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Yields of the Field Experiments 2008

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Results of the
Classical and other
Long-term Experiments
2008

R/EX/4 Exhaustion Land

Rothamsted Research

Rothamsted Research (2009) *R/EX/4 Exhaustion Land* ; Yields Of The Field Experiments 2008, pp 21 - 24 - DOI: <https://doi.org/10.23637/ERADOC-1-218>

08/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 153rd year, w. wheat.

For previous years see 'Details' 1977, 1973 and Yield Books for 74-07/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:

| | 2000-08 | 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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2. K Potassium applied annually from 2007 as muriate of potash

O None
 K1 75 kg K₂O (62.2 kg K)
 K2 150 kg K₂O (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 |
|----------|---|--|--------|-------|
| 1-Oct-07 | f | Muriate of Potash, plots 023, 043, 063, 083 & 103 | 125.00 | kg/ha |
| | f | Muriate of Potash, plots 024, 044, 064, 084 & 104 | 250.00 | kg/ha |
| | f | Basal P (triplesuperphosphate) plots 02, 04, 06, 08 & 10 | 98.0 | Kg/ha |

P test:

| | | | | |
|----------|---|--|--------|-------|
| 1-Oct-07 | f | Triple Superphosphate, plots except 011 - 013, 031 - 033, 051 - 053, 071 - 073 & 091 - 093 | 98.00 | kg/ha |
| | f | Basal K (muriate of potash) plots 01, 03, 05, 07 & 09 | 250.00 | kg/ha |

Selected plots:

| | | | | |
|----------|---|---|------|------|
| 6-Oct-07 | f | Chalk, Plots 021, 022, 024, 061, 062, 063, 083, 102, 103, 104 | 2.00 | t/ha |
| | f | Chalk, Plots 011, 023, 042, 044, 054, 064, 071, 082, 084 | 4.00 | t/ha |
| | f | Chalk, Plots 041, 043, 051, 081, 101 | 6.00 | t/ha |

All plots

| | | | | |
|-----------|---|----------------------------------|--------|----------------------|
| 30-Sep-07 | p | Glyphosate 360 | 3.00 | l/200 l/ha |
| 10-Oct-07 | a | Plough/ S, completed 11-Oct-2007 | | |
| 22-Oct-07 | a | Combination Drilled | | |
| | s | XI19 tr Redigo Twin + Deter | 350.00 | seeds/m ² |
| 23-Oct-07 | a | Rolled | | |
| 30-Oct-07 | p | Huron | 5.00 | kg/ha |
| 2-Nov-07 | p | Liberator | 0.60 | l/200 l/ha |
| | p | Alpha Trifluralin 48 EC | 2.00 | l/200 l/ha |
| 17-Nov-07 | p | Stomp 400 SC | 3.30 | l/200 l/ha |
| | p | Arelon 500 | 2.00 | l/200 l/ha |
| | p | Hallmark with Zeon Technology | 50.00 | ml/200 l/ha |
| 1-Apr-08 | f | Sulphate of Ammonia | 238.00 | kg/ha |
| 18-Apr-08 | f | Nitraprill | 580.00 | kg/ha |

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| | | | Rate | Unit |
|-----------|---|----------------------------------|--------|------------|
| 8-May-08 | p | Deuce | 1.00 | l/150 l/ha |
| | p | Bravo 500 | 0.75 | l/150 l/ha |
| | p | Flexity | 0.20 | l/150 l/ha |
| | p | BASF 3C Chlormequat 720 | 1.00 | l/150 l/ha |
| 19-May 08 | p | Ally Max SX | 42.00 | g/200 l/ha |
| | p | Starane 2 | 0.75 | l/200 l/ha |
| 21-May-08 | f | Nitraprill | 145.00 | kg/ha |
| 31-May-08 | p | Amistar Opti | 1.25 | l/200 l/ha |
| | p | Opus Team | 1.00 | l/200 l/ha |
| 6-Jun-08 | a | Mow / Rotavate paths | | |
| 16-Jun-08 | a | Mow / Rotavate paths | | |
| 25-Jul-08 | a | Rogue wild oats/thistles/weeds | | |
| 27-Aug-08 | a | Combine harvest, plots for yield | | |
| | a | Swath straw | | |
| | a | Sample, bale and weigh straw | | |
| 30-Aug-08 | a | Baled | | |

NOTE: Samples of grain and straw were taken for chemical analysis.

P TEST

GRAIN TONNES/HECTARE

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

| P_RES OLD_RES | O | P1 | P2 | P3 | Mean |
|------------------|------|-------|-------|-------|------|
| O | 3.41 | 8.96 | 9.28 | 9.80 | 7.86 |
| D | 7.50 | 10.21 | 10.53 | 10.84 | 9.77 |
| N | 2.83 | 8.95 | 10.23 | 10.31 | 8.08 |
| P | 6.53 | 10.07 | 10.20 | 10.45 | 9.31 |
| NPKNAMG | 6.73 | 9.71 | 10.56 | 10.90 | 9.48 |
| Mean | 5.41 | 9.58 | 10.16 | 10.46 | 8.90 |

GRAIN MEAN DM% 84.1

STRAW TONNES/HECTARE

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

| P_RES OLD_RES | O | P1 | P2 | P3 | Mean |
|------------------|------|------|------|------|------|
| O | 1.94 | 4.24 | 5.02 | 5.11 | 4.08 |
| D | 4.13 | 5.63 | 5.88 | 5.80 | 5.36 |
| N | 1.68 | 4.81 | 5.79 | 5.50 | 4.45 |
| P | 3.62 | 5.69 | 5.75 | 5.94 | 5.25 |
| NPKNAMG | 3.45 | 5.14 | 5.42 | 5.39 | 4.85 |
| Mean | 2.96 | 5.10 | 5.57 | 5.55 | 4.80 |

STRAW MEAN DM% 86.6

PLOT AREA HARVESTED 0.00538

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K TEST

GRAIN TONNES/HECTARE

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

| K Test | K0 | K1 | K2 | Mean |
|----------------|-------|-------|-------|-------|
| OLD_RES | | | | |
| O | 9.26 | 10.60 | 10.80 | 9.98 |
| D | 10.07 | 11.00 | 11.35 | 10.62 |
| N* | 9.56 | 9.99 | 10.40 | 9.88 |
| PK | 10.28 | 10.14 | 10.72 | 10.36 |
| N*PK | 9.64 | 10.09 | 11.18 | 10.14 |
| Mean | 9.76 | 10.36 | 10.89 | 10.20 |
| Rep | 10 | 5 | 5 | |

Standard errors of differences of means

| Table | OLD_RES | K_Test | OLD_RES K_Test | |
|--------|---------|--------|-------------------|---------|
| s.e.d. | | 0.326 | 0.728 | min.rep |
| | 0.364 | 0.282 | 0.631 | max-min |
| | | 0.230X | 0.515 | max.rep |

GRAIN MEAN DM% 83.9

STRAW TONNES/HECTARE

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

| K_Test | K0 | K1 | K2 | Mean |
|----------------|------|------|------|------|
| OLD_RES | | | | |
| O | 4.22 | 4.85 | 5.16 | 4.61 |
| D | 4.67 | 5.21 | 5.84 | 5.10 |
| N* | 4.82 | 4.63 | 4.84 | 4.78 |
| PK | 5.29 | 5.16 | 5.63 | 5.34 |
| N*PK | 4.59 | 4.76 | 5.52 | 4.86 |
| Mean | 4.72 | 4.92 | 5.40 | 4.94 |
| Rep | 10 | 5 | 5 | |

Standard errors of differences of means

| Table | OLD_RES | K_Test | OLD_RES K_Test | |
|--------|---------|--------|-------------------|---------|
| s.e.d. | | 0.181 | 0.405 | min.rep |
| | 0.203 | 0.157 | 0.351 | max-min |
| | | 0.128X | 0.286 | max.rep |

Stratum standard errors and coefficients of variation

=====
Straw (at 85% dry matter) tonnes/hectare

| Stratum | d.f. | s.e. | cv% |
|--------------|------|-------|-----|
| Blocks.Plots | 4 | 0.286 | 5.8 |

Straw Mean DM% 86.8