ROTHAMSTED RESEARCH

# Yields of the Field Experiments 1980

*Full Table of Content*

## 80/W/RN/12 Organic Manuring

### Rothamsted Research

Rothamsted Research (1981) *80/W/RN/12 Organic Manuring ;* Yields Of The Field Experiments 1980, pp 83 - 87 **- DOI: https://doi.org/10.23637/ERADOC-1-31**

80/W/RN/12

ORGANIC MANURING

Object: To study, from crop yields and soil analyses, the residual effects of a range of types of organic matter - Woburn, Stackyard B.

Sponsor: G.E.G. Mattingly.

The 16th year, s. barley, sugar beet, ley.

For previous years see 'Details' 1973 and 74-79/W/RN/12.

Design for s. barley and sugar beet: 2 blocks of 6 plots split into 8
1st & 2nd year ley: 2 blocks of 2 plots.

Whole plot dimensions: 8.53 x 30.5.

Treatments: From 1966 to 1971 the experiment had a preliminary period designed to build up organic matter, derived from different sources. An arable rotation was started on two blocks in 1972 and the remaining two blocks in 1973. Organic manures were last applied in 1971, the leys were ploughed in autumn 1971 and 1972 before starting the rotation. The experiment now tests all combinations of:-

Whole plots

1. MANURE — Organic manures and fertilisers in the preliminary period:

| | |
|---|---|
| FYM | Farmyard manure |
| STRAW | Straw |
| FERT-FYM | Fertilisers equivalent to FYM |
| FERT-STR | Fertilisers equivalent to straw |
| CLOVRLEY | Clover/grass ley, no N |
| GRASSLEY | Grass ley with N for each cut |

Sub plots

2. N — Fertiliser nitrogen (kg N):

| S. BARLEY | SUGAR BEET |
|---|---|
| 0 | 0 |
| 30 | 40 |
| 60 | 80 |
| 90 | 120 |
| 120 | 160 |
| 150 | 200 |
| 180 | 240 |
| 210 | 280 |

Two additional MANURE treatments given green manures (GREENMNR) and peat (PEAT) in the preliminary period have been sown to clover/grass ley - 2 blocks in 1979 and 2 blocks in 1980.



*https://doi.org/10.23637/ERADOC-1-31* 

80/W/RN/12

Standard applications:
S. barley: Manures: $P_2O_5$ at 110 kg as superphosphate, $K_2O$ at 60 kg as muriate of potash. Weedkillers: Mecoprop with bromoxynil and ioxynil (as 'Brittox' at 3.5 l) in 280 l. Fungicides: Tridemorph at 0.53 kg in 280 l, ethirimol (as 'Milgo E' at 1.3 l) in 280 l.
Sugar beet: Manures: Chalk at 5.0 t, (0:20:20) at 1210 kg in autumn, (0:20:20) at 610 kg in spring, Mg at 60 kg as kieserite, Boron at 8.0 kg $B_2O_3$ (as 'Solubor') in 300 l.
1st year Clover/grass ley: Chalk at 5.0 t, (0:20:20) at 1210 kg and later at 610 kg, Mg at 60 kg as kieserite, N at 60 kg as 'Nitro-Chalk'. Weedkiller: Paraquat at 0.84 kg ion in 450 l.
2nd year Clover/grass ley: $P_2O_5$ at 110 kg as superphosphate, $K_2O$ at 60 kg as muriate of potash.

Seed: S. barley: Georgie, dressed with ethirimol, sown at 160 kg.
Sugar beet: Bush Mono G, sown at 5.6 kg.
Clover/grass ley: Climax timothy at 7 kg, S.215 meadow fescue at 14 kg, Huia white clover at 2 kg, mixture sown at 23 kg.

Cultivations, etc.:-
S. barley: Ploughed in sugar beet tops: 22 Nov, 1979. P and K applied: 14 Jan, 1980. Heavy spring-tine cultivated: 29 Feb. Spring-tine cultivated with crumbler attached: 3 Mar. Seed sown: 4 Mar. N applied: 21 Mar. Weedkiller applied: 8 May. Tridemorph applied: 13 May. 'Milgo E' applied: 5 June. Combine harvested: 28 Aug.
Sugar beet: Chalk applied: 13 Nov, 1979. Ploughed: 22 Nov. Autumn PK applied: 4 Mar, 1980. Ploughed: 11 Mar. Spring PK and Mg applied: 31 Mar. Heavy spring-tine cultivated: 8 Apr. Rotary cultivated: 9 Apr. N applied, seed sown: 11 Apr. Tractor hoed: 22 May, 4 June, 20 June. Singled: 29 May. Side-hoed by hand: 16 June. Boron applied: 19 June. Lifted: 4-7 Nov.
1st year Clover/grass ley: Chalk applied: 13 Nov, 1979. Ploughed: 22 Nov. PK applied: 4 Mar, 1980. Ploughed: 11 Mar. PK and Mg applied: 31 Mar. Heavy spring-tine cultivated: 8 Apr. Rotary cultivated: 9 Apr. N applied: 11 Apr. Seeds sown: 17 Apr. Topped: 9 June. Paraquat applied because of poor germination: 26 June. Rotary cultivated: 30 June. Spring-tine cultivated: 2 July. Spring-tine cultivated with crumbler attached, seeds re-sown: 11 July.
2nd year Clover/grass ley: P and K applied: 20 Mar, 1980. Cut: 4 June, 8 Sept. Topped: 18 Sept.



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80/W/RN/12 SPRING BARLEY

GRAIN TONNES/HECTARE

***** TABLES OF MEANS *****

| N / MANURE | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | MEAN |
|---|---|---|---|---|---|---|---|---|---|
| FYM | 3.24 | 4.32 | 5.27 | 5.25 | 5.12 | 5.77 | 6.09 | 6.27 | 5.16 |
| STRAW | 2.74 | 4.08 | 4.43 | 4.72 | 6.00 | 5.83 | 5.67 | 5.11 | 4.82 |
| FERT-FYM | 2.46 | 3.55 | 4.52 | 4.46 | 4.96 | 4.99 | 5.45 | 5.67 | 4.51 |
| FERT-STR | 2.29 | 3.78 | 4.27 | 4.86 | 5.72 | 5.39 | 5.56 | 4.75 | 4.58 |
| CLOVRLEY | 3.47 | 4.57 | 5.07 | 5.07 | 5.08 | 5.32 | 5.20 | 5.33 | 4.89 |
| GRASSLEY | 3.28 | 4.27 | 5.07 | 4.82 | 6.32 | 6.21 | 5.78 | 5.98 | 5.22 |
| MEAN | 2.91 | 4.10 | 4.77 | 4.86 | 5.53 | 5.58 | 5.62 | 5.52 | 4.86 |

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

| TABLE | MANURE | N | MANURE N |
|---|---|---|---|
| SED | 0.596 | 0.239 | 0.809 |
| EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: | | | |
| MANURE | | | 0.584 |

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

| STRATUM | DF | SE | CV% |
|---|---|---|---|
| BLOCK.WP | 5 | 0.596 | 12.3 |
| BLOCK.WP.SP | 42 | 0.584 | 12.0 |

GRAIN MEAN DM% 83.1

STRAW TONNES/HECTARE

***** TABLES OF MEANS *****

| N / MANURE | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | MEAN |
|---|---|---|---|---|---|---|---|---|---|
| FYM | 0.95 | 1.85 | 2.32 | 2.19 | 2.88 | 3.02 | 3.32 | 3.67 | 2.52 |
| STRAW | 0.89 | 1.72 | 2.00 | 2.96 | 3.14 | 3.43 | 3.22 | 3.42 | 2.60 |
| FERT-FYM | 0.77 | 1.48 | 1.99 | 2.84 | 3.17 | 2.98 | 3.20 | 3.46 | 2.49 |
| FERT-STR | 0.72 | 1.53 | 2.01 | 1.99 | 2.94 | 2.85 | 3.82 | 3.98 | 2.48 |
| CLOVRLEY | 1.38 | 1.84 | 2.34 | 2.43 | 3.30 | 3.47 | 3.53 | 4.08 | 2.80 |
| GRASSLEY | 1.08 | 2.13 | 2.13 | 2.63 | 3.11 | 3.70 | 4.28 | 4.20 | 2.91 |
| MEAN | 0.97 | 1.76 | 2.13 | 2.51 | 3.09 | 3.24 | 3.56 | 3.80 | 2.63 |

STRAW MEAN DM% 82.8

SUB PLOT AREA HARVESTED 0.00173



*https://doi.org/10.23637/ERADOC-1-31* 

80/W/RN/12 SUGAR BEET

ROOTS WASHED TONNES/HECTARE

***** TABLES OF MEANS *****

| N / MANURE | 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | MEAN |
|---|---|---|---|---|---|---|---|---|---|
| FYM | 19.8 | 26.8 | 42.2 | 39.5 | 48.4 | 53.0 | 47.6 | 46.8 | 40.5 |
| STRAW | 21.0 | 30.7 | 35.1 | 41.4 | 44.5 | 47.3 | 47.8 | 43.1 | 38.9 |
| FERT-FYM | 14.4 | 22.9 | 32.1 | 41.5 | 44.5 | 46.1 | 48.4 | 42.3 | 36.5 |
| FERT-STR | 17.4 | 28.6 | 37.7 | 42.6 | 48.0 | 42.5 | 50.2 | 47.1 | 39.3 |
| CLOVRLEY | 25.1 | 34.4 | 40.2 | 41.9 | 44.0 | 45.2 | 49.4 | 47.5 | 41.0 |
| GRASSLEY | 26.3 | 40.3 | 42.2 | 44.7 | 48.9 | 51.2 | 50.7 | 49.4 | 44.2 |
| MEAN | 20.7 | 30.6 | 38.2 | 41.9 | 46.4 | 47.5 | 49.0 | 46.0 | 40.1 |

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

| TABLE | MANURE | N | MANURE N |
|---|---|---|---|
| SED | 1.65 | 1.39 | 3.59 |
| EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: | | | |
| MANURE | | | 3.41 |

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

| STRATUM | DF | SE | CV% |
|---|---|---|---|
| BLOCK.WP | 5 | 1.65 | 4.1 |
| BLOCK.WP.SP | 42 | 3.41 | 8.5 |

SUGAR PERCENTAGE

***** TABLES OF MEANS *****

| N / MANURE | 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | MEAN |
|---|---|---|---|---|---|---|---|---|---|
| FYM | 17.4 | 18.0 | 17.8 | 17.9 | 17.7 | 17.7 | 16.7 | 16.6 | 17.5 |
| STRAW | 17.7 | 18.2 | 17.9 | 17.5 | 17.6 | 17.1 | 17.1 | 16.6 | 17.5 |
| FERT-FYM | 17.3 | 17.5 | 17.9 | 18.1 | 18.1 | 17.4 | 17.4 | 16.7 | 17.5 |
| FERT-STR | 17.2 | 18.0 | 17.7 | 17.9 | 17.6 | 16.8 | 16.5 | 16.7 | 17.3 |
| CLOVRLEY | 17.5 | 17.9 | 18.1 | 18.0 | 17.5 | 17.2 | 17.0 | 16.5 | 17.5 |
| GRASSLEY | 17.3 | 17.8 | 17.7 | 17.4 | 17.4 | 16.7 | 16.4 | 16.9 | 17.2 |
| MEAN | 17.4 | 17.9 | 17.8 | 17.8 | 17.6 | 17.1 | 16.8 | 16.7 | 17.4 |



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80/W/RN/12 SUGAR BEET
TOTAL SUGAR TONNES/HECTARE
***** TABLES OF MEANS *****

| N / MANURE | 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | MEAN |
|---|---|---|---|---|---|---|---|---|---|
| FYM | 3.45 | 4.83 | 7.51 | 7.09 | 8.56 | 9.36 | 7.93 | 7.76 | 7.06 |
| STRAW | 3.73 | 5.59 | 6.28 | 7.24 | 7.84 | 8.09 | 8.20 | 7.14 | 6.76 |
| FERT-FYM | 2.49 | 4.03 | 5.72 | 7.52 | 8.04 | 8.03 | 8.39 | 7.04 | 6.41 |
| FERT-STR | 3.00 | 5.16 | 6.68 | 7.62 | 8.44 | 7.14 | 8.26 | 7.88 | 6.77 |
| CLOVRLEY | 4.38 | 6.17 | 7.27 | 7.56 | 7.70 | 7.80 | 8.39 | 7.83 | 7.14 |
| GRASSLEY | 4.54 | 7.18 | 7.47 | 7.77 | 8.51 | 8.55 | 8.30 | 8.36 | 7.59 |
| MEAN | 3.60 | 5.49 | 6.82 | 7.47 | 8.18 | 8.16 | 8.24 | 7.67 | 6.95 |

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

| TABLE | MANURE | N | MANURE N |
|---|---|---|---|
| SED | 0.289 | 0.268 | 0.678 |
| EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: | | | |
| MANURE | | | 0.656 |

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

| STRATUM | DF | SE | CV% |
|---|---|---|---|
| BLOCK.WP | 5 | 0.289 | 4.1 |
| BLOCK.WP.SP | 42 | 0.656 | 9.4 |

TOPS TONNES/HECTARE
***** TABLES OF MEANS *****

| N / MANURE | 0 | 40 | 80 | 120 | 160 | 200 | 240 | 280 | MEAN |
|---|---|---|---|---|---|---|---|---|---|
| FYM | 14.8 | 19.2 | 34.5 | 34.4 | 46.6 | 56.7 | 63.6 | 68.4 | 42.3 |
| STRAW | 12.7 | 19.7 | 29.5 | 40.5 | 43.8 | 49.3 | 56.1 | 61.6 | 39.1 |
| FERT-FYM | 10.8 | 15.3 | 22.0 | 32.1 | 40.5 | 43.4 | 56.7 | 58.9 | 35.0 |
| FERT-STR | 12.9 | 18.1 | 25.5 | 35.9 | 49.0 | 53.2 | 65.0 | 66.6 | 40.8 |
| CLOVRLEY | 18.0 | 25.3 | 34.7 | 39.6 | 49.3 | 51.8 | 56.0 | 66.1 | 42.6 |
| GRASSLEY | 20.8 | 32.6 | 34.0 | 45.2 | 57.4 | 67.8 | 67.7 | 67.0 | 49.0 |
| MEAN | 15.0 | 21.7 | 30.0 | 37.9 | 47.7 | 53.7 | 60.9 | 64.8 | 41.5 |

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

| TABLE | MANURE | N | MANURE N |
|---|---|---|---|
| SED | 2.76 | 1.77 | 4.90 |
| EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF: | | | |
| MANURE | | | 4.33 |

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

| STRATUM | DF | SE | CV% |
|---|---|---|---|
| BLOCK.WP | 5 | 2.76 | 6.7 |
| BLOCK.WP.SP | 42 | 4.33 | 10.4 |

SUB PLOT AREA HARVESTED 0.00130



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