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Yields of the Field Experiments 1960

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60/W/B/7 Irrigation

Rothamsted Research

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50/B/7.1

IRRIGATION EXPERIMENT

Revised 1960 (the 10th year)

The effects of irrigation and nitrogen - Woburn Butt Close 1960.

For details of previous cropping, treatments etc. see "Details of the Classical and Long Term Experiments" 1956.

The 3 course rotation is now as follows:-

- 1st year: early potatoes (following 1959 sugar beet).
- 2nd year: barley (following 1959 spring beans).
- 3rd year: winter beans (following 1959 spring wheat).

The fourth series carries a long term ryegrass ley for cutting.

Area of each whole plot (acres): Winter beans: 0.0555.

Sub plots (acres): Grass: 0.0264; remainder: 0.0277.

Area harvested (acres): Early potatoes: 0.0075; barley: 0.0110;
winter beans: 0.0177; grass: 0.0165.

Design: 4 series (1 in each crop) each containing 12 whole plots.
The bean plots are no longer split for the application of dung.

Treatments.

Early potatoes: all combinations of:-

Whole plots: Irrigation: None (0); full (C).

Weed control: normal cultivations after planting (no spray);
simazine spray at 2 lb in 40 gallons per acre (used as
pre-emergence weedkiller) without cultivations.

Sub plots: Nitrogen: None, 0.6 cwt N per acre as sulphate of
ammonia.

Note: After the early potatoes are lifted certain plots are sown
with trefoil as a green manure for barley. Provision is made
for a comparison of none v. irrigation applied to the trefoil.
No irrigation was applied in 1960.

Barley: All combinations of:-

Whole plots: Irrigation: None (0), full (C).

Sub plots: Nitrogen*: None, 0.2 cwt N per acre as 'Nitro-Chalk'.

Winter beans:

Whole plots: Irrigation: None (0), three systems (A, B, C -
see below).

Grass: all combinations of:-

Whole plots: Irrigation: None (0), full (C).

Potash: None, 0.6 cwt K_2O per acre as muriate of potash
applied after the 1st cut and once again in mid-season.

Sub plots: Nitrogen*: None, 0.3 cwt N per acre as 'Nitro-Chalk'
in spring and after each cut except the last.

*Note: In addition to basal dressing.

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Rainfall and Irrigation: inches

| Week ending | Rain-fall | Grass | Barley | Potatoes | Beans | | |
|-------------|-----------|-------|--------|----------|-------|------|------|
| | | C | C | C | A | B | C |
| May 2 | 0.13 | 0.50 | 0.50 | 0.50 | - | 0.50 | 0.50 |
| 9 | 0.02 | 0.50 | - | - | - | 0.50 | 0.50 |
| 16 | 0.89 | 0.62 | - | - | - | 0.50 | 0.50 |
| 23 | 0.23 | - | 0.50 | - | - | 0.50 | 0.50 |
| 30 | 0.01 | 0.50 | 0.50 | 0.50 | - | 0.67 | 0.67 |
| June 6 | - | 0.67 | 0.50 | 0.50 | 0.67 | 0.67 | 0.67 |
| 13 | 1.26 | - | - | - | - | - | - |
| 20 | 0.68 | - | - | - | 0.20 | - | 0.20 |
| 27 | 1.68 | 0.50 | - | 0.75 | - | - | - |
| July 4 | 0.01 | - | - | - | - | - | - |
| 11 | 1.23 | - | - | - | - | - | - |
| 18 | 1.19 | - | - | - | - | - | - |
| 25 | 0.37 | - | - | - | - | - | - |
| Aug 1 | 0.38 | - | - | - | - | - | - |
| 8 | 0.23 | - | - | - | - | - | - |
| 15 | 0.88 | - | - | - | - | - | - |
| 22 | 0.16 | - | - | - | - | - | - |
| 29 | 0.87 | 0.50 | - | - | - | - | - |
| Sept 5 | 1.60 | - | - | - | - | - | - |
| 12 | 0.16 | - | - | - | - | - | - |
| 19 | 1.52 | - | - | - | - | - | - |
| 26 | (0.63) | - | - | - | - | - | - |
| Oct 3 | (0.64) | - | - | - | - | - | - |
| Total | 14.77 | 3.79 | 2.00 | 2.25 | 0.87 | 3.34 | 3.54 |

Basal dressings (per acre):

Early potatoes: 0.60 cwt N as sulphate of ammonia; 0.75 cwt P_2O_5 and 1.50 cwt K_2O as compound fertiliser (14% P_2O_5 , 28% K_2O).
 Barley: 0.2 cwt N, 0.2 cwt P_2O_5 and 0.3 cwt K_2O as compound fertiliser (12% N, 12% P_2O_5 , 18% K_2O).
 Winter beans: 0.3 cwt P_2O_5 , 0.6 cwt K_2O placement drilled as compound fertiliser (10% P_2O_5 , 20% K_2O).
 Grass: 0.3 cwt N as 'Nitro-Chalk' in spring and again after each cut except the last, and 0.6 cwt P_2O_5 and 1.2 cwt K_2O as compound fertiliser (14% P_2O_5 , 28% K_2O).

Cultivations, etc.:

Early potatoes: Ploughed: Nov 20, 1959. PK compound applied: Apr 4, 1960. Sulphate of ammonia applied: Apr 6. Machine planted: Apr 7. Appropriate plots sprayed with simazine: Apr 15. Earthed up (except simazine plots): June 4. Haulm destroyed mechanically: July 13. Lifted: July 15. Trefoil sown at 30 lb per acre: July 21. Variety: Arran Pilot.

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Barley: Ground chalk applied at 3 tons per acre: Sept 8, 1959.
Ploughed: Sept 9 and Nov 21. Seed drilled at $2\frac{1}{4}$ bushels per
acre: Mar 19, 1960. Fertilisers applied: Mar 21. Sprayed
with DNBP at 10 pints in 80 gallons per acre: May 16. Combine
harvested: Aug 13. Variety: Proctor.

Winter beans: Ploughed: Sept 7, 1959. Seed placement drilled at
275 lb per acre with PK compound: Nov 5. Harvested: Aug 10 and
Aug 26, 1960. Variety: Rothamsted S.Q.

Grass: Ground chalk applied at 18 cwt per acre: Sept 23, 1959.
Seed sown at 30 lb per acre: Oct 20. 'Nitro-Chalk' and PK
compound applied: Apr 1, 1960. Cut 8 times (all plots):
May 10, May 31, June 22, July 18, Aug 8, Aug 30, Sept 23,
Nov 8. 'Nitro-Chalk' applied after each cut except the last.
Muriate of potash applied to appropriate plots after 1st and
4th cuts. Variety: S22 Italian ryegrass.

Standard errors per plot.

Early potatoes. Total tubers

Whole plot: 0.708 tons per acre or 7.2% (4 d.f.)

Sub plot: 0.630 tons per acre or 6.4% (8 d.f.)

Barley, (grain at 85% dry matter)

Whole plot: 2.51 cwt per acre or 10.2% (8 d.f.)

Sub plot: 2.25 cwt per acre or 9.1% (10 d.f.)

Winter bean, (grain at 85% dry matter)

Whole plot: 2.80 cwt per acre or 9.5% (6 d.f.)

Cut grass, dry matter

1st cut:

Whole plot: 0.58 cwt per acre or 7.3% (6 d.f.)

Sub plot: 1.44 cwt per acre or 18.2% (8 d.f.)

Total of cuts 2-4

Whole plot: 2.03 cwt per acre or 4.2% (6 d.f.)

Sub plot: 1.98 cwt per acre or 4.1% (8 d.f.)

Total of cuts 5-8

Whole plot: 1.48 cwt per acre or 3.7% (6 d.f.)

Sub plot: 2.59 cwt per acre or 6.6% (8 d.f.)

Total of all 8 cuts

Whole plot: 2.55 cwt per acre or 2.7% (6 d.f.)

Sub plot: 3.96 cwt per acre or 4.1% (8 d.f.)

60/B/7.4

Summary of Results

Early potatoes, Total tubers: tons per acre

| Weed control | Irrigation | | Weed control | | Mean |
|---------------------------------|--------------------|-------|--------------------|----------------|-----------------------|
| | 0 | C | Normal cultivation | Simazine spray | |
| Normal cultivation | 9.73 | 11.97 | | | |
| Simazine spray | 7.88 | 9.56 | | | |
| N: cwt per acre including basal | | | | | |
| | $(\pm 0.483)^{**}$ | | $(\pm 0.257)^*$ | | |
| 0.6 | 8.12 | 9.65 | 9.98 | 7.79 | 8.89 |
| 1.2 | 9.50 | 11.88 | 11.71 | 9.66 | 10.69 |
| Mean | 8.81 | 10.76 | 10.85 | 8.72 | 9.79 |
| | (± 0.289) | | | | |
| Difference (± 0.364) | 1.38 | 2.23 | 1.73 | 1.87 | 1.80 (± 0.257) |

Barley, (Grain at 85% dry matter): cwt per acre

| N: cwt per acre including basal | Irrigation | | Mean |
|---------------------------------|--------------|------|---------------------|
| | 0 | C | |
| | (± 1.21) | | |
| 0.2 | 19.2 | 23.3 | 21.3 |
| 0.4 | 26.8 | 29.4 | 28.1 |
| Mean (± 1.03) | 23.0 | 26.4 | 24.7 |
| Difference (± 1.30) | 7.6 | 6.1 | 6.8 (± 0.92) |

Winter beans, (Grain at 85% dry matter): cwt per acre

| Irrigation | | | | |
|------------|--------------|------|------|------|
| 0 | A | B | C | Mean |
| 22.6 | 26.3 | 34.5 | 34.2 | 29.4 |
| | (± 1.61) | | | |

* For use in vertical and interaction comparisons only.

** For use in horizontal and diagonal comparisons only.

60/B/7.5

Cut grass, Dry matter: cwt per acre

| | | 1st cut | | | | |
|---|------------|---------|----------|------|---|------|
| K ₂ O: cwt per acre (including basal) in 1959 | Irrigation | | | | K ₂ O: cwt per acre including basal | Mean |
| | 0 | C | | | | |
| | (±0.33) | | | | | |
| 1.2 | 7.4 | 7.5 | | | | |
| 2.4 | 4.8 | 11.8 | | | | |
| N: cwt per acre | | | 1.2 | 2.4 | | |
| | (±0.48)* | | (±0.48)* | | | |
| 0.3 | 5.8 | 9.5 | 8.0 | 7.3 | 7.7 | |
| 0.6 | 6.4 | 9.7 | 6.9 | 9.2 | 8.0 | |
| Mean (±0.24) | 6.1 | 9.6 | 7.4 | 8.3 | 7.9 | |
| Difference (±0.83) | +0.6 | +0.2 | -1.1 | +1.9 | +0.3 (±0.59) | |

Total of cuts 2 - 4

| | | Irrigation | | | | |
|---|------------|------------|----------|------|---|------|
| K ₂ O: cwt per acre including basal | Irrigation | | | | K ₂ O: cwt per acre including basal | Mean |
| | 0 | C | | | | |
| | (±1.17) | | | | | |
| 1.2 | 41.4 | 51.5 | | | | |
| 1.8 | 44.5 | 55.7 | | | | |
| N: cwt per acre | | | 1.2 | 1.8 | | |
| | (±1.01)* | | (±1.01)* | | | |
| 0.3 | 41.7 | 48.7 | 44.2 | 46.3 | 45.2 | |
| 0.6 | 44.1 | 58.4 | 48.6 | 53.9 | 51.3 | |
| Mean (±0.83) | 42.9 | 53.6 | 46.4 | 50.1 | 48.3 | |
| Difference (±1.14) | 2.4 | 9.7 | 4.4 | 7.6 | 6.1 (±0.81) | |

*For use in horizontal and diagonal comparisons only.

Mean dry matter \bar{x} as cut:

1st cut: 20.9

Total of cuts 2 - 4: 19.0

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Cut grass, Dry matter: cwt per acre

Total of cuts 5 - 8

| K ₂ O: cwt per acre including basal | Irrigation | | K ₂ O: cwt per acre including basal | | Mean |
|---|------------|------|---|------|-----------------|
| | 0 | C | | | |
| | (±0.85) | | | | |
| 1.2 | 38.9 | 35.4 | | | |
| 2.4 | 40.8 | 43.1 | | | |
| N: cwt per acre | (±0.96)* | | (±0.96)* | | |
| | | | 1.2 | 2.4 | |
| 0.3 | 36.7 | 36.9 | 35.0 | 38.7 | 36.8 |
| 0.6 | 43.0 | 41.5 | 39.3 | 45.2 | 42.3 |
| Mean (±0.60) | 39.9 | 39.2 | 37.2 | 41.9 | 39.5 |
| Difference (±1.50) | +6.3 | +4.6 | +4.3 | +6.5 | +5.5 (±1.06) |

Total of cuts 1 - 8

| K ₂ O: cwt per acre including basal | Irrigation | | K ₂ O: cwt per acre including basal | | Mean |
|---|------------|-------|---|-------|-----------------|
| | 0 | C | | | |
| | (±1.47) | | | | |
| 1.2 | 87.7 | 94.3 | | | |
| 2.4 | 90.1 | 110.6 | | | |
| N: cwt per acre | (±1.55)* | | (±1.55)* | | |
| | | | 1.2 | 2.4 | |
| 0.3 | 84.2 | 95.2 | 87.1 | 92.3 | 89.7 |
| 0.6 | 93.5 | 109.7 | 94.9 | 108.3 | 101.6 |
| Mean (±1.04) | 88.9 | 102.5 | 91.0 | 100.3 | 95.7 |
| Difference (±2.29) | 9.3 | 14.5 | 7.8 | 16.0 | 11.9 (±1.62) |

*For use in horizontal and diagonal comparisons only.

Mean dry matter % as cut:
 Total of cuts 5 - 8: 15.0
 Total of cuts 1 - 8: 17.3