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# Yields of the Field Experiments 2011

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## W/RN/12 Organic Manuring

### Rothamsted Research

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**11/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 47th year, winter wheat

For previous years see 'Details' 1973 and Yield Books for 74-10/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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In addition in 2003 F and CC treatments received 120 kg N/ha, St received 90 kg N/ha. Dg10 received 60 kg N/ha. No N was applied to Dg25, Co or Lc treatments.

**Nitrogen**
In 2008 all plots, except Lc (permanent grass/clover), split into 6 to test rates of N. For crops receiving nitrogen rates rotate as follows:
N0 > N1 > N2 > N3 > N4 > N5 > N0 etc.

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

No N was applied to the beans in 2010

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

**Experimental Diary**

| | | | Rate | Unit |
|---|---|---|---|---|
| 30-Sep-10 | p | Sprayed Gallup 360 in 200l | 4.0 | l/ha |
| 10-Oct-10 | a | Straw treatment applied, chopped and spread -Straw plots only. | | |
| 11-Oct-10 | a | Compost and FYM treatments applied by manure spreader as scheduled. | | |
| 12-Oct-10 | a | Ploughed - With Ransomes 3 furrow. Arable plots only. | | |
| 14-Oct-10 | s | Rotary Harrowed, drilled Gallant, dressed Redigo, arable plots only. 360 seeds/m$^2$. | | |
| 21-Mar-11 | f | Broadcast Nitrochalk, 27%N Early N application (N1) as scheduled to N1, N2, N3, N4 and N5 plots. | 185 | kg/ha |
| 25-Mar-11 | f | Broadcast Potassium Sulphate | 200 | kg/ha |
| | | and TSP - All plots except Dg 25. | 97.5 | kg/ha |
| 28-Mar-11 | p | Sprayed Cherokee | 1.25 | l/ha |
| | | with Manganese in 200l/ha - Wheat | 1.5 | l/ha |
| 13-Apr-11 | f | Broadcast Nitrochalk, 27%N. Main N application to wheat, as scheduled - N2, N3, N4 or N5 plots | 370-926 | kg/ha |
| 11-May-11 | p | Sprayed Tracker | 1.0 | l/ha |
| | | with Bravo 500 | 1.0 | l/ha |
| | | with Justice | 0.25 | l/ha |
| | | and CCC. - Wheat only. All in 200l | 2.25 | l/ha |
| 21-Jun-11 | a | Yield strip mown, sampled and weighed. - Ley plots only. | | |
| 22-Jun-11 | a | Mown with Kuhn. Leys only. | | |
| 25-Jun-11 | a | Leys tedded. | | |
| 26-Jun-11 | a | Windrowed - Leys only. | | |
| 27-Jun-11 | a | Round baled - Ley plots only. | | |
| 15-Aug-11 | p | Sprayed Hoedown in 200l - Wheat only. | 4.0 | l/ha |
| 01-Sep-11 | a | Combined plots for yield | | |
| 02-Sep-11 | a | Combined O+Es | | |
| 07-Sep-11 | a | Baled and removed straw | | |



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**GRAIN TONNES/HECTARE**

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

| Nitrogen Treatment | 0 | 50 | 100 | 150 | 200 | 250 | Mean |
|---|---|---|---|---|---|---|---|
| F(Fd) | 0.36 | 1.97 | 3.28 | 3.50 | 4.13 | 3.98 | 2.87 |
| F(Ln,Lc6) | 0.79 | 2.34 | 3.76 | 3.73 | 3.97 | 4.99 | 3.26 |
| St(St) | 0.38 | 2.38 | 3.63 | 3.97 | 4.37 | 4.34 | 3.18 |
| CC(Gm,Lc8) | 0.84 | 2.19 | 3.58 | 4.22 | 4.34 | 4.69 | 3.31 |
| Co(Pt,Lc8) | 1.84 | 3.13 | 4.03 | 4.09 | 4.57 | 4.79 | 3.74 |
| Dg10(Fs) | 0.68 | 2.31 | 3.26 | 4.01 | 4.10 | 4.35 | 3.12 |
| Dg25(Dg) | 1.48 | 2.76 | 3.54 | 3.60 | 4.01 | 3.83 | 3.20 |
| Mean | 0.91 | 2.44 | 3.58 | 3.87 | 4.21 | 4.42 | 3.24 |

Standard errors of differences of means
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| Table | Treatment | Nitrogen | Treatment Nitrogen |
|---|---|---|---|
| s.e.d. | 0.276 | 0.116 | 0.394 |

Except when comparing means with the same level(s) of Treatment 0.308

Stratum standard errors and coefficients of variations

| Stratum | d.f | se | cv% |
|---|---|---|---|
| Block plots | 18 | 0.391 | 12.1 |
| Blocks.Plots.Splots | 105 | 0.435 | 13.4 |

Grain mean DM% 85.3

Plot area harvested 0.00185



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**11/W/RN/12**

**GRASS/CLOVER**

**DRY MATTER TONNES/HECTARE**

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

| Year | 1st Cut | 2nd Cut | Total |
|---|---|---|---|
| 2003 | - | - | - |
| 2004 | 1.82 | - | 1.82 |
| 2005 | 1.86 | 0.13 | 1.99 |
| 2006 | 4.07 | - | 4.07 |
| 2007 | 3.12 | 1.36 | 4.48 |
| 2008 | 5.72 | 1.65 | 7.37 |
| 2009 | 4.77 | - | 4.77 |
| 2010 | 4.41 | - | 4.41 |
| 2011 | 1.46 | 0.39 | 1.85 |

Cut dry matter t/ha (21/6/11 & 24/11/11)

Note: See previous Yield Books (2004-10) for cutting dates



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