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# 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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ROTHAMSTED RESEARCH

# Results of the Classical and other Long-term Experiments

## 2009

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## List of Experiments in the 2009 Yield Book

| | |
|---|---|
| R/BK/1 | Broadbalk |
| R/HB/2 | Hoos Barley |
| R/WF/3 | Wheat and Fallow |
| R/EX/4 | Exhaustion Land |
| R/PG/5 | Park Grass |
| R/GC/8 | Garden Clover |
| R/CS/326 & W/CS/326 | Amounts of Straw |
| R/CS/477 & W/CS/478 | Continuous Maize |
| W/RN/3 | Ley Arable |
| W/RN/12 | Organic Manuring |



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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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**09/R/BK/1**

| | | |
|---|---|---|
| 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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**09/R/BK/1**

| | | | | |
|---|---|---|---|---|
| 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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**09/R/BK/1**

| Section<br>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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**09/R/BK/1**

**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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**09/R/BK/1**

| | | | 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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**09/R/BK/1**

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



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**09/R/BK/1**

WHEAT

GRAIN TONNES/HECTARE

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

| SECTION<br>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<br>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



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**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 *****

ERRATUM
see 2016 page16 (supplied)

| 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



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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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**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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**09/R/HB/2**

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



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**09/R/HB/2**

SILICATE PLOTS

GRAIN TONNES/HECTARE

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

| **PK** | N3-- | N3P- | N3-K | N3PK | Mean |
|---|---|---|---|---|---|
| **Silicate** | | | | | |
| (-)- | 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



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**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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**09/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**

| 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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**09/R/EX/4**

| | | | 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<br>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<br>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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**09/R/EX/4**

**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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**09/R/PG/5**

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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**09/R/PG/5**

**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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**09/R/PG/5**

| | | |
|---|---|---|
| 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 | | a | b | c | d | Mean |
|---|---|---|---|---|---|---|
| Manure | | | | | | |
| 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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**09/R/PG/5**

## 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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**09/R/PG/5**

## 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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**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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**09/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).

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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**09/W/RN/3**

**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 | | |



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**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 LEY | NONE | FYM | Mean |
|---|---|---|---|
| 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



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## 09/W/RN/3

### W.WHEAT (1st TEST CROP)

### GRAIN TONNES/HECTARE

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

| **FYMRES** | None | FYM | Mean |
|---|---|---|---|
| **ROTATION** | | | |
| 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** | 0 | 80 | 160 | 240 |
|---|---|---|---|---|
| **ROTATION** | | | | |
| 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** | 0 | 80 | 160 | 240 |
|---|---|---|---|---|
| **FYMRES** | 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 *).



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## 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



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**09/W/RN/3**

**RYE**

**GRAIN TONNES/HECTARE**

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

| **FYMRES** | NONE | FYM | Mean |
|---|---|---|---|
| **ROTATION** | | | |
| 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



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**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** | 0 | 50 | 100 | 150 | 200 | 250 | Mean |
|---|---|---|---|---|---|---|---|
| **Treatment** | | | | | | | |
| 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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**09/R/CS/326 and 09/W/CS/326**

| | | | 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.               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.                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
```



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**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.                   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.                 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
```



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**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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**09/R/CS/477**

| | | | 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
```



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**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



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**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



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**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



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## 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

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# 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. The data shown was provided by the Met Office. © Crown copyright 2009 Published by the Met Office.



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