ROTHAMSTED RESEARCH

Yields of the Field Experiments 2009

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Results of the Classical and Other Long-term Experiments 2009

Rothamsted Research

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Results of the

Classical and other

Long-term Experiments

2009

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List of Experiments in the 2009 Yield Book

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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	60% K_2O
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
Potassium sulphate	50% K_2O and 18.4% sulphur
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	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 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.

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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
Agriguard Chlormequat 720	gr	720 g/l chlormequat
Agriguard Fluroxypyr	h	200g/l fluroxypyr
Allure	m	1.5% w/w metaldehyde
Ally Max SX	h	143 g/l & 143 g/l metsulfuron-methyl + tribenuron-methyl
Alpha Pendimethalin 330 EC	h	330 g/l pendimethalin
Amistar	f	250 g/l azoxystrobin
Amistar Opti	f	100 g/l & 500 g/l azoxystrobin and chlorothalonil
Anchor	f	600 ml/100 kg of seed (rate recommended for legumes)
Arelon 500	h	500 g/l isoproturon
Avadex Excel 15G	h	15% w/w tri-allate
Azural	h	360 g/l glyphosate
BASF 3C Chlormequat 720	gr	720 g/l chlormequat
Beret Gold	f	200 ml/100 kg of seed
Biopower	ad	20.2 + 6.7% w/w 3,6-dioaeicosylsulphate sodium salt + 3,6-dioxaoctadecylsuphate sodium salt
Bravo 500	f	500 g/l chlorothalonil
Brutus	f	37.5 g/l & 27.5 g/l epoxiconazole and metconazole
Callisto	h	100 g/l mesotrione
Cherokee	f	chlorothalonil, 50.000 g / l cyproconazole and 62.500 g / l propiconazole
Clipper	h	360 g/l glyphosate
Cycocel	gr	460 g/l chlormequat chloride
Decoy Wetex	m	20 g/kg methiocarb
Dow Agrosciences Glyphosate 360	h	360 g/l glyphosate
Duplosan KV	h	600 g/l mecoprop-P
Fandango	f	100 g/l and 100 g/l fluoxastrobin and prothioconazole
Flexity	f	300 g/l metrafenone
Hallmark with Zeon Technology	i	100 g/l lambda cyhalothrin
Harmony M SX	h	40 g/kg + 400 g/kg metsulfuron-methyl + thifensufuron-methyl
Headland Charge	h	600 g/l mecoprop-P
Hurler	h	200 g/l fluroxypyr
Karan	i	3.000 % w/w methiocarb
Lexus Class	h	33.3 + 16.7 % carfentrazone-ethyl + Flupyrsulfuron-methyl
Landgold Lambda-Z	i	100 g/l lambda-cyhalothrin
Langold Propyzamide 400 SC	h	400 g/l propyzamide
Liberator	h	400 + 100 g/l diflufenican + flufenacet
Mesurol	m	100 g/100l
Opus	f	125 g/l epoxyconazole
Pacifica	h	10 g/kg + 30 g/kg idosulfuron-methyl-sodium + mesosulfuron-methyl
Proline	f	250.000 g/l prothioconazole
Raxil Pro	f	150 ml/100 kg of seed
Redigo Deter	f	200 ml/100 kg of seed
Roundup Metro	h	360 g/l glyphosate

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Samson	h	40 g/l nicosulfuron
Slingshot	h	360 g/l glyphosate
Splice	f	233 g/l and 67 g/l boscalid and epoxiconazole
Stomp 400 SC	h	400 g/l pendimethalin
Talius	f	200 g/l proquinazid
Weedazol-TL	h	225 g/l amitrol

Note: Seed dressing rates indicated for Anchor, Beret Gold, Mesurol, Redigo Deter and Raxil Pro are those recommended by the manufacturer and may differ from the actual rate used.

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09/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 166th 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-O8R//BK/1.

Areas harvested:

	Section	
Wheat:	0	0.00320
	1	0.00589
	2,3,6 and 7	0.00487
	5	0.00162
	8,9	0.00512
Oats:	4	0.00487 (*see note 4, below)
Maize:	7	0.00487

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

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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

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 60kg 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[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)+

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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 1999-2002 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

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Section Year	1	9	0*	8+	6**	5	3	7	4	2
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
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

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 2006 part of 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.

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Experimental Diary:

AllSections			Rate	Unit
29-Sep-08	f	Triple Superphosphate, strips 11, 13, 14, 17, and 18	170.00	kg/ha
30-Sep-08	f	Muriate of Potash - strip 14	181.00	kg/ha
02-Oct-08	f	Farm Yard Manure - strips 21and 22 excluding section 4	35.00	t/ha
06-Oct-08	a	Plough/ S		
10-Oct-08	a	Cultipressed		
16-Oct-08	a	Power Harrowed		
25-Nov-08	a	Collapsed rabbit holes with Burrow Blaster		
16-Dec-08	a	Cut Hedges		
17-Dec-08	a	Cut Hedges		
24-Mar-09	f	Sulphate of Potash - strips 5, 6, 7, 8, 9, 12, 13,15,16,17,18,19,20	217.00	kg/ha
25-Mar-09	f	Kieserite - strips 5, 6, 7, 8, 9, 11, 12, 15, 16, 17, 18, 19, and 20	80.00	kg/ha
16-May-09	a	Mow / Rotavate paths		
19-May-09	a	Rotavate side paths		
01-Jun-09	a	Mow / Rotavate paths		
15-Jun-09	a	Mow / Rotavate paths		
29-Jun-09	a	Mow / Rotavate paths		
03-Jul-09	a	Rogue wild oats/thistles/weeds - 323 wild oat plants		
28-Jul-09	a	Rotavate Down paths and headlands		
30-Jul-09	a	Mow / Rotavate paths Cut cross paths		
13-Aug-09	a	Combine harvest discards O's & Es		
	a	Baled except section 0		
27-Aug-09	p	Weedazol-TL – all except sections 3 and 8	20.00	lt/ha

Cropped Sections:

Winter Wheat			Rate	Unit
17-Oct-08	a	Combination Drilled		
	s	Hereward tr Redigo Deter - wheat sections	400.00	seeds/m^2
18-Oct-08	p	Liberator -wheat excluding section 8	0.60	l/200 l/ha
27-Oct-08	p	Allure - wheat and oats	7.50	kg/ha
20-Nov-08	p	Karan - wheat and oats	5.00	kg/ha
10-Dec-08	p	Stomp 400 SC. Sprayed all wheat excluding section 8	3.30	l/ha
	p	Arelon 500. Sprayed all wheat excluding section 8	3.00	l/ha
	p	Hallmark with Zeon Technology. Sprayed all wheat excluding section 8	50.00	ml/ha
09-Mar-09	f	Nitraprill – wheat, strips 12, 17, 18 and 19	139.00	kg/ha
21-Apr-09	f	Nitram – wheat, strips 19 and 6	139.00	kg/ha
	f	Nitram – wheat, strips 7 and 18	278.00	kg/ha
	f	Nitram – wheat, strips 2, 8 and 12	417.00	kg/ha

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			Rate	Unit
21-Apr-09	f	Nitram – wheat, strips 1, 9, 10, 11, 13, 14, 17 and 20	556.00	kg/ha
	f	Nitram – wheat, strips 15	696.00	kg/ha
	f	Nitram – wheat, strip 16	835.00	kg/ha
29-Apr-09	p	Cherokee - to section 8 only	1.25	l/ha
10-May-09	p	Cherokee - wheat sections only, except section 6 and 8.	1.25	l/ha
	p	Ally Max SX wheat sections only, except section 6 and 8.	42.00	g/ha
	p	Agriguard Fluroxypyr - wheat sections only, except section 6 and 8.	0.75	l/ha
	p	Hurler wheat sections only, except section 6 and 8 either	0.75	l/ha
13-May-09	f	Nitram – wheat, strips 12,17, 18 and 19	139.00	kg/ha
28-May-09	p	Brutus wheat + section 8	1.50	l/ha
	p	Amistar Opti wheat + section 8	1.25	l/ha
14-Aug-09	a	Combine harvest, plots for yield		
15-Aug-09	a	Sample, bale and weigh straw wheat plots		

Winter Oats

			Rate	Unit
17-Oct-08	a	Combination Drilled		
	s	Gerald tr Beret Gold - oats	400.00	seeds/m^2
27-Oct-08	p	Allure - wheat and oats	7.50	kg/ha
20-Nov-08	p	Karan - wheat and oats	5.00	kg/ha
15-Dec-08	p	Lexus Class - oats only	60.00	g/ha
	p	Hallmark with Zeon Technology – oats only	50.00	ml/ha
22-May-09	p	Ally Max SX	42.00	g/ha
	p	Duplosan KV	1.50	l/ha
	p	Headland Charge	1.50	l/ha
	p	Amistar	0.60	l/ha
	p	Flexity	0.20	l/ha
	p	Agriguard Chlormequat 720	2.25	l/ha
11-Aug-09	a	Combine harvest discards – oats.		
	a	Sample, bale and weigh straw oat straw		

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Forage Maize

			Rate	Unit
03-Apr-09	p	Clipper - maize area only	3.00	l/ha
11-May-09	a	Flexitined in preparation for maize		
12-May-09	a	Power Harrowed		
	a	Nodet Drilled		
	s	Hudson tr mesurol + thiram	10.20	seeds/m^2
13-May-09	f	Nitram - maize, strip 6	139.00	kg/ha
	f	Nitram – maize strips 7, 12, 17, 18 and 19. NOTE: plot 197 had 556 kg/ha, i.e. 278 kg/ha over and plot 187 had 417 kg/ha i.e.139 kg/ha over	278.00	kg/ha
	f	Nitram – maize, strips 2.1 and 8	417.00	kg/ha
	f	Nitram – maize, strips 1, 9, 10, 11, 13 and 14	556.00	kg/ha
	f	Nitram – maize, strip 15	696.00	kg/ha
	f	Nitram – maize, strip 16	835.00	kg/ha
15-Jun-09	p	Callisto section 7 only	0.75	l/ha
	p	Samson section 7 only	1.00	l/ha
25-Jun-09	f	Nitram – maize, Plot 187 received 139 kg/ha extra on 13-May-10 so a reduced amount was applied to this plot to ensure correct amount applied overall. Plot 197, having already received more than the total required did not receive any further N.	139.00	kg/ha
	f	Nitram – Strip 18 except plot 187	278.00	kg/ha
	f	Nitram – Strip 12	417.00	kg/ha
	f	Nitram - Strip 17	556.00	kg/ha
10-Sep-09	a	Harvest maize plots		

Wilderness

08-Dec-08	a	Topped Grubbed section
13-May-09	a	Topped
04-Jun-09	a	Mown
13-Aug-09	a	Wilderness topped

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 7 were archived

https://doi.org/10.23637/ERADOC-1-219 *pp 14*

09/R/BK/1

WHEAT

GRAIN TONNES/HECTARE

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

SECTION PLOT	2/W1	3/W2	5/W3	6/W32	0/W5	1/W43	9/W51	8/W1	Mean
01(FYM)N4	10.07	8.63	7.19	8.12	*	*	*	*	8.50
21FYMN3	10.63	9.47	9.03	9.16	6.84	7.62	7.37	3.53	7.96
22FYM	6.08	4.33	5.93	6.12	4.56	5.56	5.86	3.82	5.28
03Nil	1.74	1.38	1.43	1.68	1.20	2.05	0.92	2.33	1.59
05(P)KMg	1.83	1.67	1.42	2.03	1.46	1.71	1.49	4.79	2.05
06N1(P)KMg	4.28	3.72	3.07	3.39	2.64	2.67	3.18	3.30	3.28
07N2(P)KMg	6.56	5.35	4.06	4.83	3.69	3.83	4.00	4.34	4.58
08N3(P)KMg	8.18	6.52	4.60	5.60	4.07	3.63	5.11	5.76	5.43
09N4(P)KMg	9.44	7.51	3.77	7.18	4.86	3.86	5.37	6.16	6.02
10N4	6.36	2.32	2.84	3.27	1.22	1.06	1.81	2.55	2.68
11N4PMg	5.37	3.89	5.75	6.48	5.61	4.59	5.22	2.98	4.99
12N1+3+1(P)K2Mg2	9.19	7.88	6.43	7.64	6.01	4.98	5.99	3.95	6.51
13N4PK	8.42	7.27	5.44	6.54	4.41	3.81	5.99	5.86	5.97
14N4PK*(Mg*)	7.86	6.63	4.92	6.16	4.75	3.66	5.58	6.12	5.71
15N5(P)KMg	8.94	7.70	5.46	6.79	4.92	4.64	6.11	5.97	6.32
16N6(P)KMg	9.25	8.77	5.63	8.28	5.17	4.53	6.33	5.70	6.71
17N1+4+1PKMg	8.91	8.11	6.18	7.90	5.78	4.76	4.84	2.84	6.16
18N1+2+1PKMg	8.36	7.50	6.37	6.81	5.11	3.62	4.40	3.66	5.73
19N1+1+1KMg	6.77	5.79	5.01	5.52	3.85	3.27	4.19	3.02	4.68
20N4KMg	*	*	*	*	1.37	0.68	*	*	1.02

GRAIN MEAN DM% 85.6

STRAW TONNES/HECTARE

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

SECTION PLOT	2/W1	3/W2	5/W3	6/W32	0/W5	1/W43	9/W51	8/W1	Mean
01(FYM)N4	5.42	*	*	*	*	*	*	*	5.42
21FYMN3	6.04	*	*	*	*	4.34	*	6.89	5.76
22FYM	4.77	*	*	*	*	4.40	*	6.49	5.22
03Nil	0.58	*	*	*	*	0.84	*	2.08	1.17
05(P)KMg	0.71	*	*	*	*	0.86	*	4.58	2.05
06N1(P)KMg	2.03	*	*	*	*	1.17	*	3.53	2.24
07N2(P)KMg	2.83	*	*	*	*	1.81	*	4.66	3.10
08N3(P)KMg	3.50	*	*	*	*	1.74	*	5.42	3.55
09N4(P)KMg	4.45	*	*	*	*	1.79	*	6.26	4.17
10N4	2.47	*	*	*	*	0.62	*	2.78	1.96
11N4PMg	1.90	*	*	*	*	1.88	*	5.15	2.98
12N1+3+1(P)K2Mg2	4.99	*	*	*	*	2.66	*	5.64	4.43
13N4PK	3.51	*	*	*	*	1.66	*	5.55	3.57
14N4PK*(Mg*)	3.11	*	*	*	*	1.76	*	5.60	3.49
15N5(P)KMg	3.95	*	*	*	*	2.64	*	6.54	4.38
16N6(P)KMg	4.50	*	*	*	*	2.65	*	6.73	4.63
17N1+4+1PKMg	4.99	*	*	*	*	2.94	*	6.73	4.89
18N1+2+1PKMg	4.51	*	*	*	*	2.25	*	5.51	4.09
19N1+1+1KMg	3.55	*	*	*	*	2.90	*	4.94	3.80
20N4KMg	*	*	*	*	*	0.36	*	*	0.36

STRAW MEAN DM% 79.2

https://doi.org/10.23637/ERADOC-1-219

09/R/BK/1

W. OATS
TONNES/HECTARE

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

PLOT	GRAIN	STRAW
01(FYM)[N4]	4.24	1.98
21[FYMN2]	6.48	3.23
22[FYM]	5.96	3.25
03Nil	1.73	0.48
05(P)KMg	1.94	0.52
06[N1](P)KMg	2.25	0.46
08[N2](P)KMg	2.83	0.77
08[N3](P)KMg	2.64	0.72
09[N4](P)KMg	2.76	0.70
10[N4]	4.86	0.32
11[N4]PMg	6.24	0.71
12[N1+3+1](P)K2Mg2	2.83	*
13[N4]PK	2.89	0.72
14[N4]PK*(Mg*)	2.92	0.84
15[N5](P)KMg	4.23	1.58
16[N6](P)KMg	6.07	2.25
17[N1+4+1]PKMg	6.03	2.23
18[N1+2+1]PKMg	2.89	0.86
19[N1+1+1]KMg	2.00	0.60
MEAN DM %	84.80	79.20

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

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

PLOT	WHOLE CROP
01(FYM)N4	13.78
21FYMN3	16.15
22FYM	14.43
03Nil	0.67
05(P)KMg	6.07
06N1(P)KMg	8.31
07N2(P)KMg	9.93
08N3(P)KMg	9.62
09N4(P)KMg	9.73
10N4	1.10
11N4PMg	6.05
12N2+3(P)K2Mg2	9.98
13N4PK	10.37
14N4PK*(Mg*)	10.22
15N5(P)KMg	9.12
16N6(P)KMg	8.63
17N2+4PKMg	9.55
18N2+2PKMg	9.86
19N2+1KMg	4.08
MEAN	8.82
MEAN DM%	20.90

PLOT AREA HARVESTED 0.00162

ERRATUM
see 2016 page16 (supplied)

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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.

https://doi.org/10.23637/ERADOC-1-219

09/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. 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 158th year, s. barley.

For previous years see 'Details' 1967 and 1973, Station Report for 1966 and Yield Books for 74-08/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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09/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 2010.

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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09/R/HB/2

Experimental Diary

			Rate	Unit
12-Nov-08	f	Sulphate of Potash - Plots 311 - 414, 321 - 424, 331 - 634, 142 – 444 (excluding 241) and 551 - 582	217.00	kg/ha
	f	Triple Superphosphate - Plots 631 - 634	215.00	kg/ha
	f	Kieserite - Plots 631 - 634	233.00	kg/ha
14-Nov-08	f	Silicate of Soda - Plots 132 - 433	450.00	kg/ha
10-Dec-08	f	Farm Yard Manure - plots 721,722,723,724,731,732,733,734	35.00	t/ha
11-Dec-08	a	Plough/ N		
25-Feb-09	a	Springtined		
	a	Combination Drilled Tipple tr Raxil pro		
27-Feb-09	a	Rolled		
14-Apr-09	a	Mow / Rotavate paths		
15-Apr-09	a	Mow / Rotavate paths		
22-Apr-09	f	Nitro-chalk, plots - 113, 124, 211, 222, 313, 321, 412, 421, 611, 621, 631, 712, 721 and 732	175.00	kg/ha
		Nitro-Chalk, plots - 112, 123, 212, 223, 314, 324, 414, 422, 613, 624, 634, 711, 722 and 731	349.00	kg/ha
		Nitro-Chalk, plots – 114, 122, 213, 224, 312, 323, 411, 424, 612, 622, 632, 714, 723 and 733	524.00	kg/ha
23-Apr-09	f	Nitram - Series AA, C and strip 5, headlands and O+E's	420.00	kg/ha
20-May-09	p	Headland Charge	1.50	l/ha
	p	Duplosan KV	1.50	l/ha
	p	Harmony M SX	100.00	g/ha
	p	Fandango	1.00	l/ha
	p	Flexity	0.20	l/ha
01-Jun-09	a	Mow / Rotavate paths		
04-Jun-09	p	Amistar Opti	1.00	l/ha
	p	Proline	0.30	l/ha
25-Jun-09	a	Mow / Rotavate paths		
29-Jun-09	a	Mow / Rotavate paths		
06-Jul-09	a	Rogue wild oats/thistles/weeds 221 wild oats pulled		
	a	Topped headlands		
12-Aug-09	a	Cut paths		
13-Aug-09	a	Combine harvest discards		
	a	Baled		
15-Aug-09	a	Combine harvest, plots for yield		
16-Aug-09	a	Sample, bale and weigh straw		
27-Aug-09	p	Weedazol-TL	20.00	lt/ha

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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09/R/HB/2

MAIN PLOTS

GRAIN TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	2.31	2.29	2.81	2.81	2.56
-P-	2.23	4.94	5.74	5.99	4.72
--K	2.92	4.00	4.73	4.62	4.07
-PK	2.74	5.22	6.14	7.90	5.50
A--	1.87	3.07	2.80	2.65	2.60
AP-	2.61	4.74	4.83	5.52	4.43
A-K	2.56	3.73	3.89	4.09	3.57
APK	2.46	4.67	6.27	7.67	5.27
FYM1852onwards	7.83	8.54	10.19	10.05	9.15
FYM1852-1871	1.78	3.64	4.91	7.66	4.50
(A)	2.39	3.73	4.91	4.73	3.94
-	2.11	3.16	3.40	3.45	3.03
FYM2001onwards	5.74	7.47	9.29	9.46	7.99
P2K	2.90	5.20	5.69	7.40	5.30
MEAN	3.03	4.60	4.60	5.40	4.76

Grain Mean DM% 87.3

STRAW TONNES/HECTARE

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

N	0	48	96	144	Mean
MANURE					
---	0.74	0.78	1.06	1.16	0.93
-P-	0.50	1.44	1.63	1.87	1.36
--K	0.75	1.24	1.77	1.77	1.38
-PK	0.65	1.55	2.28	2.72	1.80
A--	0.69	1.15	1.17	1.13	1.03
AP-	0.64	1.21	1.51	2.01	1.34
A-K	0.84	1.29	1.37	1.50	1.25
APK	0.54	1.45	2.26	2.80	1.76
FYM1852onwards	2.83	3.49	4.31	3.92	3.64
FYM1852-1871	0.34	1.25	1.52	2.84	1.49
(A)	0.61	1.18	1.83	1.71	1.33
-	0.75	0.90	1.16	1.20	1.00
FYM2001onwards	1.99	2.90	3.52	3.66	3.02
P2K	0.86	1.68	1.73	2.13	1.60
MEAN	0.91	1.54	1.94	2.17	1.64

Straw Mean DM% 85.7

https://doi.org/10.23637/ERADOC-1-219

09/R/HB/2

SILICATE PLOTS

GRAIN TONNES/HECTARE

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

PK Silicate	N3--	N3P-	N3-K	N3PK	Mean
(-)-	3.90	6.05	4.05	7.96	5.49
(Si)-	4.82	7.02	5.87	8.76	6.62
(-)Si	5.30	6.86	5.81	8.31	6.57
(Si)Si	5.31	6.59	6.26	8.38	6.64
Mean	4.83	6.63	5.50	8.35	6.33

Grain Mean DM% 86.0

PHOSPHATE PLOTS

GRAIN TONNES/HECTARE

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

PLOTS	
142	5.81
143	5.84
144	5.79
242	8.05
243	7.99
244	7.87
341	5.71
342	6.20
343	6.54
344	6.67
441	7.76
442	7.94
443	7.52
444	7.61
551	7.78
552	7.58
561	7.90
562	7.56
571	5.71
572	6.09
581	3.02
582	3.31
Mean	6.65

Grain Mean DM% 86.0

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09/R/WF/3

WHEAT AND FALLOW

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

The 154th year, w. wheat.

For previous years see 'Details' 1967, 1973 and Yield Books for 74-08/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

			Rate	Unit
10-Oct-08	a	Plough/ N		
11-Oct-08	a	Cultipressed		
20-Oct-08	a	Combination Drilled		
	s	Hereward tr Redigo Deter	400.00	seeds/m2
17-Dec-08	p	Stomp 400 SC	3.30	lt/ha
	p	Arelon 500	3.00	lt/ha
	p	Hallmark with Zeon Technology	50.00	ml/ha
26-Mar-09	a	Springtined - Fallow area only		
20-Apr-09	p	Cherokee	1.00	l/ha
02-May-09	p	Splice	1.00	l/ha
02-May-09	p	Bravo 500	1.00	l/ha
	p	Talius	0.13	l/ha
	p	BASF 3C Chlormequat 720	2.25	l/ha
04-May-09	p	Ally Max SX	42.00	g/ha
	p	Agriguard Fluroxypyr	0.75	l/ha
28-May-09	p	Brutus	1.50	l/ha
	p	Amistar Opti	1.25	l/ha
02-Jun-09	a	Mow / Rotavate paths		
03-Aug-09	a	Rotavate fallows		
15-Aug-09	a	Combine harvest, plots for yield		
	a	Sample, bale and weigh straw		

Note: Unground grain and straw was archived.

GRAIN AND STRAW YIELDS TONNES/HECTARE

	GRAIN	STRAW
YIELD	2.26	0.92
MEAN DM%	83.44	87.58

PLOT AREA HARVESTED 0.04431

https://doi.org/10.23637/ERADOC-1-219

09/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 154th year, w. wheat.

For previous years see 'Details' 1977, 1973 and Yield Books for 74-08/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:

	2000-09	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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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

K Test:			Rate	Unit
30-Sep-08	f	Basal P (triple superphosphate) – plots 02, 04, 06, 08 and 10	75.00	kg/ha
	f	Muriate of Potash, plots 23, 43, 63, 83 & 103	125.00	kg/ha
	f	Muriate of Potash, plots 24, 44, 64, 84, 104	250.00	kg/ha

P Test			Rate	Unit
30-Sep-08	f	Triple Superphosphate – plots 011 – 013, 031 – 033, 051 – 053, 071 – 073 and 091-093	75.00	kg/ha
	f	Muriate of Potash, plots 01,03, 05, 07 & 09	250.00	kg/ha

All plots			Rate	Unit
06-Oct-08	a	Plough/ N		
11-Oct-08	a	Cultipressed		
16-Oct-08	a	Power Harrowed		
	a	Combination Drilled		
	s	XI-19 tr Redigo Deter	350.00	seeds/m2
18-Oct-08	p	Liberator	0.60	l/200 l/ha
17-Dec-08	p	Stomp 400 SC	3.30	lt/ha
	p	Arelon 500	3.00	lt/ha
	p	Hallmark with Zeon Technology	50.00	ml/ha
09-Mar-09	f	Ammonium Sulphate	238.00	kg/ha
25-Mar-09	f	Kieserite	80.00	kg/ha
14-Apr-09	p	Pacifica	0.40	kg/ha
20-Apr-09	f	Nitram	580.00	kg/ha
	p	Cherokee	1.00	l/ha
02-May-09	p	Splice	1.00	l/ha
	p	Bravo 500	1.00	l/ha
	p	Talius	0.13	l/ha
	p	BASF 3C Chlormequat 720	2.25	l/ha
04-May-09	p	Ally Max SX	42.00	g/ha
	p	Agriguard Fluroxypyr	0.75	l/ha

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			Rate	Unit
13-May-09	f	Nitram	145.00	kg/ha
16-May-09	a	Mow / Rotavate paths		
28-May-09	p	Brutus	1.50	l/ha
	p	Amistar Opti	1.25	l/ha
02-Jun-09	a	Mow / Rotavate paths		
29-Jun-09	a	Mow / Rotavate paths		
15-Aug-09	a	Combine harvest, plots for yield		
	a	Sample, bale and weigh straw		

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

P TEST

GRAIN TONNES/HECTARE

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

P_RES / OLD_RES	O	P(P1)	P(P2)	P(P3)	Mean
O	2.64	5.05	5.21	5.62	4.63
D	4.04	6.74	6.96	7.14	6.22
N	2.23	5.43	6.17	6.30	5.03
P	3.38	5.89	6.78	6.95	5.75
NPKNAMG	3.65	5.46	6.40	7.05	5.64
Mean	3.19	5.71	6.30	6.61	5.45

GRAIN MEAN DM% 84.4

STRAW TONNES/HECTARE

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

P_RES / OLD_RES	O	P(P1)	P(P2)	P(P3)	Mean
O	1.25	2.64	2.94	3.34	2.54
D	2.12	4.02	4.17	4.29	3.65
N	1.32	3.29	3.21	3.63	2.86
P	1.72	3.48	3.85	3.75	3.20
NPKNAMG	1.96	3.38	3.86	4.39	3.40
Mean	1.67	3.36	3.61	3.88	3.13

STRAW MEAN DM% 89.1%

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K TEST

GRAIN TONNES/HECTARE

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

K_Test	K0	K1	K2	Mean
OLD_RES				
O	5.46	7.14	7.36	6.35
D	6.72	7.92	7.93	7.32
N*	5.85	7.00	7.38	6.52
PK	6.90	7.16	7.12	7.02
N*PK	6.44	6.67	7.52	6.77
Mean	6.27	7.18	7.46	6.80
rep.	10	5	5	

Standard errors of differences of means

Table	OLD_RES	K_Test	OLD_RES K_Test	
s.e.d.		0.284	0.634	min.rep
	0.317	0.246	0.549	max-min
		0.201X	0.448	max.rep

(No comparisons in categories where s.e.d. marked with an X)

Grain mean dm% 84.4

STRAW TONNES/HECTARE

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

K_Test	K0	K1	K2	Mean
OLD_RES				
O	2.68	3.89	3.99	3.31
D	3.34	4.20	4.42	3.83
N*	2.86	3.97	4.41	3.53
PK	3.79	4.15	4.04	3.94
N*PK	3.37	3.71	4.37	3.70
Mean	3.21	3.99	4.25	3.66
rep.	10	5	5	

Standard errors of differences of means

Table	OLD_RES	K_Test	OLD_RES K_Test	
s.e.d.		0.229	0.513	min.rep
	0.256	0.199	0.444	max-min
		0.162X	0.363	max.rep

(No comparisons in categories where s.e.d. marked with an X)

Straw mean dm% 89.5

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09/R/PG/5

PARK GRASS

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

The 154th year, hay.

For previous years see 'Details' 1977 and 1973 and Yield Books for 74-08/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

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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 2007; the sixth 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 97-01/R/PG/5 Yield book entries.]

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Experimental diary

			Rate	Unit
02-Dec-08	f	Triple Superphosphate - Plots 4/1, 4/2, 6, 7, 8, 9/1, 9/2, 10, 11/1, 11/2, 14/1, 14/2, 15 and 16	171.00	kg/ha
08-Dec-08	f	Sulphate of Potash - Plots 2/1 ,6, 7, 9/1, 9/2, 11/1, 11/2, 14/1, 14/2, 15, 16 and 18, completed 09-Dec-08	542.00	kg/ha
	f	Sodium Sulphate - plots 6, 7, 8, 9/1, 9/2, 10, 11/1, 11/2, 14/1, 14/2, 15, 16 and 18, completed 09-Dec-08	43.00	kg/ha
	f	Manganese Sulphate - plots 6, 7, 8, 9/1, 9/2, 10, 11/1, 11/2, 14/1, 14/2, 15, 16 and 18, completed 09/12/08	111.00	kg/ha
	f	Silicate of Soda- plot 11-2, completed 09-Dec-08	450.00	kg/ha
11-Dec-08	f	Chalk - plot 13/2a	2.00	t/ha
	f	Chalk - plot 13/2b	0.50	t/ha
	f	Farm Yard Manure - plots 13/2, 19 and 20	35.00	t/ha
	a	Mow paths		
14-Jan-09	f	Chalk plots - 13/1a, 12a, 11/1c, 9/2b, 9/2c and 9/1a	2.00	t/ha
	f	Chalk plots - 13/1b, 12b, 9/1c, 7b, 4/2b and 4/2c	1.00	t/ha
	f	Chalk plots - 13/1c, 12c and 8c	0.30	t/ha
	f	Chalk plots - 11/2b, 11/2c, 11/1b and 10b	1.50	t/ha
	f	Chalk plots - 11/2a, 9/2a, 8a, 7a and 6b	3.00	t/ha
	f	Chalk - plot 11/1a	5.00	t/ha
	f	Chalk - plots 10a, 6a and 4/2a	4.00	t/ha
	f	Chalk - plot 9/1b	0.75	t/ha
	f	Chalk - plots 8b and 7c	0.50	t/ha
20-Jan-09	f	Chalk - plots 2/2c, 4/1b, 15c and 18c	0.30	t/ha
	f	Chalk - plots 1b and 1c	0.75	t/ha
	f	Chalk - plots 2/1c, 2/2b, 3a, 3b and 3c,	0.50	t/ha
	f	Chalk - plots 2/1a, 2/1b and 15b	1.00	t/ha
	f	Chalk - plots 1a and 18/b	1.50	t/ha
	f	Chalk - plots 4/1a, 14/1a, 14/2a and 17a	2.00	t/ha
	f	Chalk - plots 15a and 16a	3.00	t/ha
	f	Chalk - plot 18a	4.00	t/ha
29-Apr-09	f	Ammonium Sulphate Plots 1, 6a and b)	229.00	kg/ha
	f	Ammonium Sulphate Plots 4/2, 9/2, 10 18	457.00	kg/ha
	f	Ammonium Sulphate Plots 11/1, 11/2	686.00	kg/ha
30-Apr-09	f	Nitrate of Soda - Plots 16, 17	300.00	kg/ha
	f	Nitrate of Soda - Plot 14/2	600.00	kg/ha
19-May-09	a	Cut paths		
15-Jun-09	a	Mow paths		
17-Jun-09	a	Cut harvest strips, weighed and sampled		
18-Jun-09	a	Cut harvest strips, weighed and sampled		
	a	Mown discards		
19-Jun-09	a	Turned hay		
21-Jun-09	a	Turned hay		

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22-Jun-09	a	Turned hay
	a	Row up, baled and removed
09-Jul-09	a	Mow 1m path along fence
28-Jul-09	a	Put wooden marker posts in place - -
	a	Mow paths
09-Nov-09	a	Cut harvest strips, weighed and sampled - Started
10-Nov-09	a	Cut harvest strips, weighed and sampled - Finished
11-Nov-09	a	Mown, baled and bales removed
23-Dec-09	a	Fixed outer fence

1ST CUT (17-18/6/09) DRY MATTER TONNES/HECTARE

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

Grand mean 3.24

Lime / Manure		a	b	c	d	Mean
N1	1	2.36	1.41	0.90	0.66	1.33
K	2/1	1.80	2.98	0.79	0.56	1.53
None(FYM)	2/2	2.31	2.07	0.89	0.95	1.56
None	3	2.29	2.33	0.82	0.88	1.58
P	4/1	3.02	3.19	1.65	1.64	2.38
N2P	4/2	1.84	2.11	2.05	1.42	1.86
N1PKNaMg	6	5.04	5.48			5.26
PKNaMg	7	5.27	5.73	5.13	3.18	4.83
PNaMg	8	2.53	2.51	2.25	2.12	2.35
PKNaMg(N2)	9/1	5.28	5.54	4.65	1.34	4.20
N2PKNaMg	9/2	5.37	5.49	4.20	3.26	4.58
N2PNaMg	10	2.49	2.65	3.58	1.65	2.59
N3PKNaMg	11/1	5.44	5.18	5.05	3.52	4.80
N3PKNaMgSi	11/2	4.75	5.17	4.79	3.34	4.51
None	12	1.97	2.03	0.85	1.14	1.50
(FYM/F)	13/1	3.10	3.29	2.25	2.13	2.69
FYM/PM	13/2	3.71	4.66	3.85	3.24	3.86
PKNaMg(N2*)	14/1	4.53	5.06	4.26	4.22	4.52
N2*PKNaMg	14/2	4.62	4.64	4.14	3.85	4.31
PKNaMg(N2*)	15	4.96	5.40	4.52	2.21	4.27
N1*PKNaMg	16	5.26	5.69	3.77	3.39	4.53
N1*	17	2.03	2.01	1.71	1.92	1.92
N2KNaMg	18	2.04	2.81	2.53	1.57	2.24
N2KNaMg	18/2					2.96
FYM	19/1					4.21
FYM	19/2					5.47
FYM	19/3					5.27
FYM/N*PK	20/1					4.77
FYM/N*PK	20/2					5.00
FYM/N*PK	20/3					5.55

1ST CUT MEAN DM% 28.1

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2ND CUT (09 – 10/11/08) DRY MATTER TONNES/HECTARE

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

Grand mean 1.13

Lime		a	b	c	d	Mean
Manure						
N1	1	0.95	0.84	0.52	0.20	0.63
K	2/1	0.57	0.64	0.35	0.30	0.47
None(FYM)	2/2	0.61	0.58	0.42	0.39	0.50
None	3	0.64	0.77	0.39	0.44	0.56
P	4/1	0.97	0.72	0.54	0.48	0.68
N2P	4/2	0.86	0.98	0.76	0.72	0.83
N1PKNaMg	6	1.31	1.60			1.45
PKNaMg	7	1.44	1.83	1.50	0.96	1.44
PNaMg	8	1.19	1.09	0.80	0.77	0.96
PKNaMg(N2)	9/1	1.78	1.80	1.41	0.39	1.34
N2PKNaMg	9/2	1.47	1.49	1.06	1.81	1.46
N2PNaMg	10	0.94	0.92	1.00	1.20	1.01
N3PKNaMg	11/1	1.13	1.18	0.84	2.20	1.34
N3PKNaMgSi	11/2	1.42	1.33	1.02	1.89	1.42
None	12	1.04	0.85	0.54	0.57	0.75
(FYM/F)	13/1	2.42	1.91	1.57	0.76	1.67
FYM/PM	13/2	2.81	3.07	2.21	1.74	2.46
PKNaMg(N2*)	14/1	1.51	1.58	1.15	1.03	1.32
N2*PKNaMg	14/2	1.39	1.45	1.23	1.21	1.32
PKNaMg(N2*)	15	1.36	1.55	1.04	0.33	1.07
N1*PKNaMg	16	1.66	1.86	0.86	0.65	1.26
N1*	17	0.63	0.67	0.43	0.72	0.61
N2KNaMg	18	0.68	0.80	0.94	0.45	0.72
N2KNaMg	18/2					1.12
FYM	19/1					1.74
FYM	19/2					2.04
FYM	19/3					1.91
FYM/N*PK	20/1					1.65
FYM/N*PK	20/2					1.83
FYM/N*PK	20/3					1.78

2ND CUT MEAN DM% 28.52

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TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

Grand mean 4.37

Lime / Manure		a	b	c	d	Mean
N1	1	3.30	2.25	1.42	0.86	1.96
K	2/1	2.37	3.62	1.14	0.86	2.00
None(FYM)	2/2	2.92	2.65	1.31	1.34	2.05
None	3	2.93	3.10	1.21	1.32	2.14
P	4/1	4.00	3.92	2.19	2.12	3.06
N2P	4/2	2.70	3.09	2.82	2.15	2.69
N1PKNaMg	6	6.35	7.07			6.71
PKNaMg	7	6.71	7.56	6.64	4.15	6.26
PNaMg	8	3.72	3.59	3.06	2.89	3.31
PKNaMg(N2)	9/1	7.06	7.34	6.05	1.73	5.54
N2PKNaMg	9/2	6.84	6.99	5.26	5.07	6.04
N2PNaMg	10	3.42	3.57	4.58	2.85	3.60
N3PKNaMg	11/1	6.57	6.36	5.88	5.72	6.13
N3PKNaMgSi	11/2	6.17	6.50	5.82	5.24	5.93
None	12	3.01	2.88	1.39	1.70	2.25
(FYM/F)	13/1	5.53	5.20	3.82	2.89	4.36
FYM/PM	13/2	6.52	7.73	6.05	4.98	6.32
PKNaMg(N2*)	14/1	6.05	6.64	5.41	5.24	5.83
N2*PKNaMg	14/2	6.01	6.09	5.37	5.05	5.63
PKNaMg(N2*)	15	6.32	6.96	5.56	2.55	5.35
N1*PKNaMg	16	6.92	7.55	4.63	4.04	5.78
N1*	17	2.66	2.68	2.14	2.65	2.53
N2KNaMg	18	2.72	3.61	3.47	2.02	2.95
N2KNaMg	18/2					4.08
FYM	19/1					5.96
FYM	19/2					7.50
FYM	19/3					7.18
FYM/N*PK	20/1					6.43
FYM/N*PK	20/2					6.83
FYM/N*PK	20/3					7.33

TOTAL OF 2 CUTS MEAN DM% 28.31

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09/R/GC/8

GARDEN CLOVER

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

The 156th year, red clover.

For previous years see `Details' 1967 and 1973, and Yield books for 74-08/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:

			Rate	Unit
20-Jan-09	f	Triple Superphosphate	75.00	t/ha
	f	Chalk	1.25	t/ha
	f	Magnesium Sulphate	50.00	t/ha
	f	Potassium Sulphate	150.00	t/ha
12-May-09	a	First cut		
30-Jun-09	a	Second cut		
19-Aug-09	a	Third cut		

NOTE: Samples of clover taken from each cut for chemical analysis

1ST CUT (12/05/09) DRY MATTER TONNES/HECTARE

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

```
Grand mean  3.98

 FUNG_RES       NONE    BENOMYL
                4.22       3.73


 1ST CUT MEAN DM%  17.9
```


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09/R/GC/8

SECOND CUT (30/06/09) DRY MATTER TONNES/HECTARE

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

```
Grand mean  4.06

 FUNG_RES      NONE   BENOMYL
               4.29      3.82


 1ST CUT MEAN DM%  19.5
```

THIRD CUT (19/08/09) DRY MATTER TONNES/HECTARE

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

```
Grand mean  2.35

 FUNG_RES      NONE   BENOMYL
               2.38      2.32


 3RD CUT MEAN DM%  22.5
```

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

```
Grand mean  10.38

 FUNG_RES      NONE   BENOMYL
              10.89      9.87


 TOTAL OF 3 CUTS MEAN DM%  20.0

PLOT AREA HARVESTED CUT 1,2 & 3    0.00014
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https://doi.org/10.23637/ERADOC-1-219

09/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 72nd year, leys, w. beans, w. wheat, w. rye, forage maize

For previous years see 'Details' 1967 & 1973 and Yield Books for 74-08/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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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).

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 will be 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.
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
   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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09/W/RN/3

3. **N** Nitrogen fertilizer as split dressings in spring 2009 (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:
   Nsplit to wheat (no FYM)
   Nsingle to wheat (FYM)

   1/8 plots:

3. **N** Nitrogen fertilizer in spring 2009 (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 16 October 2008.

Continuous rotations	No FYM	FYM Res
Before wheat	Half plots	Half plots
ABe	370	400
AM	210	290

None to other plots.

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09/W/RN/3

Experimental Diary

Grass Ley and clover/grass ley (**ROTATION** LN1, LLN1, LC1 and LLC1)

			Rate	Unit
16-Oct-08	a	Plough/ S, Rye plots		
	f	Sulphate of Potash - 1st year leys, plots 65, 66, 69, 70 and, 77-80.	140.00	kg/ha
	f	Triple Superphosphate- 1st year leys, plots 65, 66, 69, 70 and 77-80.	213.00	kg/ha
17-Oct-08	a	Power Harrowed		
18-Oct-08	a	Accord Drilled		
	s	Rothamsted Special Mix 1 (Laura 50%, Promesse Timothy 50%) Plots 65, 66, 69 and 70 Ley plots (seed bed N applied)	30.00	kg/ha
	s	Rothamsted Special Mix 2 (Avoca 12%, Laura 44%, Promesse Timothy 44%) Plots77, 78, 79 and 80 Ley with Clover plots (seed bed N applied)	30.00	kg/ha
	a	Rolled - wheat, rye, oat and ley plots		
13-Mar-09	f	Nitraprill - plots 65, 66, 69 and 70	217.00	kg/ha
16-Mar-09	f	Muriate of Potash - plots 65, 66, 69, 70, 77, 78, 79 and 80	167.00	kg/ha
24-Jun-09	a	Cut harvest strips, weighed and sampled		
	a	Mown - Leys harvested for yield		
28-Jun-09	a	Baled		
30-Jun-09	f	Muriate of Potash - Leys only, plots 65, 66,69, 70,77, 78, 79 and 80	83.00	kg/ha
	f	Nitram – plots 65, 66, 69 and 70	217.00	kg/ha
17-Jul-09	a	Topped Ley plots		
30-Oct-09	a	Cut harvest strips, weighed and sampled ley plots, 2nd cut		

Grass leys (**ROTATION** LN2-3 AND LLN2-8)

			Rate	Unit
13-Mar-09	f	Nitraprill - plots 11, 12, 13, 14, 37, 38, 43 and 44	217.00	kg/ha
16-Mar-09	f	Muriate of Potash - plots 11, 12, 13, 14, 37, 38, 43 and 44	167.00	kg/ha
17-Mar-09	f	Triple Superphosphate - plots 11-14, 37, 38, 43 and 44	213.00	kg/ha
20-May-09	p	Duplosan KV Grass leys only	1.50	L in 200 l/ha
24-Jun-09	a	Cut harvest strips, weighed and sampled		
	a	Mown - Leys harvested for yield		
28-Jun-09	a	Baled		
17-Jul-09	a	Topped Ley plots		
13-Aug-09	p	Slingshot 200 lt water (Desiccated crop due to high population of grass weeds) plots 11, 12, 13 and 14	4.00	lt/ha
09-Sep-09	a	Cut harvest strips, weighed and sampled, block 1 ley plots only		
30-Oct-09	a	Cut harvest strips, weighed and sampled ley plots, 2nd cut		

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Clover/grass leys (**ROTATION** LC2-3 and LLC2-8)

			Rate	Unit
16-Mar-09	f	Muriate of Potash - plots 3, 4, 7, 8, 14, 33, 34, 41 and 42	167.00	kg/ha
17-Mar-09	f	Triple Superphosphate plots 3, 4, 7 and 8	213.00	kg/ha
24-Jun-09	a	Cut harvest strips, weighed and sampled		
	a	Mown - Leys harvested for yield		
28-Jun-09	a	Baled		
17-Jul-09	a	Topped Ley plots		
13-Aug-09	p	Slingshot 200 lt water (Desiccated crop due to high population of grass weeds) plots 3, 4, 7 and 8	4.00	lt/ha
09-Sep-09	a	Cut harvest strips, weighed and sampled Block 1 ley plots only		
30-Oct-10	a	Cut harvest strips, weighed and sampled ley plots, 2nd cut		

W. beans (**ROTATION)**

			Rate	Unit
08-Oct-08	p	Roundup Metro	4.00	l/200 l/ha
16-Oct-08	f	Triple Superphosphate - Arable crops, plots 1, 2, 15, 16, 35, 36, 39 and 40	127.00	kg/ha
14-Nov-08	a	Plough/ S, bean plots		
	a	Broadcast bean plots		
	s	Wizard	35.00	seeds/m2
18-Nov-08	a	Power Harrowed - bean plots		
08-Dec-08	p	Landgold Propyzamide 400 SC -winter beans	2.10	l/220 l/ha
	p	Stomp 400 SC - winter beans	3.30	l/220 l/ha
17-Mar-09	f	Potassium Sulphate	150.00	kg/ha
24-Aug-09	a	Combine harvest, plots for yield		
	a	Combine harvest discards		
26-Aug-09	a	Baled		
03-Sep-09	a	Remove bales		

Forage maize (**ROTATION**)

			Rate	Unit
16-Oct-08	f	Triple Superphosphate - plots 5 and 6	127.00	kg/ha
17-Mar-09	f	Potassium Sulphate	150.00	kg/ha
21-May-09	a	Rotavate		
	a	Drilled		
	s	Hudson	10.20	seeds/m2
30-May-09	f	Nitram	290.00	kg/ha
18-Jun-09	p	Callisto	0.75	l/ha
	p	Samson	0.50	l/ha
03-Sep-09	a	Hand Cut - maize plots		

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09/W/RN/3

W. wheat (1st TEST CROP)

			Rate	Unit
08-Oct-08	p	Roundup Metro	4.00	l/200 l/ha
16-Oct-08	a	Plough/ S, plots 17 - 32		
	f	Muriate of Potash - Corrective K to plot 17 (11.06 kg/plot)	370.00	kg/ha
	f	Muriate of Potash - Corrective K to plot 18 (11.96 kg/plot)	400.00	kg/ha
	f	Muriate of Potash - Corrective K to plot 19 (8.67 kg/plot)	290.00	kg/ha
	f	Muriate of Potash - Corrective K to plot 20 (6.28 kg/plot)	210.00	kg/ha
	f	Triple Superphosphate - Arable crops, plots 17-32	127.00	kg/ha
17-Oct-08	a	Power Harrowed		
18-Oct-08	a	Accord Drilled		
	s	Glasgow tr Redigo Deter - wheat plots 17-32	350.00	seeds/m2
	a	Rolled - wheat plots		
11-Dec-08	p	Avadex Excel 15G	15.00	kg/ha
17-Dec-08	p	Alpha Pendimethalin 330 EC	4.00	lt/ha
	p	Hallmark with Zeon Technology	50.00	ml/ha
	p	Headland Manganese 500	1.00	lt/ha
	f	Potasium Sulphate	150.0	kg/ha
21-Mar-09	f	Nitraprill – plots N1, N2 and N3	116.00	kg/ha
22-Apr-09	f	Nitro-chalk - N1 plots	145.00	kg/ha
	f	Nitro-chalk – N2 plots	436.00	kg/ha
	f	Nitro-chalk – N3 plots	727.00	kg/ha
10-May-09	p	Landgold Lambda-Z	75.00	L in 200 l/ha
03-Jun-09	p	Amistar - winter wheat	1.00	L in 200 l/ha
	p	Opus	0.80	L in 200 l/ha
11-Aug-09		The wheat on some plots was laid flat (probably by badgers or deer). Plots most affected were 321, 322, 323, 282, 284 and 204. The nil N plots are relatively unaffected		
24-Aug-09	a	Combine harvest, plots for yield		
	a	Combine harvest discards		
26-Aug-09	a	Baled		
03-Sep-09	a	Remove bales		

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09/W/RN/3

W. rye (2nd TEST CROP AND ROTATION)

			Rate	Unit
08-Oct-08	p	Roundup Metro	4.00	l/200 l/ha
16-Oct-08	a	Plough/ S, plots 49-64, 67, 68, 71-76		
	f	Chalk - Block 4	5.00	t/ha
	f	Triple Superphosphate - plots 49-64, 67, 68 71-76	127.00	kg/ha
17-Oct-08	a	Power Harrowed		
18-Oct-08	a	Accord Drilled		
	s	Organic Matador - Rye plots	350.00	seeds/m2
	a	Rolled		
17-Dec-08	p	Alpha Pendimethalin 330 EC -rye plots	3.30	lt/ha
	p	Hallmark with Zeon Technology - rye plots	50.00	ml/ha
	p	Headland Manganese 500 - rye plots	5.00	lt/ha
17-Mar-09	f	Potasium Sulphate – plots 49-64, 67, 68, 71-76	150.00	kg/ha
30-Apr-09	f	Nitram, plots 67-68, 71-76 (rotation crop)	290.00	kg/ha
05-May-09	f	Nitrochalk – N1, plots 49-64 (test crop)	182.00	kg/ha
	f	Nitrochalk – N2, plots 49-64 (test crop)	364.00	kg/ha
	f	Nitrochalk – N3, plots 49-64 (test crop)	545.00	kg/ha
03-Jun-09	p	Amistar - rye	0.40	L in 200 l/ha
	p	Opus - rye	0.40	L in 200 l/ha
24-Aug-09	a	Combine harvest, plots for yield		
	a	Combine harvest discards		
26-Aug-09	a	Baled		
03-Sep-09	a	Remove bales		

W. Oats (ROTATION)

			Rate	Unit
08-Oct-08	p	Roundup Metro	4.00	l/200 l/ha
16-Oct-08	a	Plough/ S, plots 9, 10, 45-48		
	f	Triple Superphosphate - plots 9, 10 and 45 - 48	127.00	kg/ha
17-Oct-08	a	Power Harrowed		
18-Oct-08	a	Accord Drilled -oat plots		
	s	Gerald tr Beret Gold - Oat Plots	350.00	seeds/m2
	a	Rolled		
19-Dec-08	p	Lexus Class	60.00	g/ha
	p	Landgold Lambda-Z	50.00	ml/ha
17-Mar-09	f	Potasium Sulphate	150.00	kg/ha
30-Apr-09	f	Nitram	290.00	kg/ha
03-Jun-09	p	Amistar	0.20	L in 200 l/ha
	p	Flexity	0.20	L in 200 l/ha
24-Aug-09	a	Combine harvest, plots for yield		
	a	Combine harvest discards		
26-Aug-09	a	Baled		
03-Sep-09	a	Remove bales		

https://doi.org/10.23637/ERADOC-1-219

09/W/RN/3

LEYS

1st CUT (24/06/09) DRY MATTER TONNES/HECTARE

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

FYM_RES	NONE	FYM	Mean
LEY			
LC1	2.63	2.49	2.56
LC2	4.89	4.08	4.48
LC3	5.31	5.59	5.45
LN1	2.19	2.28	2.23
LN2	5.84	6.44	6.14
LN3	3.26	3.32	3.29
(LLC/LC)LC1	2.53	2.59	2.56
(LLC/LC)LC2	3.07	3.34	3.20
LLC8	4.57	4.48	4.53
(LLN/LN)LN1	4.20	4.14	4.17
(LLN/LN)LN2	6.05	5.85	5.95
LLN8	4.35	4.97	4.66
Mean	4.07	4.13	4.10

1ST CUT MEAN DM% 33.3

1ST CUT AREA HARVESTED 0.00200

2ND CUT (30/10/09) DRY MATTER TONNES/HECTARE

FYM_RES	NONE	FYM	Mean
LEY			
LC1	0.00	0.00	0.00
LC2	0.00	0.00	0.00
LC3	0.71	0.87	0.79
LN1	0.00	0.00	0.00
LN2	0.00	0.00	0.00
LN3	1.01	0.89	0.95
(LLC/LC)LC1	0.00	0.00	0.00
(LLC/LC)LC2	0.00	0.00	0.00
LLC8	1.48	1.11	1.30
(LLN/LN)LN1	0.00	0.00	0.00
(LLN/LN)LN2	0.00	0.00	0.00
LLN8	1.76	2.11	1.93
Mean	0.41	0.41	0.41

2ND CUT MEAN DM% 32.7

2ND CUT AREA HARVESTED 0.00200

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09W/RN/3

LEYS

TOTAL OF 2 CUTS DRY MATTER TONNES/HECTARE

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

FYM_RES	NONE	FYM	Mean
LEY			
LC1	2.63	2.49	2.56
LC2	4.89	4.08	4.48
LC3	6.03	6.46	6.24
LN1	2.19	2.28	2.23
LN2	5.84	6.44	6.14
LN3	4.28	4.22	4.25
(LLC/LC)LC1	2.53	2.59	2.56
(LLC/LC)LC2	3.07	3.34	3.20
LLC8	6.06	5.59	5.82
(LLN/LN)LN1	4.20	4.14	4.17
(LLN/LN)LN2	6.05	5.85	5.95
LLN8	6.11	7.08	6.59
Mean	4.49	4.54	4.52

TOTAL OF 2 CUTS MEAN DM% 32.9

ARABLE TREATMENT CROPS

MAIZE

WHOLE CROP (100% DRY MATTER) TONNES/HECTARE

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

FYMRES	NONE	FYM	Mean
AO	8.41	7.76	8.09

Mean DM% 22.9

Plot area harvested 0.00108

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09/W/RN/3

BEANS

GRAIN TONNES/HECTARE

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

FYMRES ROTATION	NONE	FYM	Mean
AO	2.10	2.20	2.15
LLn/AO	3.68	3.90	3.79
LLc/ABe	2.16	1.11	1.63
ABe	0.54	0.46	0.50
Mean	2.12	1.92	2.02

Grain mean DM% 88.0

Plot area harvested 0.00413

OATS

GRAIN TONNES/HECTARE

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

FYMRES ROTATION	NONE	FYM	Mean
ABe	5.86	6.64	6.25
LLc/ABe	7.01	6.70	6.86
LLn/AO	4.14	4.59	4.37
Mean	5.67	5.98	5.83

Plot area harvested 0.00413

Grain mean DM% 87.3

https://doi.org/10.23637/ERADOC-1-219

09/W/RN/3

W.WHEAT (1st TEST CROP)

GRAIN TONNES/HECTARE

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

FYMRES / **ROTATION**	None	FYM	Mean
LLN	4.36	3.33	3.85
LN	5.98	3.49	4.74
LLc/ABe	5.40	5.51	5.45
LC	5.27	6.35	5.81
AM	5.43	5.47	5.45
ABe	4.34	4.97	4.65
LLn/AO	4.87	6.61	5.74
LLc	7.21	5.58	6.39
Mean	5.36	5.16	5.26

N / **ROTATION**	0	80	160	240
LLN	2.09	3.01	5.23	5.07
LN	2.98	5.06	5.57	5.35
LLc/ABe	3.01	7.13	5.57	6.11
LC	3.26	6.57	6.83	6.60
AM	1.43	5.72	7.75	6.90
ABe	1.91	5.47	6.28	4.96
LLn/AO	3.19	4.61	8.24	6.92
LLc	5.00	6.69	5.97	7.90
Mean	2.86	5.53	6.43	6.22

N / **FYMRES**	0	80	160	240
none	2.84	5.90	6.58	6.11
FYM	2.88	5.17	6.27	6.34

ROTATION	**N** / **FYMRES**	0	80	160	240
LLN	none	2.12	4.03	5.92	5.38
	FYM	2.06	1.99	4.54	4.75
LN	none	3.27	7.88	6.29	6.48
	FYM	2.69	*2.25	*4.84	*4.21
LLc/ABe	none	2.78	6.66	5.86	6.32
	FYM	3.24	7.61	5.27	5.90
LC	none	3.18	6.60	5.38	5.92
	FYM	3.33	6.53	8.27	7.27
AM	none	1.51	5.95	7.59	6.67
	FYM	1.35	5.48	7.91	7.12
ABe	none	1.99	5.68	6.35	3.35
	FYM	1.83	5.26	6.21	6.57
LLn/AO	none	3.11	*1.89	7.42	7.05
	FYM	3.27	7.34	9.06	6.78
LLc	none	4.75	8.51	7.85	7.73
	FYM	5.26	4.87	4.10	8.08

Plot area harvested 0.00192
Grain mean DM% 88.1

Note: No yields available for plots 204 and 282 because of pest damage. The shaded values shown were estimated by Genstat. Yields on plots 284,321,322 & 323 were also affected by pest damage (see values marked *).

https://doi.org/10.23637/ERADOC-1-219

09/W/RN/3

RYE (2nd TEST CROP)

GRAIN TONNES/HECTARE

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

FYMRES ROTATION	none	FYM	Mean
LLn	4.49	4.98	4.74
Ln	4.63	4.19	4.41
LLc	4.86	4.58	4.72
Lc	4.62	4.86	4.74
AM	3.41	3.47	3.44
ABe	3.84	3.82	3.83
LLn/AO	4.65	4.55	4.60
LLc/ABe	4.28	4.27	4.27
Mean	4.35	4.34	4.34

N ROTATION	0	50	100	150
LLn	3.23	4.58	5.85	5.28
Ln	3.09	4.24	4.99	5.31
LLc	4.13	4.40	5.02	5.32
Lc	3.53	4.68	5.23	5.50
AM	2.13	3.19	4.05	4.39
ABe	2.33	3.69	4.61	4.67
LLn/AO	3.28	4.03	5.20	5.89
LLc/ABe	3.28	3.98	4.69	5.14
Mean	3.13	4.10	4.95	5.19

N FYMRES	0	50	100	150
none	3.13	4.17	4.90	5.19
FYM	3.12	4.03	5.01	5.18

ROTATION	N FYMRES	0	50	100	150
LLn	none	2.99	4.27	5.41	5.30
	FYM	3.48	4.89	6.28	5.27
Ln	none	3.25	4.48	5.18	5.61
	FYM	2.94	4.00	4.80	5.01
LLc	none	4.32	4.33	5.20	5.59
	FYM	3.94	4.47	4.83	5.05
Lc	none	3.32	4.92	5.17	5.06
	FYM	3.75	4.45	5.30	5.94
AM	none	2.02	3.41	3.83	4.40
	FYM	2.23	2.98	4.28	4.39
ABe	none	2.35	3.79	4.53	4.67
	FYM	2.32	3.59	4.68	4.68
LLn/AO	none	3.26	4.29	5.21	5.83
	FYM	3.30	3.78	5.18	5.94
LLc/ABe	none	3.52	3.89	4.64	5.09
	FYM	3.03	4.08	4.75	5.20

Plot area harvested 0.00192

Grain mean DM% 86.6

https://doi.org/10.23637/ERADOC-1-219

09/W/RN/3

RYE

GRAIN TONNES/HECTARE

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

FYMRES ROTATION	NONE	FYM	Mean
ABe	4.55	4.46	4.50
AM	4.50	4.97	4.74
LLn/AO	4.89	5.13	5.01
LLc/ABe	4.90	5.04	4.97
Mean	4.71	4.90	4.81

GRAIN MEAN DM% 86.6

PLOT AREA HARVESTED 0.00413

https://doi.org/10.23637/ERADOC-1-219

09/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 45th year spring barley

For previous years see 'Details' 1973 and Yield Books for 74-08/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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09/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).

Experimental Diary

			Rate	Unit
30-Sep-08	a	Direct drill - CC plots 004, 010, 019 and 032		
	s	Zlata (Mustard) - CC plots	10.00	kg/ha
28-Oct-08	f	Chopped wheat straw - plots 003, 015, 017 and 031, all chopped using McConnell topper	7.50	t/ha
17-Mar-09	f	Potassium Sulphate - all plots except 005, 011, 023 and 026	200.00	kg/ha
	f	Triple Superphosphate - all plots except 005, 011, 023 and 026	97.5	kg/ha
19-Mar-09	f	FYM, Dg 10 plots	10.00	t/ha
		FYM, Dg 25 plots	25.00	t/ha
	f	Compost, Co plots	40.00	t/ha
02-Apr-09	a	Combination drilled		
	s	Tipple Tr Raxil Pro	350.00	seeds/m2
	a	Rolled		
14-May-09	p	Ally	30.00	g/ha
	p	Cherokee	1.25	l/ha
	p	Cycocel	2.25	l/ha
	p	Headland Manganese 500	1.00	L in 200 l/ha
	p	Fandango	1.00	l/ha
	p	Flexity	0.20	l/ha
	p	Ally Max SX	30.00	g/ha
	p	Headland Manganese 500	1.00	L in 200 l/ha
28-May-09	a	Nitro-chalk N1 plots	130.00	kg/ha
	a	Nitro-chalk N2 plots	259.00	kg/ha
	a	Nitro-chalk N3 plots	389.00	kg/ha
	a	Nitro-chalk N4 plots	519.00	kg/ha
	a	Nitro-chalk N5 plots	648.00	kg/ha
03-Jun-09	p	Opus	0.50	L in 200 l/ha
	p	Amistar	0.40	L in 200 l/ha
24-Jun-09	a	Cut harvest strips ley plots, weighed and sampled		
28-Jun-09	a	Baled		
17-Jul-09	a	Topped Ley plots		
23-Aug-09	a	Combine harvest, plots for yield		
	a	Combine harvest, spring barley plots for yield		
24-Aug-09	a	Combine harvest discards		
26-Aug-09	a	Baled		
02-Sep-09	a	Remove bales		

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09/W/RN/12

GRAIN TONNES/HECTARE

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

Nitrogen / **Treatment**	0	50	100	150	200	250	Mean
F(Fd)	2.50	3.27	4.05	4.26	4.16	4.24	3.75
F(Ln,Lc6)	2.92	3.93	4.22	4.81	4.52	4.53	4.15
St(St)	2.56	3.45	4.17	4.63	4.14	4.47	3.90
CC(Gm,Lc8)	2.69	3.79	4.42	4.50	4.32	4.93	4.11
Co(Pt,Lc8)	3.50	4.66	4.70	4.91	5.12	5.00	4.65
Dg10(Fs)	2.74	4.04	4.28	4.26	4.26	4.49	4.01
Dg25(Dg)	3.80	5.06	5.19	5.44	5.10	5.23	4.97
Mean	2.96	4.03	4.43	4.69	4.52	4.70	4.22

Standard errors of differences of means

Table	Treatment	Nitrogen	Treatment Nitrogen
s.e.d.	0.229	0.092	0.319

Except when comparing means with the same level(s) of Treatment 0.243

Grain mean dm% 89.3

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

Note: See previous Yield Books (2004-08) for cutting dates

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09/R/CS/326 and 09/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 23rd year, w. wheat

For previous years see Yield Books for 87-08/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	6.00	3.98
2 NORMAL	Twice normal	12.00	7.96
4 NORMAL	Four times normal	24.00	15.92

Experimental Diary

Great Knott III (R)

			Rate	Unit
28-Aug-08	a	Load straw Normal plots	24.30	kg/plot
	a	Load straw x 2 Plots	48.60	kg/plot
	a	Load straw x 4 Plots	97.20	kg/plot
	a	Topped to chop straw		
12-Sep-08	p	Dow Agrosciences Glyphosate 360	2.00	l/200 l/ha
02-Oct-08	a	Plough/ E		
04-Oct-08	a	Cultipressed		
16-Oct-08	a	Combination Drilled		
	s	Hereward tr Anchor	350.00	seeds/m2
22-Oct-08	p	Liberator	0.60	l/200 l/ha
24-Oct-08	p	Decoy Wetex	7.00	kg/ha
20-Nov-08	p	Karan	5.00	kg/ha
27-Nov-08	p	Avadex Excel 15G	15.00	kg/ha
10-Dec-08	p	Alpha Pendimethalin 330 EC	4.00	l/ha
	p	Arelon 500	3.00	l/ha
	p	Hallmark with Zeon Technology	50.00	ml
03-Mar-09	f	Double Top	185.00	kg/ha
14-Apr-09	p	Pacifica	0.40	kg/ha
	p	Biopower	1.00	l/ha
21-Apr-09	f	Nitram	174.00	kg/ha

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			Rate	Unit
02-May-09	p	Splice	1.00	l/ha
	p	Bravo 500	1.00	l/ha
	p	Talius	0.13	l/ha
	p	BASF 3C Chlormequat 720	2.25	l/ha
04-May09	p	Ally Max SX	42.00	g/ha
	p	Agriguard Fluroxypyr	0.75	l/ha
14-May-09	f	Nitram	145.00	kg/ha
28-May-09	p	Brutus	1.50	l/ha
	p	Amistar Opti	1.25	l/ha
25-Jun-09	a	Mow / Rotavate paths		
13-Aug-09	a	Combine harvest discards		
15-Aug-09	a	Combine harvest, plots for yield		
	a	Sample, bale and weigh straw		
19-Aug-09	a	Sample, bale and weigh straw		

Far Field I (W)

			Rate	Unit
16-Sep-08	a	Load straw Normal plots	17.31	kg/plot
	a	Load straw x 2 Plots	34.63	kg/plot
	a	Load straw x 4 Plots	69.25	kg/plot
25-Sep-08	a	Topped to chop straw		
14-Oct-08	a	Plough/ NW		
	a	Power Harrowed		
	a	Accord Drilled		
	s	Hereward tr Anchor	350.00	seeds/m2
	a	Rolled	1.00	
11-Dec-08	p	Avadex Excel 15G	15.00	kg/ha
11-Mar-09	f	Double Top	185.00	kg/ha
20-Apr-09	p	Pacifica	0.50	kg/ha
	p	Biopower	1.00	l/ha
29-Apr-09	f	Nitram	145.00	kg/ha
10-May-09	p	Cherokee	1.25	l/ha
	p	Cycocel	2.25	l/ha
	p	Headland Manganese 500	1.00	L in 200 l/ha
03-Jun-09	p	Opus	0.80	L in 200 l/ha
	p	Amistar	1.00	L in 200 l/ha
05-Jun-09	f	Nitram	116.00	kg/ha
24-Aug-09	a	Combine harvest, plots for yield		
	a	Sample, bale and weigh straw		

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09/R/CS/326

GRAIN TONNES/HECTARE

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

```
    Treatment
            -      7.68
            1      7.97
            2      8.28
            4      8.39

         Mean      8.08
```

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

Table            Treatment
s.e.d.               0.308
```

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

Stratum                         d.f.          s.e.         cv%

Blocks.Plots                       9         0.436         5.4
```

```
Grain mean dm%  85.6
```

STRAW TONNES/HECTARE

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

```
    Treatment
            -       4.27
            1       4.23
            2       4.67
            4       4.71

         Mean       4.47
```

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

Table             Treatment
s.e.d.               0.387
```

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

Straw (at 85% dry matter) tonnes/hectare

Stratum                         d.f.          s.e.         cv%

Blocks.Plots                       9         0.548        12.3
```

```
Straw mean dm%  89.4

Plot area harvested   0.00270
```


https://doi.org/10.23637/ERADOC-1-219

09/W/CS/326

GRAIN TONNES/HECTARE

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

```
    Treatment
            -       4.58
            1       5.23
            2       4.91
            4       4.80
         Mean       4.88

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

Table              Treatment
s.e.d.                 0.569

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

Stratum                         d.f.          s.e.         cv%

Blocks.Plots                       6         0.697        14.3


GRAIN MEAN DM%  88.3
```

STRAW TONNES/HECTARE

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

```
    Treatment
            -       3.21
            1       3.18
            2       3.21
            4       3.04
         Mean       3.16

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

Table            Treatment
s.e.d.               0.406

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

Stratum                         d.f.          s.e.         cv%

Blocks.Plots                       6         0.497        15.7

STRAW MEAN DM%  86.8

Plot area harvested   0.00290
```


https://doi.org/10.23637/ERADOC-1-219 *pp 56*

09/R/CS/477

CONTINUOUS MAIZE

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

Sponsors: A. J. Macdonald

The 13th year, forage maize and s. barley

For previous years see Yield Books for 97-08/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

			Rate	Unit
06-Oct-08	a	Apply maize tops, plots 3, 6, 9, 12, 16, &18 at 300 kg/plot	10.00	t/ha
16-Oct-08	f	Triple Superphosphate	171.00	kg/ha
	f	Muriate of Potash	181.00	kg/ha
05-Nov-08	a	Plough/ N		
26-Mar-09	a	Springtined		
	a	Combination Drilled		
	s	Optic Tr Raxil Pro	350.00	seeds/m2
	a	Rolled		
11-May-09	a	Rotavate prep for maize		
12-May-09	a	Power Harrowed		
	a	Nodet Drilled		
	s	Hudson tr mesurol + thiram	10.20	seeds/m2
14-May-09	f	Double Top	356.00	kg/ha
20-May-09	p	Headland Charge	1.50	l/ha
	p	Duplosan KV	1.50	l/ha
	p	Harmony M SX	100.00	g/ha
	p	Fandango	1.00	l/ha
	p	Flexity	0.20	l/ha

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			Rate	Unit
04-Jun-09	p	Amistar Opti	1.00	l/ha
	p	Proline	0.30	l/ha
15-Jun-09	p	Callisto maize only	0.75	l/ha
	p	Samson maize only	1.00	l/ha
30-Jun-09	a	Mow / Rotavate paths		
12-Aug-09	a	Mow / Rotavate paths		
13-Aug-09	a	Mow / Rotavate paths cut paths		
27-Aug-09	a	Combine harvest, S. Barley plots for yield		
28-Aug-09	a	Combine harvest		
29-Aug-09	a	Baled		
10-Sep-09	a	Hand cut maize and removed crop		

MAIZE

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

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

Treatment	
M	10.35
(B)M	11.02
MT	10.06
Mean	10.48

Standard errors of differences of means

Table	Treatment
s.e.d.	1.305

Stratum standard errors and coefficients of variation

Stratum	d.f.	s.e.	cv%
Blocks.Plots	4	1.598	15.3

MEAN DM% 21.4

PLOT AREA HARVESTED 0.00108

https://doi.org/10.23637/ERADOC-1-219 *pp 58*

09/R/CS/477

SPRING BARLEY

GRAIN TONNES/HECTARE

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

Treatment

(M)B	4.65
BT	5.00
B	4.81
Mean	4.82

Standard errors of differences of means

Table	Treatment
s.e.d.	0.221

Stratum standard errors and coefficients of variation

Stratum	d.f.	s.e.	cv%
Blocks.Plots	4	0.270	5.6

Grain mean dm% 81.0

Plot area harvested 0.00525

https://doi.org/10.23637/ERADOC-1-219 *pp 59*

09/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 13th year, forage maize and s. barley

For previous years see Yield Books for 97-08/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	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

			Rate	Unit
02-Oct-08	a	Broadcast maize tops at 225 kg/plot, plots 2, 4, 12, 13, 16, and 17.	10.00	t/ha
06-Oct-08	a	Topped to tidy		
16-Oct-08	f	Triple Superphosphate	171.00	kg/ha
	f	Muriate of Potash	181.00	kg/ha
	a	Plough/ NE		
02-Apr-09	s	Optic tr Raxil Pro		
21-May-09	a	Rotavate		
	a	Drilled		
	s	Hudson tr Measurol	10.20	S/m2
30-May-09	a	Broadcast		
	f	Double Top	355.00	kg/ha
03-Jun-09	p	Opus	0.50	L in 200 l/ha
	p	Amistar	0.40	L in 200 l/ha
18-Jun-09	p	Callisto	0.75	l/ha
	p	Samson	0.50	l/ha
24-Aug-09	a	Combine harvest spring barley plots		
	a	Combine harvest discards		
26-Aug-09	a	Baled		
02-Sep-09	a	Remove bales		
03-Sep-09	a	Hand cut Maize plots and removed crop		

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09/W/CS/478

MAIZE

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

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

Treatment	
M	11.44
MT	11.25
(B)M	11.17
Mean	11.29

Standard errors of differences of means

Table	Treatment
s.e.d.	0.515

Stratum standard errors and coefficients of variation

Stratum	d.f.	s.e.	cv%
Blocks.Plots	4	0.630	5.6

MEAN DM% 23.8

PLOT AREA HARVESTED 0.00108

https://doi.org/10.23637/ERADOC-1-219 *pp 61*

09/W/CS/478

SPRING BARLEY

GRAIN TONNES/HECTARE

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

Treatment	
(M)B	3.43
BT	3.79
B	3.25
Mean	3.49

Standard errors of differences of means

Table	Treatment
s.e.d.	0.134

Stratum standard errors and coefficients of variation

Stratum	d.f.	s.e.	cv%
Blocks.Plots	4	0.164	4.7

Grain mean dm% 86.1

Plot area harvested 0.00525

https://doi.org/10.23637/ERADOC-1-219 *pp 62*

Rothamsted Experimental Station

The Weather : Monthly Summary : 2009

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

	Sunshine		Mean temperatures °C								Rain			Drainage	Wind[c]
			Maximum		Minimum		Dew	Ground	In ground under grass		Total mm		Rain	20 inch	
	Hours	( )	°C	( )	°C	( )	point	frosts [a]	30 cm	100 cm	12cm(5") turf wall		days[b]	mm	km/hr
January	76.2	(+21.15)	5.2	(-1.15)	-0.8	(-1.62)	0.6	23	3.4	6.0	70.4	(+0.7)	21	48.9	9.2
February	85.0	(+14.31)	6.4	(-0.36)	1.0	(+0.26)	1.3	17	3.8	5.2	73.9	(+25.1)	14	68.4	8.4
March	182.0	(+74.81)	11.3	(+1.81)	2.4	(+0.11)	3.1	19	6.7	6.9	37.3	(-16.6)	18	3.2	10.0
April	184.7	(+37.92)	14.7	(+2.75)	5.4	(+1.73)	6.4	11	10.0	8.8	46.7	(-6.8)	16	8.6	8.2
May	242.1	(+47.24)	17.1	(+1.37)	7.7	(+1.34)	7.4	4	12.7	11.0	24.8	(-24.9)	13	0.0	10.5
June	208.3	(+18.02)	20.0	(+1.35)	10.2	(+0.94)	9.7	2	15.3	13.2	68.1	(+7.9)	13	6.4	7.5
July	199.7	(-3.63)	20.8	(-0.58)	12.3	(+0.95)	11.6	0	17.0	15.2	73.3	(+31.2)	19	3.1	9.1
August	185.2	(-11.62)	22.0	(+0.54)	12.7	(+1.34)	12.4	0	17.1	15.7	63.4	(+9.7)	13	15.5	8.0
September	144.7	(+2.35)	18.8	(+0.81)	10.6	(+1.19)	10.0	0	15.1	15.1	15.9	(-45.1)	9	0.0	9.6
October	79.9	(-32.24)	14.7	(+0.98)	8.0	(+1.32)	8.6	5	12.3	13.4	39.1	(-35.6)	15	0.0	7.7
November	77.0	(+6.89)	11.3	(+1.96)	5.9	(+2.62)	6.6	8	9.7	11.4	146.1	(+79.9)	23	8.8	12.3
December	72.4	(+24.33)	5.4	(-1.74)	0.0	(-1.92)	1.1	16	5.7	8.6	105.2	(+35.1)	21	67.2[d]	9.6
Year	1737.2	(+199.53)	14.0[e]	(+0.65)	6.3[e]	(+0.69)	6.6[e]	105	10.7[e]	10.9[e]	764.3	(+60.8)	195	230.1[d]	9.2[e]

[a] Number of nights grass minimum was below 0.0 °C

30 year Mean Rainfall = 704mm

[b] Number of days rain was 0.2 mm or more

[c] At 2 metres above ground

[d] Denotes a missing value. In this case the 20" drain measuring equipment failed and we lost data for days 1 to 8 in December.

[e] Monthly mean

Woburn Experimental Farm

The Weather : Monthly Summary : 2009

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

	Sunshine		Mean temperatures °C								Rain			Wind[c]
			Maximum		Minimum		Dew	Ground	In ground under grass		Total mm		Rain	
	Hours	( )		( )		( )	point	frosts [a]	30 cm	100 cm	Tipping bucket		days [b]	km/hr
												( )		
January	70.3	(+21.80)	5.6	(-1.16)	-0.6	(-1.68)	0.7	18	3.6	6.3	35.6	(-19.88)	17	8.4
February	80.3	(+16.25)	6.5	(-0.63)	0.8	(-0.02)	1.6	9	3.7	5.2	53.8	(+13.00)	15	3.7
March	175.6	(+74.27)	11.6	(+1.70)	2.4	(+0.00)	3.5	13	6.8	6.5	28.8	(-20.77)	15	5.4
April	185.1	(+49.26)	15.1	(+2.84)	5.1	(+1.68)	6.6	2	10.2	8.3	32.6	(-20.00)	13	3.6
May	234.3	(+51.15)	18.0	(+1.93)	7.3	(+1.29)	7.7	0	12.4	10.1	22.0	(-30.73)	12	5.3
June	206.0	(+29.11)	20.5	(+1.49)	9.5	(+0.48)	10.6	0	16.0	12.9	0.2	(-58.59)	1	3.1
July	201.8	(+8.23)	21.5	(-0.25)	12.5	(+1.30)	12.7	0	17.8	15.5	63.8	(+18.16)	12	5.0
August	188.0	(+3.40)	22.4	(+0.76)	12.9	(+1.76)	13.4	0	17.4	15.8	97.6	(+43.10)	17	4.4
September	141.0	(+9.82)	19.3	(+1.09)	10.1	(+0.76)	10.9	0	15.0	15.2	14.4	(-44.04)	9	4.2
October	79.4	(-24.39)	15.5	(+1.44)	7.6	(+1.12)	9.3	7	12.6	13.5	22.5	(-42.20)	14	6.7
November	66.5	(+3.09)	11.5	(+1.82)	6.3	(+2.87)	6.7	6	10.0	11.7	108.6	(+51.20)	24	11.9
December	58.0	(+16.38)	5.6	(-1.88)	-0.1	(-1.98)	1.3	15	5.7	9.1	65.0	(+5.33)	23	7.4
Year	1686.2	(+258.37)	14.4[d]	(+0.76)	6.1[d]	(+0.64)	7.1[d]	70.0	10.9[d]	10.8[d]	544.8	(-105.40)	172.0	5.8[d]

[a] Number of nights grass minimum was below 0.0 °C

[b] Number of days rain was 0.2 mm or more

[c] At 2 metres above ground

[d] Monthly mean

30 Year Mean Rainfall = 649mm

Shaded data indicates loss of information.

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