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# Results of the Classical and Other Long-term Experiments 2004

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## 04/W/RN/12 - Organic Manuring

### Rothamsted Research

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04/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.

**Sponsor:** P.R. Poulton. A.J.Macdonald

The 40th year, s. barley, grass/clover ley.

For previous years see 'Details' 1973 and 74-03/W/RN/12.

**Design:** 4 blocks of 8 plots.

**Whole plot dimensions:** 8.0 x 29.5 (8.0 x 26.5 on Block III).

**Treatments:** From 1966 to 1971 the experiment had a preliminary period designed to build up organic matter from different sources. An arable rotation was started on two blocks in 1972 and the remaining two blocks in 1973. After a period of testing the residues, a further period of accumulation was started; on two blocks (which included ley sown in 1979) in 1981 and on the other two (which included ley sown in 1980) in 1982. A second test phase began when leys on the first pair of blocks were ploughed for the 1st test crop in 1987 and on the second pair for the 1st test crop in 1988. From 1988 two blocks, and 1989 the other two, to 1994, plots were split into 6 sub-plots to test five levels of nitrogen and nil. From 1995 to 1997 residual effects of that nitrogen were measured. In 1998 to 2000 yields were taken from whole plots only. In 2001 plots were split into half-plots to test two rates of N. For 2003 the experiment was modified to test further inputs of organic matter. An arable rotation (w. rye, s. barley, w. beans, w. wheat, forage maize) was started on seven plots within each block; the eighth was sown to a grass/clover ley.

Whole plots

1. **TREATMNT** (Not necessarily applied each year):

| 1966-1971/2 | 1979/82-1986/7 | Since 2003 |
|-------------|----------------|------------|
| Fd          | Fd             | F          |
| Ln          | Lc6            | F          |
| St          | St             | St         |
| Gm          | Lc8            | CC         |
| Pt          | Lc8            | Co         |
| Fs          | Fs             | Dg10       |
| Dg          | Dg             | Dg25       |
| Lc          | Lc6            | Lc         |

F: no organic amendment. St: chopped straw at 7.5t/ha. CC: cover crop prior to spring sown crops. Co: compost at 40t/ha. Dg10: FYM at 10t/ha. Dg25: FYM at 25t/ha. Dg: FYM at 50t/ha. Fd: fertilizers equivalent to FYM. Fs: fertilizers equivalent to straw (+P). Lc/Lc6/Lc8: grass/clover leys. Ln: grass ley + N. Gm: green manure. Pt: peat.

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1. **TREATMNT** (Not necessarily applied each year):(cont.)

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

In addition in 2003 F and CC treatments received 120 kg N/ha, St received 90 kg N/ha. Dg10 received 60 kg N/ha. No N was applied to Dg25, Co or Lc treatments.

In 2004 all plots, except Lc (permanent grass/clover), split into 6 at random and the following nitrogen range applied as Nitro-chalk:

N0, 1, 2, 3, 4, 5 as 0, 35, 70, 105, 140, 175 kg N.

**Experimental diary:**

14-Aug-03 : T : : Drilled Albatross, White mustard, at 10 kg with Moore Unidrill to CC plots.  
22-Sep-03 : T : : Chopped straw applied at 7.5 t to St plots.  
09-Mar-04 : T : : Compost applied at 40 t to CO plots.  
10-Mar-04 : T : : FYM applied at 25 t to Dg25 plots and at 10 t to Dg10 plots.  
12-Mar-04 : B : : tm)PDQ at 5.5 l in 200 l  
          : B : : tm)Enhance Low Foam at 100 ml in 200 l.  
22-Mar-04 : B : : Ploughed 35cm wide furrows  
12-Apr-04 : B : : Power harrowed.  
          : B : : Drilled, Optic, tr. Sibutol, at 400 seeds/m<sup>2</sup> with 4.0 m Accord drill.  
          : B : : Rolled.  
07-May-04 : T : : Nitrogen treatments applied as Nitro-chalk 27% N by hand.  
24-May-04 : T : : Sulphate of Potash at 200 kg (not to Dg25)  
          : T : : Triple Superphosphate at 97.5 kg (not to Dg25).  
02-Jun-04 : B : : Harmony M at 60 g in 200 l to barley plots.  
03-Jun-04 : B : : tm)Opus at 0.4 l in 200 l to barley plots.  
          : B : : tm)Acanto at 0.5 l in 200 l to barley plots.  
06-Jul-04 : T : : Cut, samples and weighed grass/clover, Lc plots only.  
14-Jul-04 : T : : Mowed Lc plots.  
15-Jul-04 : T : : Turned hay Lc plots.  
17-Jul-04 : T : : Turned hay Lc plots.  
19-Jul-04 : T : : Turned hay Lc plots.  
20-Jul-04 : T : : Rowed up hay and baled Lc plots.  
04-Sep-04 : T : : Combine harvested, barley plots for yield.  
          : T : : Swathed straw.  
08-Aug-04 : T : : Baled straw.

**NOTE:** Samples of grain were taken for chemical analysis.

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GRAIN TONNES/HECTARE

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

| TREATMNT     | N | 0    | 35   | 70   | 105  | 140  | 175  | Mean |
|--------------|---|------|------|------|------|------|------|------|
| F (Fd)       |   | 1.31 | 2.14 | 2.32 | 2.62 | 2.45 | 2.61 | 2.24 |
| F (Ln, Lc6)  |   | 1.78 | 2.73 | 3.19 | 3.51 | 3.60 | 3.72 | 3.09 |
| St (St)      |   | 1.22 | 2.49 | 2.93 | 3.18 | 2.94 | 2.98 | 2.62 |
| CC (Gm, Lc8) |   | 1.57 | 2.39 | 2.83 | 3.40 | 3.14 | 3.29 | 2.77 |
| Co (Pt, Lc8) |   | 2.23 | 2.98 | 3.50 | 3.29 | 3.49 | 4.23 | 3.29 |
| Dg10 (Fs)    |   | 1.61 | 2.32 | 3.01 | 2.92 | 2.98 | 3.23 | 2.68 |
| Dg25 (Dg)    |   | 2.10 | 3.03 | 3.30 | 3.57 | 3.41 | 3.32 | 3.12 |
| Mean         |   | 1.69 | 2.58 | 3.01 | 3.21 | 3.14 | 3.34 | 2.83 |

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

| Table   | TREATMNT | N     | TREATMNT |
|---|----------|-------|----------|
| rep.  | 24       | 28    | 4        |
| s.e.d.  | 0.262    | 0.107 | 0.368    |
| Except when comparing means with the same level(s) of |          |       |          |
| TREATMNT  |          |       | 0.283    |

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

| Stratum               | d.f. | s.e.  | cv%  |
|-----------------------|------|-------|------|
| Blocks.Plots          | 18   | 0.371 | 13.1 |
| Blocks.Plots.Subplots | 105  | 0.401 | 14.2 |

GRAIN MEAN DM% 86.8

PLOT AREA HARVESTED 0.00192