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## Yields of the Field Experiments 1989

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### **89/R/RN/1 and 89/R/RN/2 Ley Arable - Old Grass, Leys, Sugar Beet, W. Wheat**

#### **Rothamsted Research**

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## 89/R/RN/1 and 89/R/RN/2

### LEY ARABLE

**Object:** To study the effects of three-year leys on the fertility of the soil as measured by a sequence of three arable test crops - Highfield and Fosters.

**Sponsor:** P.R. Poulton.

The 41st year, old grass, leys, sugar beet, w. wheat.

For previous years see 'Details' 1967 and 1973 and 74-88/R/RN/1 and 2.

The experiment is duplicated on:-

**HIGHFIELD** A site with much organic matter initially (ploughed out from permanent grass) (89/R/RN/1)

**FOSTERS** A site with little organic matter initially (89/R/RN/2)

**ROTATION** Treatments: The experiment originally tested four six-course rotations, with all phases present each year. For many years these rotations were:-

|         | Treatment crops | Test crops |
|---------|-----------------|------------|
| LUCERNE | LU, LU, LU      | W, P, B    |
| CLOGRA  | LC, LC, LC      | W, P, B    |
| GRASS   | LN, LN, LN      | W, P, B    |
| ARABLE  | H, SB, O        | W, P, B    |

LU = lucerne, LC = clover-grass ley, no nitrogen fertilizer,  
LN = all-grass ley with nitrogen fertilizer, H = 1-year seeds hay,  
SB = sugar beet, O = s. oats, W = w. wheat, P = potatoes,  
B = s. barley.

From 1983 the test crops have been W, W, W.

**RESEEDED** On both fields in the first three years other plots were sown with long-term reseeded grass

**OLDGRASS** On Highfield plots of the old turf were left initially unploughed, for comparison with the three-year leys

In 1962 and 1963 some of the old and reseeded grass plots were divided for management identical to:-

|   |                  |
|---|------------------|
| C | Clover-grass ley |
| N | All-grass ley    |

From 1968 only two phases on each field continued in the six-course rotation (the museum blocks). The four other phases (the new sequence blocks) were used for studies on take-all (*Gaeumannomyces graminis*) in wheat. These studies ended in 1985 and these phases are no longer included in the experiment.

89/R/RN/1 and 89/R/RN/2

Additional treatments to 2nd test crop w. wheat:-

Sub plots

**FYMRES70** Farmyard manure residues, last applied 1970:

NONE None  
FYM 30 tonnes on each occasion

Sub plots

**N** Nitrogen fertilizer in 1989 (kg N) as 'Nitram':

0  
50  
100  
150

**Standard applications:**

2nd Treatment crops:

Lucerne: Manures: (0:18:36) at 630 kg.  
All-grass ley: Manures: (0:18:36) at 420 kg. (25:0:16) at 300 kg  
on two occasions.  
Clover-grass ley: Manures: (0:18:36) at 420 kg.  
Sugar beet: Manures: (13:13:20) at 1150 kg. Weedkiller:  
Metamitron at 3.5 kg in 200 l. Insecticide: Pirimicarb at  
0.14 kg in 200 l.

2nd Test crop:

W. wheat: Manures: (0:18:36) at 560 kg. Weedkillers: Glyphosate  
at 1.4 kg in 200 l. Chlortoluron at 3.5 kg in 200 l.  
Reseeded grass and old grass: Manures: (0:18:36) at 420 kg. All-  
grass half plots: (25:0:16) at 300 kg in spring and after each  
cut except the last.

**Seed:** Sugar beet: Monoire, seed spaced 3.8 cm apart in rows 51 cm  
apart.

W. wheat: Avalon, sown at 180 kg.

**Cultivations, etc.:-**

2nd Treatment crops:

Lucerne: PK applied: 9 Dec, 1988. First cut: 24 May, 1989.  
Second cut: 25 Sept (Fosters), 27 Sept (Highfield).  
All-grass ley and clover-grass ley: PK applied: 9 Dec, 1988. NK  
applied to all-grass ley: 10 Apr, 1989 and 26 May. Cut:  
24 May, 25 Sept.  
Sugar beet: Ploughed: 19 Dec, 1988. NPK applied: 10 Apr, 1989.  
Spring-tine cultivated twice: 18 Apr. Weedkiller applied,  
rotary harrowed and harrowed: 2 May. Rolled, seed sown,  
rolled: 3 May. Insecticide applied: 9 June. Singled: 20 June.  
Lifted: 21 Nov.

2nd Test crop w. wheat: Glyphosate applied: 1 Oct, 1988. PK applied:  
7 Oct. Ploughed: 11 Oct. Rotary harrowed, seed sown: 27 Oct.  
Chlortoluron applied: 15 Nov. N treatments applied: 18 Apr,  
1989. Combine harvested: 7 Aug.

Reseeded grass and old grass: PK applied: 9 Dec, 1988. NK applied  
to all-grass half plots: 10 Apr, 1989 and 26 May. Cut: 24 May,  
25 Sept.

89/R/RN/1 and 89/R/RN/2

NOTE: Lucerne on Highfield grew poorly and no yields were recorded.

DRY MATTER: TONNES/HECTARE

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

|  | HIGHFIELD |      | FOSTERS |         |      |      |
|--|-----------|------|---------|---------|------|------|
| <b>CLOVER-GRASS LEY</b>                          |           |      |         |         |      |      |
| TOTAL OF 2 CUTS                                  | 3.29      |      | 3.62    |         |      |      |
| MEAN DM%   | 35.1      |      | 36.2    |         |      |      |
| <b>ALL-GRASS LEY</b>                             |           |      |         |         |      |      |
| TOTAL OF 2 CUTS                                  | 6.58      |      | 6.40    |         |      |      |
| MEAN DM%   | 36.6      |      | 37.1    |         |      |      |
| <b>LUCERNE</b>                                   |           |      |         |         |      |      |
| TOTAL OF 2 CUTS                                  |           |      | 6.70    |         |      |      |
| MEAN DM%   |           |      | 31.6    |         |      |      |
| <b>OLD GRASS</b>                                 |           |      |         |         |      |      |
| TOTAL OF 2 CUTS                                  | C         |      | N       |         |      |      |
| 41ST EXPTL YEAR                                  |           |      |         |         |      |      |
| BLOCKS 1 & 4                                     | 1.96      |      | 6.46    |         |      |      |
| BLOCK 2  | 3.06      |      | 6.43    |         |      |      |
| MEAN DM%   | 35.1      |      | 35.2    |         |      |      |
| <b>RESEDED GRASS</b>                             |           |      |         |         |      |      |
| TOTAL OF 2 CUTS                                  | HIGHFIELD |      | FOSTERS |         |      |      |
|  | BLOCKS    | C    | N       | BLOCKS  | C    | N    |
| 41ST EXPTL YEAR                                  | 1 & 4     | 2.24 | 6.71    | 1 & 3   | 3.85 | 6.28 |
| 41ST EXPTL YEAR<br>(SEEDED 1949<br>RESEDED 1973) | 2 & 3     | 3.18 | 6.77    | 2 & 4   | 3.83 | 5.68 |
| MEAN DM%   |           | 34.7 | 35.5    |         | 35.0 | 36.5 |
| <b>SUGAR BEET: TONNES/HECTARE</b>                |           |      |         |         |      |      |
|  | HIGHFIELD |      |         | FOSTERS |      |      |
| ROOTS WASHED                                     | 40.0      |      |         | 36.4    |      |      |
| SUGAR PERCENTAGE                                 | 17.1      |      |         | 16.7    |      |      |
| TOTAL SUGAR                                      | 6.85      |      |         | 6.07    |      |      |
| TOPS   | 28.6      |      |         | 29.7    |      |      |



89/R/RN/1 HIGHFIELD W.WHEAT (2ND TEST CROP)

GRAIN TONNES/HECTARE

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

| FYMRES70        | NONE | FYM  | Mean |      |      |
|-----------------|------|------|------|------|------|
| <b>ROTATION</b> |      |      |      |      |      |
| LUCERNE         | 5.96 | 5.46 | 5.71 |      |      |
| CLOGRA          | 5.82 | 5.97 | 5.90 |      |      |
| GRASS           | 5.99 | 5.37 | 5.68 |      |      |
| ARABLE          | 3.94 | 3.24 | 3.59 |      |      |
| Mean            | 5.43 | 5.01 | 5.22 |      |      |
| <b>N</b>        |      |      |      |      |      |
|                 | 0    | 50   | 100  | 150  | Mean |
| <b>ROTATION</b> |      |      |      |      |      |
| LUCERNE         | 4.23 | 6.10 | 6.23 | 6.30 | 5.71 |
| CLOGRA          | 4.92 | 6.16 | 5.73 | 6.77 | 5.90 |
| GRASS           | 4.54 | 5.29 | 6.47 | 6.42 | 5.68 |
| ARABLE          | 1.94 | 3.28 | 4.59 | 4.56 | 3.59 |
| Mean            | 3.91 | 5.21 | 5.75 | 6.01 | 5.22 |
| <b>N</b>        |      |      |      |      |      |
|                 | 0    | 50   | 100  | 150  | Mean |
| <b>FYMRES70</b> |      |      |      |      |      |
| NONE            | 4.10 | 5.47 | 5.96 | 6.18 | 5.43 |
| FYM             | 3.71 | 4.95 | 5.55 | 5.85 | 5.01 |
| Mean            | 3.91 | 5.21 | 5.75 | 6.01 | 5.22 |
| <b>N</b>        |      |      |      |      |      |
|                 | 0    | 50   | 100  | 150  |      |
| <b>ROTATION</b> |      |      |      |      |      |
| LUCERNE         | NONE | 4.95 | 6.35 | 6.49 | 6.05 |
|                 | FYM  | 3.51 | 5.85 | 5.96 | 6.54 |
| CLOGRA          | NONE | 4.84 | 6.20 | 5.56 | 6.68 |
|                 | FYM  | 4.99 | 6.13 | 5.90 | 6.86 |
| GRASS           | NONE | 4.68 | 5.69 | 6.84 | 6.73 |
|                 | FYM  | 4.39 | 4.89 | 6.10 | 6.10 |
| ARABLE          | NONE | 1.94 | 3.63 | 4.94 | 5.25 |
|                 | FYM  | 1.94 | 2.92 | 4.24 | 3.88 |

GRAIN MEAN DM% 89.0

PLOT AREA HARVESTED 0.00663

89/R/RN/2 FOSTERS W.WHEAT (2ND TEST CROP)

GRAIN TONNES/HECTARE

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

| FYMRES70        | NONE            | FYM  | Mean |      |      |
|-----------------|-----------------|------|------|------|------|
| <b>ROTATION</b> |                 |      |      |      |      |
| LUCERNE         | 6.06            | 6.33 | 6.19 |      |      |
| CLOGRA          | 6.13            | 6.17 | 6.15 |      |      |
| GRASS           | 5.27            | 5.47 | 5.37 |      |      |
| ARABLE          | 4.37            | 3.99 | 4.18 |      |      |
| Mean            | 5.46            | 5.49 | 5.48 |      |      |
| <b>N</b>        | 0               | 50   | 100  | 150  | Mean |
| <b>ROTATION</b> |                 |      |      |      |      |
| LUCERNE         | 5.08            | 5.95 | 6.80 | 6.95 | 6.19 |
| CLOGRA          | 4.69            | 5.54 | 6.68 | 7.69 | 6.15 |
| GRASS           | 4.63            | 5.35 | 5.40 | 6.12 | 5.37 |
| ARABLE          | 2.27            | 3.78 | 4.74 | 5.94 | 4.18 |
| Mean            | 4.17            | 5.15 | 5.90 | 6.68 | 5.48 |
| <b>N</b>        | 0               | 50   | 100  | 150  | Mean |
| <b>FYMRES70</b> |                 |      |      |      |      |
| NONE            | 3.97            | 5.19 | 5.76 | 6.91 | 5.46 |
| FYM             | 4.36            | 5.11 | 6.05 | 6.44 | 5.49 |
| Mean            | 4.17            | 5.15 | 5.90 | 6.68 | 5.48 |
| <b>N</b>        | 0               | 50   | 100  | 150  |      |
| <b>ROTATION</b> | <b>FYMRES70</b> |      |      |      |      |
| LUCERNE         | NONE            | 4.98 | 5.61 | 6.37 | 7.27 |
|                 | FYM             | 5.18 | 6.28 | 7.22 | 6.64 |
| CLOGRA          | NONE            | 3.99 | 6.37 | 6.34 | 7.81 |
|                 | FYM             | 5.39 | 4.71 | 7.02 | 7.57 |
| GRASS           | NONE            | 4.35 | 5.17 | 4.49 | 7.08 |
|                 | FYM             | 4.90 | 5.54 | 6.31 | 5.15 |
| ARABLE          | NONE            | 2.56 | 3.63 | 5.84 | 5.47 |
|                 | FYM             | 1.98 | 3.92 | 3.64 | 6.42 |

GRAIN MEAN DM% 88.9

PLOT AREA HARVESTED 0.00663