ROTHAMSTED RESEARCH

# Yields of the Field Experiments 2014


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## R/EX/4 Exhaustion Land

### Rothamsted Research

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**14/R/EX/4**

**EXHAUSTION LAND**

**Object**: To study the residual effects of manures applied 1856 - 1901, and of additional phosphate applied since 1986 (P test) and of additional potassium since 2007 (K test); on the yield of continuous s. barley up to 1991, w. wheat since – Hoosfield.

The 159th year, w. wheat.

For previous years see 'Details' 1977, 1973 and Yield Books for 74-12/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. In 2009 maintenance P applications were changed from 20 kg P/ha to 15 kg P/ha. This was not recorded in the yield books for 2009-13. (P1) (P2) and (P3) are residues of P applied annually 1986–1992:

| | 2009-Present | 2000-08 | 1986-92 |
|---|---|---|---|
| O | None | None | None |
| P (P1) | 15 kg P | 20 kg P | 44 kg P |
| P (P2) | 15 kg P | 20 kg P | 87 kg P |
| P (P3) | 15 kg P | 20 kg P | 131 kg P |

**NOTE**: P treatments were applied at 61.5 kg P in error in 2000.

Plus

Whole plots (K test, previously N test until 1991

**1. OLD RES** Residues of manures applied annually 1876 – 1901:

| | |
|---|---|
| O | None |
| D | Farmyard manure at 35 t |
| N* | 96 kg N as nitrate of soda |
| PK | 34 kg P as superphosphate, 137 kg K as sulphate of potash |
| N*PK | N, P and K as above |



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**2. K** Potassium applied annually from 2007 as muriate of potash

| | |
|---|---|
| O | None |
| K1 | 75 kg $K_2O$ (62.2 kg K) |
| K2 | 150 kg $K_2O$ (124.5 kg K) |

Whole plots
Nitrogen: 50 kg N as ammonium sulphate (to supply sufficient S) during first two weeks in March, 200 kg N as ammonium nitrate at GS31/mid-April (whichever comes first) and 50 kg N as ammonium nitrate at GS37 (not later than mid-May)

**Experimental diary**

| Date | | Application | Rate | Units |
|---|---|---|---|---|
| 30-Sep-13 | f | Applied MOP Fertiliser - Plots 023, 043, 063, 083, 103 | 125 | kg/ha |
| 30-Sep-13 | f | Applied MOP Fertiliser - Plots 011, 012, 013, 014, 024, 031, 032, 033, 034, 044, 051, 052, 053, 054, 064, 071, 072, 073, 074, 084, 091, 092, 093, 094, 104 | 250 | kg/ha |
| 30-Sep-13 | f | Applied TSP - All Plots except Plots 014, 034, 054, 074, 094 | 75 | kg/ha |
| 01-Oct-13 | a | Topping | - | - |
| 02-Oct-13 | a | Applied Chalk - Plots 013, 014, 041, 043, 051, 054, 072 | 2 | t/ha |
| 02-Oct-13 | a | Applied Chalk - Plots 021, 042, 044, 081, 071, 074, 091, 102, 104 | 4 | t/ha |
| 02-Oct-13 | a | Applied Chalk - Plots 011, 012, 022, 023, 024, 031, 052, 053, 061, 062, 063, 064, 082, 083, 084, 101, 103 | 6 | t/ha |
| 09-Oct-13 | a | Ploughed | - | - |
| 10-Oct-13 | a | Cultipressed | - | - |
| 18-Oct-13 | s | Drilled All Plots - var. Xi19 | 400 | seeds/$m^2$ |
| 27-Nov-13 | p | Applied Major Slug Pellets | 4 | kg/ha |
| 27-Nov-13 | p | Sprayed Hallmark | 50 | ml/ha |
| 27-Nov-13 | p | Sprayed Liberator | 600 | ml/ha |
| 27-Nov-13 | p | Sprayed Stomp | 1.7 | l/ha |
| 10-Mar-14 | f | Applied sulphate of ammonia - All Plots | 238 | kg/ha |
| 01-Apr-14 | f | Applied Nitram Fertilizer - All Plots | 580 | kg/ha |
| 03-Apr-14 | p | Sprayed Artemis | 1.0 | l/ha |
| 03-Apr-14 | p | Sprayed Bravo 500 | 1.0 | l/ha |
| 03-Apr-14 | p | Sprayed BASF 3C 720 | 1.75 | l/ha |
| 09-Apr-14 | f | Applied Kieserite - All Plots | 80 | kg/ha |
| 28-Apr-14 | p | Sprayed Kingdom | 1.25 | l/ha |
| 28-Apr-14 | p | Sprayed Bravo 500 | 1.0 | l/ha |
| 13-May-14 | f | Applied Nitram - All Plots | 145 | kg/ha |
| 16-May-14 | p | Sprayed Simba | 30 | g/ha |
| 16-May-14 | p | Sprayed Vortex | 1.5 | l/ha |



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| | | | | |
|---|---|---|---|---|
| 06-Jun-14 | p | Sprayed Cello | 550 | ml/ha |
| 25-Jun-14 | a | Rotavated Fallow Areas (discard surrounds) | - | - |
| 31-Jul-14 | a | Cut Paths - in and around experiment | - | - |
| 19-Aug-14 | a | Claas Harvested OE's | - | - |
| 21-Aug-14 | a | Sampo - Harvested All Plots | - | - |
| 24-Aug-14 | a | Sampled, Baled and Weighed Straw - all plots | - | - |
| 04-Sep-14 | a | Claas Combine - Harvesting Leftover Wheat from Trial | - | - |

Note: Samples of grain and straw were taken for chemical analysis. The yield strips on plots 031, 034, 071, 074, 091 & 094 were made smaller this year to avoid areas where the crop had already been sampled by S. McGrath et al.

**P TEST**

**Grain tonnes/hectare**

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

| P_RES | O | P1 | P2 | P3 | Mean |
|---|---|---|---|---|---|
| OLD_RES | | | | | |
| O | 3.63 | 7.34 | 7.91 | 8.06 | 6.74 |
| D | 6.36 | 8.43 | 8.80 | 8.80 | 8.10 |
| N | 2.79 | 8.33 | 8.32 | 8.65 | 7.02 |
| P | 6.89 | 8.68 | 8.83 | 9.01 | 8.35 |
| NPKNAMG | 5.45 | 8.41 | 8.71 | 9.73 | 8.07 |
| Mean | 5.02 | 8.24 | 8.51 | 8.85 | 7.66 |

**Grain mean DM% 86.0**

**Straw tonnes/hectare**

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

| P_RES | O | P1 | P2 | P3 | Mean |
|---|---|---|---|---|---|
| OLD_RES | | | | | |
| O | 2.24 | 4.55 | 4.98 | 4.98 | 4.19 |
| D | 3.28 | 4.90 | 5.33 | 5.56 | 4.77 |
| N | 1.76 | 4.81 | 5.13 | 5.22 | 4.23 |
| P | 3.56 | 4.88 | 5.07 | 5.62 | 4.78 |
| NPKNAMG | 3.34 | 5.08 | 5.17 | 6.02 | 4.90 |
| Mean | 2.83 | 4.85 | 5.14 | 5.48 | 4.57 |

**Straw mean DM% 91.0**

**Plot area harvested 0.00538, 0.00252.**



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K TEST

Grain tonnes/hectare

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

| K_Test | K0 | K1 | K2 | Mean |
|---|---|---|---|---|
| OLD_RES | | | | |
| O | 7.93 | 9.11 | 9.41 | 8.60 |
| D | 8.56 | 10.01 | 9.84 | 9.25 |
| N* | 8.27 | 9.17 | 9.17 | 8.72 |
| PK | 9.16 | 9.57 | 9.45 | 9.34 |
| N*PK | 8.88 | 9.99 | 10.11 | 9.47 |
| Mean | 8.56 | 9.57 | 9.60 | 9.07 |

Grain mean DM% 86.2

Straw tonnes/hectare

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

| K_Test | K0 | K1 | K2 | Mean |
|---|---|---|---|---|
| OLD_RES | | | | |
| O | 3.97 | 5.31 | 5.55 | 4.70 |
| D | 4.34 | 5.55 | 5.84 | 5.02 |
| N* | 4.38 | 5.43 | 5.61 | 4.95 |
| PK | 5.13 | 5.29 | 5.46 | 5.25 |
| N*PK | 4.53 | 5.39 | 5.59 | 5.01 |
| Mean | 4.47 | 5.39 | 5.61 | 4.99 |

Straw mean DM% 90.9  Plot area harvested 0.00538



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