	O	P1	P2	P3	Mean
OLD_RES					
O	1.83	4.32	4.45	5.45	4.01
D	3.24	5.49	6.00	5.87	5.15
N	0.89	4.78	5.15	5.81	4.16
P	3.24	5.25	6.10	6.05	5.16
NPKNAMG	3.60	5.35	5.83	6.64	5.35
Mean	2.56	5.04	5.51	5.96	4.77

Grain mean DM% 86.3

Straw tonnes/hectare

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

P_RES	O	P1	P2	P3	Mean
OLD_RES					
O	0.51	2.21	2.17	2.98	1.97
D	0.80	2.72	3.25	3.47	2.56
N	0.29	2.07	2.32	2.65	1.83
P	1.15	2.55	2.85	3.36	2.47
NPKNAMG	1.24	2.46	3.26	4.01	2.74
Mean	0.80	2.40	2.77	3.29	2.32

Straw mean DM% 87.1

Plot area harvested 0.00538, 0.00252.

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13/R/EX/4

K TEST

Grain tonnes/hectare

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

K_Test	K0	K1	K2	Mean
OLD_RES				
O	4.99	6.10	6.51	5.64
D	5.89	6.59	6.76	6.28
N*	4.92	5.26	5.93	5.26
PK	6.04	6.57	6.67	6.33
N*PK	5.58	6.45	7.06	6.17
Mean	5.48	6.19	6.59	5.94

Grain mean DM% 88.1

Straw tonnes/hectare

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

K_Test	K0	K1	K2	Mean
OLD_RES				
O	1.92	2.66	2.83	2.34
D	2.38	3.15	3.27	2.80
N*	1.67	2.23	2.45	2.01
PK	2.81	3.06	2.82	2.87
N*PK	2.36	3.47	3.39	2.89
Mean	2.23	2.91	2.95	2.58

Straw mean DM% 92.4 Plot area harvested 0.00538

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13/R/PG/5

PARK GRASS

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

The 158th year, hay.

For previous years see 'Details' 1977 and 1973 and Yield Books for 74-12/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
(P)KNaMg	Plot 7/1	P withheld since 2013
PKNaMg	Plot 7/2	P K Na Mg (P continued)
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
N3*PKNaMg (N2*)	Plot 15	P K Na Mg (N2* until 1875 and nil N until 2013)
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*, N3*:	48, 96, 144 kg N as nitrate of soda (30 kg N to plot 20 in years with no farmyard manure). In 2013 plot 15 started to receive 144 kg N/ha as nitrate of soda to provide a comparison with plot 11/1, which receives 144 kg N/ha as sulphate of ammonia.
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
(P):	In 2013 plot 7 was split into 7/1 & 7/2. P was withheld from plot 7/1 to evaluate the effect of withholding P on plant biodiversity in 2013-2015. 7/2 continues to receive P as above.

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13/R/PG/5

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

1. Manure, fertilisers and organic manures (cont'd)

F:	Fishmeal every fourth year to supply 63 kg N (stopped 1999; replaced by PM)
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 2011-2012; the seventh 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 Lime was applied at rates shown below.

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 97-01/R/PG/5 Yield book entries.]

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Experimental Diary

Date		Application	Rate	Unit
18-Dec-12	f	Applied TSP – plots 4/1, 4/2, 6 (a & b)	171	kg/ha
19-Dec-12	f	Applied TSP – plots 7/2, 8, 9/1, 9/2, 10, 11/1, 11/2, 14/1, 14/2, 15 and 16.	171	kg/ha
18/19-Feb-13	f	Applied powders - sodium sulphate, magnesium sulphate and silicate of soda. Applied sulphate of potash & FYM (19th Feb) to finish.	See details above.	
05-Apr-13	f	Applied Nitrogen, Ammonium Sulphate and Sodium Nitrate.	See details above	
13-May-13	a	Cut Paths	—	
14-May-13	a	Cut Paths, also cut path into crop for accessibility	—	
22-May-13	a	Cut Paths	—	
05-Jun-13	a	Cut paths	—	
20-Jun-13	a	Repairing Fencing - corner nearest manor	—	
20-Jun-13	a	Cut Paths and Surrounds	—	
21-Jun-13	a	Fence Repairs	—	
24-Jun-13	a	Fence repairs	—	
25-Jun-13	a	Cut plots for yield - 1st Cut	—	
26-Jun-13	a	Cut Plots For Yield- Finished 1st Cut	—	
26-Jun-13	a	Mowed Discards	—	
27-Jun-13	a	Mown Discards	—	
01-Jul-13	a	Turned Mown Grass	—	
04-Jul-13	a	Baled and Removed	—	
25-Jul-13	a	Cut Paths with iSeki	—	
21-Nov-13	a	Cut plots for yield - 2nd Cut	—	
22-Nov-13	a	Completed cutting plots for yield - 2nd Cut	—	
25-Nov-13	a	Mowed OE's- all grass	—	
25-Nov-13	a	Cut all grass on Park Grass - long ways across all plots and OE's	—	
25-Nov-13	a	Rowed and baled all grass - on all plots and oe's	—	

NOTE: Samples of herbage (1st and 2nd Cut) were taken for chemical analysis. Unground herbage samples from all plots were archived.

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13/R/PG/5

1ST CUT (23-24/6/12) DRY MATTER TONNES/HECTARE

***** TABLES OF MEANS

1ST CUT (25-26/6/13) DRY MATTER TONNES/HECTARE

Grand mean 3.39

Manure	Lime	a	b	c	d	Mean
N1	1	2.17	1.51	1.04	0.65	1.35
K	2/1	2.08	2.19	0.96	0.82	1.51
None(FYM)	2/2	1.81	1.96	0.91	1.04	1.43
None	3	1.96	1.76	0.66	0.95	1.33
P	4/1	3.00	3.11	1.93	1.84	2.47
N2P	4/2	2.52	2.71	2.88	1.62	2.43
N1PKNaMg	6	4.80	5.78			5.29
(P)KNaMg	7/1	4.79	4.98	4.92	3.24	4.48
PKNaMg	7/2	4.62	4.97	4.56	3.89	4.51
PNaMg	8	2.56	2.83	2.36	2.40	2.54
PKNaMg(N2)	9/1	5.28	4.90	4.13	0.96	3.82
N2PKNaMg	9/2	5.14	5.07	4.77	2.75	4.43
N2PNaMg	10	2.93	3.35	3.39	1.55	2.80
N3PKNaMg	11/1	6.43	6.08	5.81	1.48	4.95
N3PKNaMgSi	11/2	6.68	6.57	6.45	2.55	5.56
None	12	2.33	1.71	1.07	1.03	1.54
(FYM/F)	13/1	3.43	3.31	2.97	2.71	3.10
FYM/PM	13/2	3.94	4.49	4.32	3.98	4.18
PKNaMg(N2*)	14/1	4.50	4.88	5.02	4.83	4.81
N2*PKNaMg	14/2	5.37	4.77	4.89	4.87	4.98
N3*PKNaMg(N2*)	15	5.55	5.88	5.26	5.40	5.52
N1*PKNaMg	16	4.77	4.85	5.66	4.38	4.92
N1*	17	1.94	2.11	1.36	1.79	1.80
N2KNaMg	18	1.89	1.79	1.81	0.40	1.47
N2KNaMg	18/2					2.51
FYM	19/1					4.32
FYM	19/2					4.19
FYM	19/3					4.11
FYM/N*PK	20/1					4.31
FYM/N*PK	20/2					4.31
FYM/N*PK	20/3					4.28

1st CUT MEAN DM% 25.80

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13/R/PG/5

***** Tables of means

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

Grand mean 0.82

Manure	Lime	a	b	c	d	Mean
N1	1	0.36	0.38	0.40	0.25	0.35
K	2/1	0.47	0.39	0.20	0.31	0.34
None(FYM)	2/2	0.38	0.27	0.25	0.34	0.31
None	3	0.34	0.28	0.14	0.29	0.26
P	4/1	0.56	0.44	0.28	0.37	0.41
N2P	4/2	0.59	0.52	0.53	0.55	0.55
N1PKNaMg	6	0.63	0.88			0.76
(P)KNaMg	7/1	0.95	1.14	1.61	0.96	1.17
PKNaMg	7/2	1.06	1.15	1.47	1.00	1.17
PNaMg	8	0.70	0.48	0.52	0.51	0.55
PKNaMg(N2)	9/1	1.04	1.07	0.50	0.17	0.69
N2PKNaMg	9/2	0.84	0.99	0.70	0.89	0.85
N2PNaMg	10	0.34	0.46	0.76	0.70	0.56
N3PKNaMg	11/1	1.46	1.19	0.76	0.58	0.99
N3PKNaMgSi	11/2	1.79	1.59	1.17	1.54	1.52
None	12	0.60	0.24	0.27	0.30	0.35
(FYM/F)	13/1	1.05	1.07	0.57	0.47	0.79
FYM/PM	13/2	1.61	2.51	1.52	1.31	1.74
PKNaMg(N2*)	14/1	1.22	1.28	1.39	1.56	1.36
N2*PKNaMg	14/2	0.74	0.97	1.29	1.51	1.13
N3*PKNaMg(N2*)	15	1.35	1.52	1.35	1.11	1.33
N1*PKNaMg	16	1.03	1.30	1.24	1.01	1.15
N1*	17	0.60	0.51	0.31	0.45	0.47
N2KNaMg	18	0.24	0.32	0.28	0.21	0.26
N2KNaMg	18/2					0.45
FYM	19/1					1.41
FYM	19/2					1.57
FYM	19/3					1.26
FYM/N*PK	20/1					1.40
FYM/N*PK	20/2					1.52
FYM/N*PK	20/3					1.37

2ND CUT MEAN DM% 23.60

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13/R/PG/5

***** Tables of means

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

Grand mean 4.21

Manure	Lime	a	b	c	d	Mean
N1	1	2.53	1.89	1.45	0.90	1.69
K	2/1	2.54	2.58	1.16	1.14	1.85
None(FYM)	2/2	2.19	2.23	1.15	1.39	1.74
None	3	2.31	2.04	0.80	1.24	1.60
P	4/1	3.57	3.55	2.21	2.21	2.88
N2P	4/2	3.11	3.23	3.41	2.17	2.98
N1PKNaMg	6	5.43	6.66			6.05
(P)KNaMg	7/1	5.74	6.13	6.54	4.21	5.65
PKNaMg	7/2	5.67	6.12	6.03	4.89	5.68
PNaMg	8	3.26	3.32	2.88	2.91	3.09
PKNaMg(N2)	9/1	6.32	5.97	4.63	1.13	4.51
N2PKNaMg	9/2	5.98	6.07	5.47	3.64	5.29
N2PNaMg	10	3.27	3.80	4.15	2.25	3.37
N3PKNaMg	11/1	7.89	7.27	6.56	2.06	5.94
N3PKNaMgSi	11/2	8.47	8.15	7.62	4.09	7.08
None	12	2.93	1.95	1.34	1.33	1.89
(FYM/F)	13/1	4.49	4.37	3.54	3.18	3.89
FYM/PM	13/2	5.55	7.00	5.84	5.29	5.92
PKNaMg(N2*)	14/1	5.71	6.16	6.41	6.39	6.17
N2*PKNaMg	14/2	6.12	5.74	6.18	6.38	6.10
N3*PKNaMg(N2*)	15	6.91	7.40	6.61	6.51	6.86
N1*PKNaMg	16	5.81	6.15	6.90	5.39	6.06
N1*	17	2.55	2.62	1.67	2.24	2.27
N2KNaMg	18	2.12	2.11	2.09	0.61	1.73
N2KNaMg	18/2					2.96
FYM	19/1					5.72
FYM	19/2					5.76
FYM	19/3					5.37
FYM/N*PK	20/1					5.71
FYM/N*PK	20/2					5.83
FYM/N*PK	20/3					5.65

TOTAL OF 2 CUTS MEAN DM% 24.62

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13/R/GC/8

GARDEN CLOVER

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

The 160th year, red clover.

For previous years see `Details' 1967 and 1973, and Yield books for 74-12/R/GC/8.

Design: 2 blocks of 2 plots.

Whole plot dimensions: 1.00 x 1.40.

Treatments:

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

Experimental diary:

Date		Application	Rate	Units
08-May-13	a	Weeds Removed	—	—
08-May-13	f	Epsom Salts applied at 50 kg Mg/ha	50	kg/ha
08-May-13	f	TSP applied at 75 kg P_2O_5/ha	75	kg/ha
08-May-13	f	Potassium sulphate applied	150	kg/ha
08-May-13	a	Chalk applied	1.25	t/ha
08-May-13	a	Plots dug over and sown with garden clover var. Milvus	30	kg/ha
08-May-13	p	Osarex slug pellets broadcast after sowing	5	kg/ha
09-Jul-13	a	Hand weeded	—	—
01-Oct-13	a	First and only cut	—	—

```
***** Tables of means

1ST AND ONLY CUT (01/10/13) DRY MATTER TONNES/HECTARE

Grand mean 0.93

 FUNG_RES      NONE BENOMYL
               0.76   1.10

 1ST CUT MEAN DM% 19.7
```


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13/W/RN/3

LEY/ARABLE

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

Sponsors: A. J. Macdonald

The 76th year, leys, w. beans, w. wheat, w. rye

For previous years see 'Details' 1967 & 1973 and Yield Books for 74-12/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 1988 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

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

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13/W/RN/3

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.

From 2007 plots previously in the 1st cycle of testing eight-year leys followed by two arable test crops (i.e. those plots which were changed to eight-year ley treatments in 1976 or 1977) changed to a three-year arable rotation followed by two arable test crops. Plots were "phased in" but joined the relevant point in the rotation. From 2008 the second cycle 8-yr grass and grass/clover leys changed to 3-yr grass or grass/clover leys respectively. They were phased in between 2008 and 2012.
LLN/AO (Previously 1st cycle, 8-yr grass ley) R, BE, O, W, R
LLC/ABe (Previously 1st cycle, 8-yr grass/clover ley) R, O, BE, W, R
LLC/LC3 (Previously 2nd cycle, 8-yr grass ley) Lc 1, Lc 2, Lc 3, W, R
LLN/LN3 (Previously 2nd cycle, 8-yr grass/clover ley) Ln 1, Ln 2, Ln 3, W, R

From 2009 W oats (O) replaced forage maize (M) in the AM and ABe rotations on block III and were phased in on blocks V, IV, II and I in subsequent years. The AM treatment was re-named AM/AO.

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
   LLC/LC3 not yet in phase
   LLN/LN3 not yet in phase
   LLN/AO not yet in phase
   LLC/ABe not yet in phase
   AM/AO
   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:

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13/W/RN/3

3. **N** Nitrogen fertilizer as split dressings in spring 2013 (kg N) as 34.5% N:

0	0	
80	40 + 40	) to be applied
160	40 + 120	) late-February/early-March
240	40+ 200	) and mid-April

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

Whole plots:

1. **ROTATION** Rotations before first test crop:
   LLN8
   LN 3
   LLC 8
   LC 3
   LLC/LC3 not yet in phase
   LLN/LN3 not yet in phase
   LLN/AO not yet in phase
   LLC/ABe not yet in phase
   AM/AO
   ABe

1/ 2 plots:

2. **NSPLIT(FYM res)** Farmyard manure residues, last applied 1960s:
   N split to wheat (no FYM)
   N single to wheat (FYM)

   1/8 plots:

3. **N** Nitrogen fertilizer in spring 2013 (kg N) as 34.5%:
   0
   50
   100
   150

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 ha^{-1}) as muriate of potash, applied where necessary to first test crop w. wheat and long-term leys in the wheat block, applied 2013 (see date below).

Continuous rotations	No FYM	FYM Res
Before wheat	Half plots	Half plots
Abe/Be	270	340
AO/O	200	270
LLn/AO	0	30
Ln/Ln	90	70
None to other plots.		

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13/W/RN/3

Experimental Diary

Date		Application	Rate	Units
All				
20-Oct-12	p	Sprayed glyphosate - grass plots not sprayed.	4	l/ha
15-Nov-12	f	Applied TSP to blocks 4 and 5 and plots: 1,2,5,6,9,10,15,16,17,18,19,20,21,22,27,28,35,36,39, 40,45,46,47,48.	127	kg/ha
19-Nov-12	a	Ploughed	—	—
21-Feb-13	a	Spring tined	—	—
20-Apr-13	f	Applied Sulphate of Potash - applied to all arable plots only.	150	kg/ha
02-May-13	a	Rolled wheat, rye, oats and leys to control wireworms	—	—
12-Sep-13	p	Sprayed Gallup 360 to whole trial except 1st and 2nd year leys.	4	l/ha
Grass ley and clover/grass leys (first year leys)				
14-Nov-12	f	Applied Potassium Sulphate to plots 33,34,37,38,41,42,43,44 also.	140	kg/ha
14-Nov-12	f	Applied TSP to plots 3,4,7,8,11,12,13,14,23,24,25,26,29,30,31,32.	213	kg/ha
15-Nov-12	f	Applied TSP to plots 33,34,37,38,41,42,43,44.	213	kg/ha
15-Nov-12	f	Applied Nitram to plots 33,34,41,42.	25	kg/ha
15-Nov-12	f	Applied Nitram to plots 37,38,43,44.	50	kg/ha
14-Mar-13	s	Drilled Grass plots 37, 38, 43 and 44	30	kg/ha
14-Mar-13	s	Drilled Grass and Clover plots 33, 34, 41 and 42	30	kg/ha
03-Jul-13	a	Mowed the rest of the grass plots	—	—
Grass ley and clover/grass leys (second and third year leys)				
06-Nov-12	a	Topped grass plots - unable to bale and remove, too little grass.	—	—
14-Nov-12	f	Applied Potassium Sulphate to plots 3,4,7,8,11,12,13,14,23,24,25,26,29,30,31 and 32	140	kg/ha
22-Apr-13	f	Applied Nitram to plots 11,12,13,14,25,26,31,32,37,38,43,44.	217	kg/ha
22-Apr-13	f	Applied MOP to plots 3,4,7,8,11,12,13,14,23,24,25,26,29,30,31,32,33,34,37 ,38,41,42,43,44.	167	kg/ha
01-Jul-13	a	Cut grass plots cut for yield	—	—
08-Jul-13	a	Rowed up grass Ley plots	—	—
08-Jul-13	a	Baled and removed ley plots	—	—
15-Jul-13	f	Applied Nitram to plots 11,12,13,14,25,26,31,32,37,38,43 and 44	217	kg/ha
15-Jul-13	f	Applied MOP to ley plots	83	kg/ha
13-Nov-13	a	Cut and weighed grass plots for yield - plots 3,4,7,8,11,12,13,14,33,34,37,38,41,42,43,44.	—	—

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13-Nov-13	a	Topped grass plots - grass too short to bale and remove.	—	—
S Beans				
14-Mar-13	s	Drilled Fuego Spring beans - no dressing, plots 22,21,18 and 17.	45	seeds/m^2
15-Mar-13	s	Drilled Fuego plots 5,6,9 and 10. Finished	45	seeds/m^2
02-Jun-13	p	Sprayed Troy 480 SL - sprayed on beans only.	3	l/ha
19-Jun-13	p	Sprayed San 703 and Hallmark with Zeon Technology -spring beans only	1.0 75	l/ha l/ha
05-Jul-13	p	Sprayed San 703 and Hallmark with Zeon Technology -spring beans only	1.5 75	l/ha l/ha
14-Aug-13	p	Sprayed Roundup Max	2	kg/ha
01-Sep-13	a	Cut plots for yield	—	—
04-Sep-13	a	Combined	—	—
06-Sep-13	a	Baled	—	—
S Wheat				
15-Nov-12	f	Applied corrective K to plots 53,54,63,64 as MOP		
13-Mar-13	s	Drilled Zircon tr Kinto spring wheat plots. (Block 4)	4.2 5.4 6.0 4.8	kg/ha kg/ha kg/ha kg/ha
26-Apr-13	f	Applied Nitro-chalk to Block 4 treatment plots only.	350	seeds/m^2
31-May-13	f	Applied main N dressing to wheat (Block 4) by hand as Nitro-chalk.	148	kg/ha
03-Jun-13	p	Sprayed Ally Max, Kindom, Bravo 500 and Hatchet Xtra to wheat only.	148 444 741	kg/ha kg/ha kg/ha
05-Jul-13	p	Sprayed Topik, Ignite, Comet and Zarado to wheat only plots.	Al 42 Ki 1.25 Br 1.00 Ha 0.75 To 0.15 Ig 1.1 Co 0.25 Za 1.0	g/ha l/ha l/ha l/ha l/ha l/ha l/ha l/ha
01-Sep-13	a	Cut plots for yield	—	—
04-Sep-13	a	Combined	—	—
06-Sep-13	a	Baled	—	—

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S Rye

16-Nov-12	a	Applied Chalk, Block 5.		
13-Mar-13	s	Drilled Ovid, Spring Rye. No dressing. Block 5 and plots 35,36,39,40,45,46,47 and 48	5	t/ha
03-May-13	f	Applied main N dressing to block 5 as Nitro-chalk,	350	seeds/m^2
03-Jun-13	p	Sprayed Ally Max, Folicur and Amistar to spring rye only	42 0.5 0.5	
01-Sep-13	a	Cut plots for yield	—	—
04-Sep-13	a	Combined	—	—
06-Sep-13	a	Baled	—	—

S Oats

14-Mar-13	s	Drilled Circle tr Kinto, spring oats. Plots 1,2,15,16,19,20,27 and 28	350	seeds/m^2 kg/ha
22-Apr-13	f	Applied Nitram, applied to plots 1,2,15,16,19,20,27,28,35,36,39,40,45,46,47,48.	290	l/ha l/ha l/ha
02-Jun-13	p	Sprayed Cello, Foundation and Hatchet Xtra, sprayed oats only	Ce 0.8 Fo1.25 Ha 0.5	l/ha
05-Jul-13	p	Sprayed Cello, sprayed oats only	0.55	
01-Sep-13	a	Cut plots for yield	—	—
04-Sep-13	a	Combined	—	—
06-Sep-13	a	Baled	—	—

NOTE: All crops (wheat, rye, beans and oats) were spring varieties in 2013 because they were late sown due to the very wet autumn and spring weather. Herbage and grain samples were taken for chemical analyses.

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LEYS

1ST CUT (1/7/13) DRY MATTER TONNES/HECTARE

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

FYM_RES

LEY	NONE	FYM	MEAN
LC1	0.00	0.00	0.00
LC2	5.39	5.08	5.24
LC3	5.44	6.02	5.73
LN1	0.00	0.00	0.00
LN2	6.29	5.71	6.00
LN3	6.10	5.37	5.74
(LLC/LC)LC1	0.00	0.00	0.00
(LLC/LC)LC2	5.53	4.70	5.11
(LLC/LC)LC3	7.16	6.45	6.81
(LLN/LN)LN1	0.00	0.00	0.00
(LLN/LN)LN2	6.65	8.14	7.40
(LLN/LN)LN3	6.40	5.34	5.87

1ST CUT MEAN DM% 31.7

13/W/RN/3

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

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

FYM_RES

LEY	NONE	FYM	MEAN
LC1	0.35	0.39	0.37
LC2	0.18	0.13	0.15
LC3	0.00	0.00	0.00
LN1	1.22	1.04	1.13
LN2	0.15	0.22	0.19
LN3	0.00	0.00	0.00
(LLC/LC)LC1	0.63	0.88	0.75
(LLC/LC)LC2	0.11	0.43	0.27
(LLC/LC)LC3	0.00	0.00	0.00
(LLN/LN)LN1	0.75	1.14	0.94
(LLN/LN)LN2	0.82	0.65	0.74
(LLN/LN)LN3	0.00	0.00	0.00

2ND CUT MEAN DM% 19.4

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TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

FYM_RES			
LEY	NONE	FYM	MEAN
LC1	0.35	0.39	0.37
LC2	5.57	5.21	5.39
LC3	5.44	6.02	5.73
LN1	1.22	1.04	1.13
LN2	6.45	5.93	6.19
LN3	6.10	5.37	5.74
(LLC/LC)LC1	0.63	0.88	0.75
(LLC/LC)LC2	5.64	5.13	5.38
(LLC/LC)LC3	7.16	6.45	6.81
(LLN/LN)LN1	0.75	1.14	0.94
(LLN/LN)LN2	7.48	8.80	8.14
(LLN/LN)LN3	6.40	5.34	5.87

TOTAL OF 2 CUTS MEAN DM% 26.0

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13/W/RN/3

ARABLE TREATMENT CROPS

BEANS

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

FYMRES ROTATION	NONE	FYM	Mean
(AO)Be	0.27	0.39	0.33
(LLn/AO)Be	1.11	1.30	1.21
(LLc/ABe)Be	1.07	1.05	1.06
(ABe)Be	0.86	0.97	0.92
Mean	0.83	0.93	0.88

GRAIN MEAN DM% 87.7

PLOT AREA HARVESTED 0.00413

OATS

GRAIN85% GRAIN (AT 85% DRY MATTER) TONNES/HECTARE

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

ROTATION	NONE	FYM	MEAN
ABe	3.64	3.79	3.71
AO	4.86	4.30	4.58
LLc/ABe	5.02	4.30	4.66
LLn/AO	5.31	5.24	5.28

GRAIN MEAN DM% 87.6

PLOT AREA HARVESTED 0.00413

RYE

GRAIN (85% DRY MATTER) TONNES/HECTARE

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

FYMRES ROTATION	NONE	FYM	Mean
(ABe)R	4.69	5.48	5.08
(AO)R	4.27	5.12	4.69
(LLn/AO)R	4.37	5.02	4.70
(LLc/ABe)R	5.67	5.62	5.65
Mean	4.75	5.31	5.03

GRAIN MEAN DM% 85.8

PLOT AREA HARVESTED 0.00413

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13/W/RN/3

W. WHEAT

Grain tonnes/hectare

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

FYMRES	none	FYM	Mean
ROTATION			
(AO)W	5.14	4.55	4.85
(ABe)W	5.10	4.95	5.03
(LLn/AO)W	5.13	5.42	5.27
(LLc/ABe)W	5.14	4.92	5.03
(LN)W	4.41	3.60	4.00
(LLN/Ln)W	4.09	4.70	4.40
(LC)W	3.12	3.18	3.15
(LLc/Lc)W	4.02	3.46	3.74
Mean	4.52	4.35	4.43

N	0	80	160	240	Mean
ROTATION					
(AO)W	2.50	5.23	5.72	5.93	4.85
(ABe)W	3.91	5.40	5.64	5.16	5.03
(LLn/AO)W	3.61	6.20	5.66	5.62	5.27
(LLc/ABe)W	3.78	5.73	5.20	5.41	5.03
(LN)W	3.56	2.77	5.49	4.20	4.00
(LLN/Ln)W	4.06	4.61	4.82	4.10	4.40
(LC)W	3.61	2.26	2.95	3.78	3.15
(LLc/Lc)W	4.03	3.53	3.92	3.48	3.74
Mean	3.63	4.47	4.92	4.71	4.43

N	0	80	160	240	Mean
FYMRES					
none	3.71	4.51	5.09	4.76	4.52
FYM	3.55	4.42	4.76	4.66	4.35
Mean	3.63	4.47	4.92	4.71	4.43

N	0	80	160	240
ROTATION FYMRES				
(AO)W none	2.72	5.38	6.33	6.13
FYM	2.29	5.08	5.10	5.74
(ABe)W none	3.81	5.74	5.91	4.96
FYM	4.00	5.07	5.38	5.37
(LLn/AO)W none	3.11	6.39	5.23	5.77
FYM	4.11	6.01	6.08	5.48
(LLc/ABe)W none	3.88	5.77	5.21	5.71
FYM	3.68	5.69	5.18	5.11
(LN)W none	4.21	3.91	5.77	3.75
FYM	2.91	1.63	5.20	4.66
(LLN/Ln)W none	3.79	3.88	4.28	4.43
FYM	4.33	5.35	5.36	3.77
(LC)W none	3.98	2.38	2.94	3.19
FYM	3.24	2.15	2.95	4.36
(LLc/Lc)W none	4.21	2.67	5.05	4.16
FYM	3.86	4.39	2.79	2.79

GRAIN MEAN DM% 87.0

PLOT AREA HARVESTED 0.00192

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13/W/RN/3

W. RYE

Grain tonnes/hectare

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

FYMRES	none	FYM	Mean
ROTATION			
(AO)R	4.16	4.08	4.12
(ABe)R	3.84	4.43	4.14
(LLn/AO)R	5.04	4.65	4.85
(LLc/ABe)R	4.58	4.79	4.68
(Ln)R	2.98	4.03	3.50
(LLn/Ln)R	3.32	4.60	3.96
(Lc)R	4.22	4.10	4.16
(LLc/Lc)R	4.33	4.71	4.52
Mean	4.06	4.42	4.24

ROTATION					
(AO)R	2.81	4.07	4.59	5.02	4.12
(ABe)R	2.38	3.84	4.90	5.43	4.14
(LLn/AO)R	3.35	5.00	5.36	5.67	4.85
(LLc/ABe)R	2.82	4.58	5.59	5.73	4.68
(Ln)R	2.78	3.32	3.83	4.09	3.50
(LLn/Ln)R	3.25	2.69	5.56	4.33	3.96
(Lc)R	2.85	4.22	4.85	4.72	4.16
(LLc/Lc)R	3.27	4.53	4.77	5.52	4.52
Mean	2.94	4.03	4.93	5.06	4.24

N	0	50	100	150	Mean
FYMRES					
none	2.79	3.76	4.75	4.94	4.06
FYM	3.09	4.30	5.11	5.19	4.42
Mean	2.94	4.03	4.93	5.06	4.24

N	0	50	100	150
ROTATION FYMRES				
(AO)R none	2.88	4.04	4.58	5.14
(AO)R FYM	2.74	4.11	4.59	4.90
(ABe)R none	2.17	3.38	4.70	5.12
(ABe)R FYM	2.58	4.29	5.09	5.74
(LLn/AO)R none	3.23	5.26	5.99	5.70
(LLn/AO)R FYM	3.47	4.74	4.74	5.64
(LLc/ABe)R none	2.88	4.28	5.54	5.61
(LLc/ABe)R FYM	2.77	4.89	5.64	5.86
(Ln)R none	2.09	2.94	2.99	3.90
(Ln)R FYM	3.46	3.70	4.66	4.29
(LLn/Ln)R none	2.95	1.93	4.93	3.48
(LLn/Ln)R FYM	3.56	3.46	6.20	5.18
(Lc)R none	2.61	4.26	4.85	5.16
(Lc)R FYM	3.08	4.17	4.85	4.29
(LLc/Lc)R none	3.50	4.02	4.44	5.39
(LLc/Lc)R FYM	3.05	5.04	5.11	5.66

GRAIN MEAN DM% 85.4

PLOT AREA HARVESTED 0.00192

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13/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: A. J. Macdonald

The 48th year, Winter Rye

For previous years see 'Details' 1973 and Yield Books for 74-12/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 on 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. **Treatment** (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.

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

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13/W/RN/12

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 2008 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 2009 s. barley crop nitrogen rates (kg N/ha) were:
0, 35, 70, 105, 140, 175 as nitro-chalk (27% N).

No N was applied to the beans in 2010

For 2011 W. wheat nitrogen rates (kg N/ha) were:
0, 50, 100, 150, 200, 250 as nitro-chalk (27% N).

For 2012 Forage Maize nitrogen rates were 0, 50, 100, 150, 200, 250 & 250 kg N/ha as Nitro-chalk (27% N)

For 2013 Winter rye nitrogen rates were 0, 30,60,90,120,150 kg N/ha as Nitro-chalk (27% N)

Experimental Diary

Date		Application	Rate	Units
20-Oct-12	p	Sprayed glyphosate, grass plots not sprayed.	4	l/ha
24-Oct-12	a	Applied compost, plots 7, 12, 21 and 27	40	t/ha
24-Oct-12	a	Applied straw, Plots 3, 15, 17, 31.	7.5	t/ha
06-Nov-12	a	Applied FYM -finished	—	—
06-Nov-12	a	Topped grass plots, unable to bale and remove, too little grass.	—	—
06-Nov-12	a	Ploughed - East	—	—
08-Nov-12	a	Ploughed- finished	—	—
10-Dec-12	a	Power harrowed- prep site	—	—
12-Dec-12	s	Drilled Kapitan, drilled as a solid block	450	seeds/m^2
13-Dec-12	s	Drilled Kapitan - finished	450	seeds/m^2
20-Apr-13	f	Applied Sulphate of Potash, applied to whole trial except plots 5, 11, 23 and 26.	200	kg/ha
20-Apr-13	f	Applied TSP- applied to all plots except 5, 11, 23 and 26	97.5	kg/ha
01-May-13	p	Sprayed Ally Max + Folicur + Amistar + Moddus + New 5C Cycocel - 200 lt/ha water. Sprayed all rye plots but not the grass.	Al@42 Fol@0.5 Am@0.5 Mo@0.25 Cyc1.5	g/ha l/ha l/ha l/ha l/ha
07-May-13	f	Applied Nitro-chalk, applied to treated plots.		
03-Jun-13	p	Sprayed Amistar and Folicur- Rye only	Am@0.5 Fol@0.5	l/ha l/ha
01-Jul-13	a	Cut grass plots, cut for yield	—	—

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03-Jul-13	a	Mowed grass, mowed rest of grass plots	—	—
08-Jul-13	a	Rowed up grass, ley plots	—	—
08-Jul-13	a	Baled and removed, ley plots	—	—
31-Aug-13	a	Cut plots for yield	—	—
04-Sep-13	a	Combined	—	—
06-Sep-13	a	Baled	—	—
13-Nov-13	a	Cut and weighed grass plots for yield, plots 1,13,24 and 29	—	—
13-Nov-13	a	Topped grass plots, grass too short to bale and remove.	—	—

WINTER RYE

WHOLE CROP TONNES/HECTARE (100%DM)

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

Nitrogen Treatment	0kg	30kg	60kg	90kg	120kg	150kg	Mean
F(Fd)	1.98	3.67	4.90	5.59	5.61	6.08	4.64
F(Ln,Lc6)	2.68	4.22	5.05	6.05	6.12	6.20	5.05
St(St)	2.45	4.04	4.63	5.39	5.83	6.47	4.80
CC(Gm,Lc8)	2.09	4.19	5.22	5.61	6.53	5.83	4.91
Co(Pt,Lc8)	4.00	5.18	6.00	6.43	6.44	6.39	5.74
Dg10(Fs)	2.86	4.11	5.48	6.29	6.42	5.94	5.18
Dg25(Dg)	4.01	5.25	5.86	6.34	6.70	6.45	5.77
Mean	2.87	4.38	5.31	5.96	6.24	6.20	5.16

Standard errors of differences of means

Table	Treatment	Nitrogen	Treatment Nitrogen
s.e.d.	0.231	0.117	0.366
Except when comparing means with the same level(s) of Treatment			0.310

Grain Mean %DM 86.5

Plot area harvested (ha)
0.001766 0.001566

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GRASS/CLOVER

DRY MATTER TONNES/HECTARE

***** Table of means *****

Year	1st Cut	2nd Cut	Total
2003	-	-	-
2004	1.82	-	1.82
2005	1.86	0.13	1.99
2006	4.07	-	4.07
2007	3.12	1.36	4.48
2008	5.72	1.65	7.37
2009	4.77	-	4.77
2010	4.41	-	4.41
2011	1.46	0.39	1.85
2012	4.11	0.64	4.75
2013	4.65	0.60	5.24

Cut dry matter t/ha (1/7/13 & 13/11/13)

Note: See previous Yield Books (2004-12) for cutting dates

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13/R/CS/326 and 13/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: A Macdonald and M. J. Glendining,

The 27th year, w. wheat

For previous years see Yield Books for 87-12/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	6.60	4.10
2 NORMAL	Twice normal	13.20	8.21
4 NORMAL	Four times normal	26.40	16.41

Experimental Diary

Great Knott III (R)

Date		Application	Rate	Units
23-Aug-12	a	Baled and weighed straw	See above	
20-Sep-12	a	Ploughed		
11-Oct-12	s	Drilled w/Crusoe dr Redigo Deter	145	kg/ha
13-Oct-12	f	Spread MOP	227	kg/ha
13-Oct-12	p	Sprayed Liberator EW	0.6	l/ha
18-Oct-12	p	Spread Slug Pellets - Gusto	6	kg/ha
25-Apr-13	f	Applied Nitram (second N application)	261	kg/ha
07-May-13	p	Sprayed Kingdom, Bravo and Cycocel	King@1.25 Brav@1.0 Cyco@2.0	l/ha l/ha l/ha
05-Jun-13	p	sprayed refine max, ignite, comet, hatchet	ref@75 ign@1.2 com@0.4 hat@0.75	g/ha l/ha l/ha l/ha
13-Jun-13	a	Cut Paths	—	—
18-Jun-13	p	Sprayed Cello	@0.55	l/ha

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18-Jul-13	a	Cut Paths	—	—
13-Aug-13	a	Sampo - Harvested plots	—	—
13-Aug-13	a	Baled weighed and sampled plots	—	—

The first and third split N applications of Nitram were 148 and 261 kg/ha, but the application dates were not recorded.

Far Field I (W)

Date		Application		Rate	Units
07-Sept-12	a	Straw weighed		See above	
20-Sep-12	a	Ploughed all plots		—	—
27-Oct-12	s	Drilled Crusoe trt Redigo Deter		400	seeds/m^2
20-Feb-13	s	Drilled Crusoe trt Redigo Deter, re-drilled trial		500	seeds/m^2
19-Apr-13	f	Applied Double Top Fertilizer		148	kg/ha
09-May-13	f	Applied Nitram		203	kg/ha
16-May-13	p	Sprayed Atlantis + Hadron + Biopower in 150 lt/ha water		At@0.4 Had@0.6 Bio@1.0	kg/ha kg/ha l/ha
31-May-13	f	Applied Nitram		203	kg/ha
10-Jun-13	p	Sprayed Bassoon and Gemstone	Ba 0.4	Ge 1.0	l/ha l/ha
05-Jul-13	p	Sprayed Ally Max, Ignite, Comet and Hatchet Xtra in 200 lt/ha water volume.	Ig 1.1 0.25	Al 42 Co Ha 0.75	g/ha l/ha l/ha l/ha
02-Sep-13	a	Cut plots for yield		—	—
05-Sep-13	a	Straw weights done		—	—

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13/R/CS/326

GRAIN TONNES/HECTARE

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

Straw_	
-	6.71
1	6.75
2	6.91
4	7.23
Mean	6.90

Standard errors of differences of means

Table	Straw_
s.e.d.	0.219

Stratum standard errors and coefficients of variation
==========

Stratum	d.f.	s.e.	cv%
Blocks.Plots	9	0.310	4.5

Grain mean DM% 87.6

Straw tonnes/hectare

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

Straw_	
-	3.47
1	3.50
2	3.70
4	3.94
Mean	3.65

Standard errors of differences of means

Table	Straw_
s.e.d.	0.192

Stratum standard errors and coefficients of variation
==========

Stratum	d.f.	s.e.	cv%
Blocks.Plots	9	0.272	7.4

Straw mean DM% 91.1

Plot area harvested 0.00284

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13/W/CS/326

```
Grain tonnes/hectare

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

       Straw_
            -      5.01
            1      4.66
            2      4.97
            4      4.92

         Mean      4.89

Standard errors of differences of means
---------------------------------------

Table                Straw_
s.e.                  0.443

Stratum standard errors and coefficients of variation
=====================================================

Stratum                   d.f.          s.e.         cv%

Blocks.Plots                 6         0.542        11.1

Grain mean DM  88.6


Straw tonnes/hectare

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

       Straw_
            -      2.47
            1      2.56
            2      2.73
            4      2.53

         Mean      2.57

Standard errors of differences of means
---------------------------------------

Table                Straw_
s.e.                  0.311

Stratum standard errors and coefficients of variation
=====================================================

Stratum                   d.f.          s.e.         cv%

Blocks.Plots                 6         0.381        14.8

Straw mean DM%  94.8

Plot area harvested 0.00305
```


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13/R/CS/477

CONTINUOUS MAIZE

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

Sponsors: A. J. Macdonald

The 17th year, forage maize and s. barley

For previous years see Yield Books for 97-12/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)	S. barley, after ten years of Maize, straw removed
BT	Continuous spring barley, straw removed plus 10 t maize tops incorporated
B	Continuous spring barley, straw removed

Note: Cropping was changed from Maize to S. barley on the BM treatment in 2010

Experimental diary

Date		Application	Rate	Units
28-Sept-12	f	TSP applied – all plots	171	kg/ha
		MOP applied – all plots	181	kg/ha
05-Oct-12	a	Maize tops spread on plots 3, 9,18, 6, 12, 16	10	t/ha
02-Apr-13	a	Spring tined		
03-Apr-13	s	Drilled Barley only, var. Tipple dr Rancona	350	seeds/m^2
6-Apr-13	p	Sprayed Kula	3.5	l/ha
16-May-13	a	flexitined maize plots	—	—
20-May-13	a	Power-harrowed maize plots	—	—
20-May-13	a	Drilled Maize, Hudson tr Mesurol	as plan	
21-May-13	f	Applied Doubletop to Maize and Barley	@356	kg/ha
26-May-13	p	Sprayed Refine Max, Compitore Plus, Mobius, Cyflomid	re@75 co@1.0 mo@0.6 cyf@0.125	g/ha g/ha l/ha l/ha l/ha
26-Jun-13	p	Sprayed Mobius	@0.4	l/ha
26-Jun-13	p	Sprayed Samson and Callisto, Maize sprayed only	Both @0.5	l/ha
10-Jul-13	a	Pulling Wild Oats	—	—
19-Jul-13	a	Cut Paths.	—	—
12-Aug-13	a	Claas - Harvested opened up exp.	—	—

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27-Aug-13	a	Claas - Harvested OE's	—	—
27-Aug-13	a	Sampo - Harvested all plots	—	—
29-Aug-13	a	Claas - Harvested, cleared OE's	—	—
25-Sep-13	a	Harvested all Maize plots	—	—
25-Sep-13	a	Cleared OE's Maize	—	—
26-Sep-13	a	Cut Maize OE's	—	—

NOTE: Samples of barley grain and maize (whole crop) were taken for chemical analyses.

```
MAIZE

WHOLE CROP TONNES/HECTARE (100% DM)

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

    Treatment
            M      2.33
           MT      2.72
         M(B)      2.94
         (B)M      1.87

         Mean      2.47

Standard errors of differences of means
---------------------------------------

Table            Treatment
rep.                     3
d.f.                     6
s.e.d.               0.678

Stratum standard errors and coefficients of variation
=====================================================

Variate: TPlDm Total plant dry matter tonnes/hectare

Stratum                   d.f.          s.e.         cv%

Blocks                       2         0.437        17.7
Blocks.Plots                 6         0.830        33.7

MEAN DM% 23.8

Plot area harvested 0.00108
```

Note: Maize yields were adversely affected by the accidental application of residual herbicide (Topik). Therefore, yields are unreliable.

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13/R/CS/477

SPRING BARLEY

Grain tonnes/hectare

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

Treatment	
BT	5.10
B	4.85
Mean	4.98

Standard errors of differences of means

Table	Treatment
rep.	3
d.f.	2
s.e.d.	0.086

Stratum standard errors and coefficients of variation
==========

Variate: Grain85% Grain (at 85% dry matter) tonnes/hectare

Stratum	d.f.	s.e.	cv%
Blocks	2	0.299	6.0
Blocks.Plots	2	0.106	2.1

GRAIN MEAN DM% 87.1

Plot area harvested 0.00525

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13/W/CS/478

CONTINUOUS MAIZE

Object: To monitor the fate of organic carbon in the soil organic matter – Woburn, Stackyard AI

Sponsors: A. J. Macdonald

The 17th year, forage maize and s. barley

For previous years see Yield Books for 97-12/W/CS/478

Design: 3 randomised blocks of 6 plots.

Plot dimensions: 9.0 x 25.00

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) S. barley, after ten years of maize, straw removed
BT Continuous spring barley, straw removed plus 10 t maize tops incorporated
B Continuous spring barley, straw removed
Note: Cropping was changed from Maize to S. barley on the BM treatment in 2010
NOTE: Samples of barley grain and maize (whole crop) were taken for chemical analyses.

Experimental diary

Date		Application	Rate	Units
23-Oct-12	a	Applied Maize tops, plots 2, 4, 12, 13, 16, 17.	10	t/ha
06-Nov-12	a	Ploughed North	—	—
15-Mar-13	a	Spring tined	—	—
04-Apr-13	s	Drilled NFC Tipple, tr Rancona	350	seeds/m^2
04-Apr-13	a	Rolled, rolled Oats/sp Barley	—	—
20-Apr-13	f	Applied TSP	171	kg/ha
22-Apr-13	f	Applied MOP	181	kg/ha
23-Apr-13	f	Applied Double Top, applied to Sp. Barley and maize seedbed	356	kg/ha
22-May-13	s	Drilled Maize, Hudson tr Mesurol	10.1	seeds/m^2
02-Jul-13	p	Sprayed Harmony M, Mobius and Hatchet Xtra, sprayed spring barley only	Har @ 0.1 Mob @ 0.5 Hat @ 0.7	kg/ha l/ha l/ha
05-Jul-13	p	Sprayed Mobius, sprayed spring barley only	0.4	l/ha
05-Jul-13	p	Sprayed Samson and Callisto, Maize plots only	0.5 0.5	l/ha l/ha
31-Aug-13	a	Cut plots for yield	—	—

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04-Sep-13	a	Combined	—	—
06-Sep-13	a	Baled	—	—
07-Oct-13	a	Cut Maize for yields	—	—
07-Oct-13	a	Mowed and Baled, only two bales of maize	—	—

```
MAIZE WHOLE CROP TONNES/HECTARE (100% DM)

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

    Treatment
         M      2.79
         T      4.22
      M(B)      3.11
      (B)M      3.34

       Mean     3.36

Standard errors of differences of means
---------------------------------------

Table            Treatment
rep.                     3
d.f.                     6
s.e.d.               0.628

Stratum standard errors and coefficients of variation
=====================================================
Stratum                  d.f.          s.e.         cv%

Blocks                      2         0.390        11.6
Blocks.Plots                6         0.769        22.8

Mean DM% 26.5

Plot area harvested 0.00108
```


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13/W/CS/478

```
SPRING BARLEY

GRAIN TONNES/HECTARE

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

    Treatment
           BT      3.93
            B      3.06

         Mean      3.49

Standard errors of differences of means
---------------------------------------

Table            Treatment
rep.                     3
d.f.                     2
s.e.d.               0.247

Stratum standard errors and coefficients of variation
=====================================================

Stratum                  d.f.          s.e.         cv%

Blocks                      2         0.203         5.8
Blocks.Plots                2         0.303         8.7

Grain mean DM%  88.0

Plot area harvested  0.00525

Standard errors of differences of means
---------------------------------------
Table            Treatment
s.e.d.               0.095

Stratum standard errors and coefficients of variation
=====================================================
Stratum                  d.f.          s.e.         cv%

Blocks.Plots                4         0.116         2.4

GRAIN MEAN DM% 84.3

PLOT AREA HARVESTED 0.00525
```


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Rothamsted Research

The Weather : Monthly Summary : 2013

(Departure from the 30 year means (1981 - 2010) in brackets)

	Sunshine		Mean temperatures °C								Rain			Drainage	Wind
			Maximum		Minimum		Dew point	Ground	In ground under grass		Tipping Bucket		Rain	20"	
	Hours	()	°C	()	°C	()	°C	frosts*	30 cm	100 cm	Total mm	()	days**	mm	km/hr***
January	44.8	(-17.23)	4.9	(-1.78)	0.5	(-0.70)	1.09	18	5.2	6.9	62.8	(-7.17)	16	82.6	10.1
February	86.1	(+5.81)	5.2	(-1.75)	0.2	(-0.74)	0.01	16	4.1	5.7	43.4	(-6.74)	18	60.1	10.7
March	72.9	(-42.00)	5.2	(-4.71)	-0.2	(-2.83)	0.44	19	4.2	5.4	83.1	(+32.30)	15	58.8	10.8
April	193.7	(+32.53)	12.2	(-0.45)	3.0	(-1.05)	2.25	13	6.8	6.1	32.8	(-22.29)	15	8.3	12.1
May	183.2	(-11.44)	14.8	(-1.32)	6.1	(-0.72)	5.06	6	10.9	9.4	56.0	(+1.28)	15	8.0	10.0
June	185.3	(-12.89)	18.0	(-1.10)	9.3	(-0.45)	8.95	1	13.6	11.6	24.6	(-28.69)	9	0.5	9.7
July	277.3	(+72.09)	24.5	(+2.71)	12.8	(+0.93)	12.88	0	17.2	14.4	47.4	(-2.48)	12	2.3	7.6
August	191.2	(-5.04)	22.1	(+0.49)	12.7	(+0.88)	12.4	0	17.3	15.8	57.5	(-6.23)	14	12.9	7.7
September	122.7	(-20.67)	17.8	(-0.53)	9.7	(-0.20)	10.3	0	15.0	14.9	50.2	(-7.39)	21	13.4	7.0
October	84.7	(-27.05)	15.3	(+1.21)	9.3	(+2.15)	10.1	2	13.1	13.5	108.8	(+27.07)	26	54.9	10.0
November	77.9	(+7.13)	8.9	(-0.85)	3.6	(-0.24)	3.8	9	8.7	10.9	59.5	(-17.13)	23	35.8	8.9
December	62.1	(+8.33)	9.1	(+2.22)	2.6	(+0.92)	3.5	16	6.7	8.5	123.1	(+53.60)	24	102.2	11.1
Year	1581.9	(-10.43)	13.1	(-0.49)	5.8	(-0.17)	5.9	100.0	10.2	10.3	749.1	(+16.13)	208.0	439.7	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 the ground

30 year Mean Rainfall = 733mm

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Woburn Experimental Farm
The Weather : Monthly Summary : 2013
(Departure from 30-year means (1981 - 2010) in brackets)

	Sunshine		Mean temperatures °C								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	43.7	(-16.28)	5.4	(-1.60)	0.4	(-0.83)	1.3	17	5.5	7.5	31.0	(-23.53)	13	8.5
February	76.7	(+1.75)	5.6	(-1.78)	-0.1	(-0.98)	0.1	23	4.3	6.2	45.2	(+3.04)	18	7.6
March	80.7	(-32.78)	5.6	(-4.71)	-0.8	(-3.47)	0.1	25	4.4	5.7	60.2	(+14.29)	20	7.2
April	197.6	(+46.71)	13.1	(+0.08)	2.9	(-0.85)	3.6	15	7.4	6.4	26.8	(-25.41)	11	10.1
May	179.8	(-7.36)	15.5	(-1.07)	5.4	(-1.11)	6.7	7	11.3	9.1	74.6	(+21.34)	18	8.0
June	184.0	(-3.87)	18.6	(-0.95)	9.2	(-0.26)	9.5	2	15.0	11.7	27.2	(-22.87)	12	8.1
July	255.3	(+58.15)	24.7	(+2.63)	12.3	(+0.71)	13.4	0	18.7	14.9	37.2	(-12.69)	10	4.1
August	178.1	(-10.77)	22.7	(+0.84)	12.3	(+0.74)	12.7	0	18.2	16.2	43.8	(-14.00)	14	7.0
September	133.0	(-4.06)	21.6	(+2.91)	10.5	(+0.93)	12.8	1	17.8	17.9	50.4	(-6.68)	19	6.8
October	89.3	(-22.50)	16.9	(+2.43)	10.1	(+3.19)	11.8	3	14.4	15.2	104.4	(+33.53)	27	9.9
November	64.8	(-1.46)	9.2	(-0.73)	3.2	(-0.56)	4.7	14	8.6	11.7	56.8	(-5.67)	19	6.9
December	63.8	(+18.16)	9.7	(+2.50)	2.9	(+1.39)	4.3	11	6.6	9.1	74.6	(+18.85)	22	10.5
Year	1546.7	(+25.69)	14.1	(+0.06)	5.7	(-0.08)	10.2	118.0	11.1	11.0	632.2	(-19.80)	203.0	7.9

* Number of nights grass minimum was below 0.0 °C

** Number of days rain was 0.2 mm or more

*** At 2 metres above the ground

30 year Mean Rainfall = 652mm

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