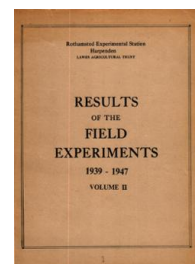


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# Yields of the Field Experiments 1939-1947 Volume 2



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## Yields of the Field Experiments 1939-1947 Volume 2 - Results

### Rothamsted Research

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Rothamsted Experimental Station  
Harpenden  
LAWES AGRICULTURAL TRUST

**RESULTS**  
OF THE  
**FIELD**  
**EXPERIMENTS**

1939 - 1947

VOLUME II

1







Rothamsted Experimental Station

Harpenden

Lawes Agricultural Trust

RESULTS

of the

FIELD

EXPERIMENTS

1939 - 1947

Vol. II. Short Term Experiments

The summaries given in this report are similar to those given in the appendices to the Annual Reports of the Station before the war. Only experiments conducted at Rothamsted and Woburn are included. The design and supervision of these experiments are the responsibility of the Field Plots Committee (Members during the period covered by this report: E.M. Crowther (Chairman), H.V. Garner (Secretary), D.J. Finney, J.R. Moffatt, R.G. Warren, D.J. Watson, F. Yates).

Price: 10/-



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| Beans    | Fertilizers                 | M/1  |
| Beans    | Varieties and Sowings       | M/8  |
| Potatoes | Various Organics            | G/8  |
| Potatoes | Control of Virus Diseases   | N/10 |
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Woburn

|        |                     |      |
|--------|---------------------|------|
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|--------|---------------------|------|

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|------------|-----------------------------|------|
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| Potatoes   | Various Organics            | G/9  |
| Potatoes   | Control of Virus Diseases   | N/12 |
| Potatoes   | Cultivations                | N/14 |
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Woburn

|        |                     |      |
|--------|---------------------|------|
| Barley | Control of Take-All | K/27 |
|--------|---------------------|------|

1947 Rothamsted

|                     |                             |      |
|---------------------|-----------------------------|------|
| Wheat               | Various Organics            | G/14 |
| Wheat               | Control of Eyespot          | K/21 |
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Five small experiments made in 1940 on the effects of poison gas contamination of various crops are not reported.

Where basal manuring is not included in the description of an experiment, none was applied.







F/1

### CROPPING OF NEWLY PLOUGHED GRASSLAND

A series of three experiments.

#### 1. Great Knott II, 1939-40

Six crops were grown in 1939. Superphosphate was tested on all of them, potash on beans and potatoes only. In 1940 wheat was grown, testing sulphate of ammonia and the residual effects of the previous crops and fertilizers. Two fumigants, naphthalene and calcium sulphide, were used against wireworm in 1939 and their effects on the six crops were also measured.

Design; 24 randomized plots, each split into three for fumigants in 1939 and for sulphate of ammonia in 1940, the sub-plots under beans and potatoes in 1939 being split again into two for potash. In 1940 the experiment was treated as two randomized blocks of 12 plots each.

Area of each sub-plot ( $\frac{1}{3}$  whole plot); 0.0248 acre.

#### First Season, 1939

Crops; Spring wheat, barley, oats, flax, spring beans, potatoes.

#### Treatments

Superphosphate; None, 1 cwt.  $P_2O_5$  per acre

Sulphate of potash (to potatoes); None, 1 cwt.  $K_2O$  per acre

Muriate of potash (to beans); None, 0.5 cwt.  $K_2O$  per acre

Fumigants; None, naphthalene (15 cwt. per acre), calcium sulphide (350 lb. per acre). Fumigants applied before ploughing in February.

Basal Manuring; 0.4 cwt. N per acre as sulphate of ammonia, to potatoes.

#### Crop Notes

Grass, 11 years old, ploughed; Feb. 1-13. Rolled; Feb. 13.  
Harrowed; Feb. 20 - Mar. 4

| Crop         | Variety        | Sown     | Harvested    |
|--------------|----------------|----------|--------------|
| Spring wheat | Red Marvel     | March 10 | August 28    |
| Barley       | Plumage Archer | March 3  | August 28    |
| Oats         | Star           | March 3  | August 14    |
| Flax         | Liral Monarch  | April 11 | September 13 |
| Beans        | Spring         | March 3  | August 28    |
| Potatoes     | Ally           | May 20   | September 22 |

Wireworms; Three sample estimates of the wireworm populations were made from series of 6" square soil samples. The first series was of 11 random samples from the field, the others were of one sample from each sub-plot.



F/2

Cropping of Newly Ploughed Grassland

Second Season, 1940

Wheat

Treatments

Residual effects of 1939 cropping, and of superphosphate and sulphate of potash.

Sulphate of ammonia: None, 0.2, 0.4 cwt. N per acre, applied as a top dressing.

Crop Notes

Variety: Wilma. Seed sown: Nov. 10, 1939. Harvested: Aug. 12.



2. West Barnfield, 1940-41

and

3. Appletree, 1941-42

Eight crops were grown in the first year, testing sulphate of ammonia (on potatoes and sugar beet only in 1940), superphosphate, muriate of potash and salt. In the following year the direct effect of sulphate of ammonia and the residuals of the different crops and fertilizers were investigated, the test crops being wheat in 1941 and oats in 1942.

Design; 4 randomized blocks of 8 plots each, every plot being split into four for fertilizer treatments in the first season, two out of each four sub-plots receiving sulphate of ammonia in the second season. Certain interactions confounded with block differences.

Area of each sub-plot; 0.0167 acre.

First Seasons, 1940 and 1941

Crops; Wheat, barley, oats, beans, flax, potatoes, sugar beet, hay.

Treatments

Sulphate of ammonia;

To potatoes and sugar beet in 1940 and 1941; None, 0.6 cwt. N per acre.

To all other crops in 1941 only; None, 0.3 cwt. N per acre

Superphosphate; None, 0.6 cwt.,  $P_2O_5$  per acre

Muriate of potash; None, 0.75 cwt.  $K_2O$  per acre

Agricultural salt; None, 3 cwt. per acre.

No fertilizers were applied to the permanent grass left unploughed to provide the experimental hay crops; instead, the four artificials were applied directly to the second-year cereal crops.

Crop Notes

West Barnfield. Grass, 12 years old, ploughed: Oct. 10-20, 1939.

Rolled: Oct. 21. Springtime harrowed: Nov. 13

Appletree. Grass, many years old, ploughed: Oct. 18-24, 1940.

1 ton per lime applied and disc harrowed: Nov. 30.



F/4

Cropping of Newly Ploughed Grassland

| Crop       | Variety        | Sown     | Harvested               |
|------------|----------------|----------|-------------------------|
| 1940       |                |          |                         |
| Wheat      | Wilma          | 20/11/39 | August 13               |
| Barley     | Plumage Archer | March 13 | August 5                |
| Oats       | Star           | March 22 | August 5                |
| Beans      | Spring         | March 22 | August 13               |
| Flax       | Liral Monarch  | March 22 | July 18                 |
| Potatoes   | Arran Banner   | April 27 | September 24            |
| Sugar Beet | Klein E        | May 3    | October 15              |
| Hay        |                |          | June 17                 |
| 1941       |                |          |                         |
| Wheat      | Wilhelmina     | 4/12/40  | August 27               |
| Barley     | Plumage Archer | March 22 | August 27               |
| Oats       | Star           | March 22 | August 26               |
| Beans      | Spring         | March 22 | August 27               |
| Flax       | Liral Prince   | April 17 | August 20               |
| Potatoes   | Arran Banner   | April 30 | October 16              |
| Sugar Beet | Klein E        | April 26 | October 30              |
| Hay        |                |          | June 30 and<br>November |

Second Seasons, 1941 and 1942

Wheat or Oats

Treatments

Residual effects of first seasons' cropping and of superphosphate, muriate of potash and salt.

Sulphate of ammonia: None, 0.3 cwt. N per acre

The plots that were under hay in the first seasons received all their artificials in the seed bed for wheat or oats.

Half the sugar beet and potato plots received 0.6 cwt. N per acre in 1940, but there was no residual effect of this treatment.

Crop Notes

| Year | Crop  | Variety   | Sown        | Harvested |
|------|-------|-----------|-------------|-----------|
| 1941 | Wheat | Wilhemina | November 26 | August 30 |
| 1942 | Oats  | Star      | March 27    | August 20 |

One plot which had carried flax in 1940 was damaged by an oil bomb in the autumn of 1940, and new soil was added.



Great Knott, 1939

F/5

|                           | Standard Errors<br>per sub-plot<br>(4 d.f.) |      | per split sub-plot<br>(6 d.f.) |      |
|---------------------------|---|------|--------------------------------|------|
|                           | per acre                                    | %    | per acre                       | %    |
| Wheat, grain              | 2.07 cwt.                                   | 10.8 |                                |      |
| Barley, grain             | 3.14 "                                      | 10.2 |                                |      |
| Oats, grain               | 1.07 "                                      | 3.1  |                                |      |
| Flax, seed                | 1.45 "                                      | 15.0 |                                |      |
| Flax, straw               | 5.47 "                                      | 15.3 |                                |      |
| Beans, grain              | 2.51 "                                      | 13.5 | 4.27 cwt.                      | 22.9 |
| Potatoes, total<br>tubers | 0.55 tons                                   | 7.6  | 0.91 tons                      | 12.5 |

| Fumigants        | Superphosphate       |         | Mean        | Superphosphate       |         | Mean       |
|------------------|----------------------|---------|-------------|----------------------|---------|------------|
|                  | Absent               | Present |             | Absent               | Present |            |
|                  | Grain; cwt. per acre |         |             | Straw; cwt. per acre |         |            |
|                  | Spring Wheat         |         |             |                      |         |            |
|                  | $\pm 1.47$           |         | $\pm 1.04$  |                      |         |            |
| None             | 20.5                 | 16.3    | 18.4        | 37.4                 | 25.6    | 31.5       |
| Naphthalene      | 20.5                 | 20.7    | 20.6        | 30.1                 | 32.0    | 31.0       |
| Calcium Sulphide | 19.5                 | 17.8    | 18.6        | 32.6                 | 32.0    | 32.3       |
| Mean             | 20.2                 | 18.3    | 19.2        | 33.4                 | 29.9    | 31.6       |
|                  | Barley               |         |             |                      |         |            |
|                  | $\pm 2.22$           |         | $\pm 1.57$  |                      |         |            |
| None             | 33.0                 | 27.5    | 30.2        | 32.5                 | 24.8    | 28.6       |
| Naphthalene      | 32.4                 | 26.5    | 29.4        | 29.4                 | 26.6    | 28.0       |
| Calcium Sulphide | 32.6                 | 32.0    | 32.3        | 31.1                 | 34.3    | 32.7       |
| Mean             | 32.7                 | 28.7    | 30.7        | 31.0                 | 28.6    | 29.8       |
|                  | Oats                 |         |             |                      |         |            |
|                  | $\pm 0.753$          |         | $\pm 0.533$ |                      |         |            |
| None             | 36.2                 | 35.2    | 35.7        | 34.1                 | 35.5    | 34.8       |
| Naphthalene      | 33.7                 | 33.8    | 33.8        | 32.6                 | 34.0    | 33.3       |
| Calcium Sulphide | 35.5                 | 31.4    | 33.4        | 32.8                 | 34.3    | 33.6       |
| Mean             | 35.1                 | 33.5    | 34.3        | 33.2                 | 34.6    | 33.9       |
|                  | Flax                 |         |             |                      |         |            |
|                  | $\pm 1.03$           |         | $\pm 0.725$ | $\pm 3.87$           |         | $\pm 2.74$ |
| None             | 9.3                  | 10.8    | 10.0        | 35.6                 | 41.5    | 38.6       |
| Naphthalene      | 9.1                  | 10.0    | 9.6         | 32.4                 | 37.1    | 34.8       |
| Calcium Sulphide | 7.2                  | 11.6    | 9.4         | 26.4                 | 41.8    | 34.1       |
| Mean             | 8.5                  | 10.8    | 9.7         | 31.5                 | 40.1    | 35.8       |

Standard errors shown are for use in vertical comparisons, and have 4 d.f.



F/6

Cropping of Newly Ploughed Grassland

Great Knott, 1939

|                                       | Superphosphate |         | Potash        |         | Mean          |
|---------------------------------------|----------------|---------|---------------|---------|---------------|
|                                       | Absent         | Present | Absent        | Present |               |
| Spring Beans: Grain, cwt. per acre    |                |         |               |         |               |
|                                       | $\pm 1.78^a$   |         | $\pm 2.14^b$  |         | $\pm 1.26^a$  |
| None                                  | 16.9           | 17.1    | 18.7          | 15.3    | 17.0          |
| Naphthalene                           | 21.7           | 19.7    | 20.9          | 20.6    | 20.7          |
| Calcium sulphide                      | 17.4           | 19.2    | 19.4          | 17.1    | 18.3          |
| Mean                                  | 18.7           | 18.7    | 19.7          | 17.7    | 18.7          |
|                                       |                |         | $\pm 1.23$    |         |               |
| Spring Beans: Straw, cwt. per acre    |                |         |               |         |               |
| None                                  | 23.5           | 20.8    | 22.6          | 21.7    | 22.2          |
| Naphthalene                           | 23.8           | 22.5    | 23.5          | 22.7    | 23.1          |
| Calcium sulphide                      | 22.5           | 24.1    | 24.1          | 22.5    | 23.3          |
| Mean                                  | 23.3           | 22.5    | 23.4          | 22.3    | 22.9          |
| Potatoes: Total tubers, tons per acre |                |         |               |         |               |
|                                       | $\pm 0.392^a$  |         | $\pm 0.456^b$ |         | $\pm 0.277^a$ |
| None                                  | 7.25           | 8.29    | 7.39          | 8.16    | 7.78          |
| Naphthalene                           | 7.17           | 7.06    | 6.64          | 7.59    | 7.12          |
| Calcium sulphide                      | 6.26           | 7.71    | 6.53          | 7.44    | 6.98          |
| Mean                                  | 6.89           | 7.69    | 6.85          | 7.73    | 7.29          |
|                                       |                |         | $\pm 0.263^b$ |         |               |
| Potatoes: Percentage Ware             |                |         |               |         |               |
| None                                  | 86.8           | 89.9    | 89.1          | 87.6    | 88.3          |
| Naphthalene                           | 86.8           | 88.4    | 87.4          | 87.8    | 87.6          |
| Calcium sulphide                      | 84.1           | 89.0    | 85.2          | 88.0    | 86.6          |
| Mean                                  | 85.9           | 89.1    | 87.2          | 87.8    | 87.5          |

Standard errors

(a) For fumigant comparisons, 4 d.f.

(b) For potash comparisons, 6 d.f.

Wireworm Population: thousands per acre

Before fumigation.

July, 1938: 253 ( $\pm 59$ )

Aug. 11-24, 1938: 112 ( $\pm 16$ )

| After fumigation  | No fumigant | Naphthalene     | Calcium sulphide | Mean |
|-------------------|-------------|-----------------|------------------|------|
| April 18-26, 1939 | 298         | 312<br>$\pm 60$ | 326              | 312  |

These standard errors have 46 d.f.



Cropping of Newly Ploughed Grassland  
Great Knott, 1940

|               | per whole plot<br>(11 d.f.) |                    | Standard Errors<br>per sub-plot<br>(24 d.f.) |                               | per split sub-plot<br>(12 d.f.) |                         |
|---------------|-----------------------------|--------------------|--|-------------------------------|---------------------------------|-------------------------|
|               | per acre                    | %                  | per acre                                     | %                             | per acre                        | %                       |
| Wheat, grain  | 3.25 cwt.                   | 8.3                | 3.38 cwt.                                    | 8.6                           | 3.18 cwt.                       | 7.8                     |
| Wheat, straw  | 4.79 cwt.                   | 10.1               | 4.08 cwt.                                    | 8.6                           | 4.03 cwt.                       | 7.8                     |
| Crops in 1939 | cwt. 0.0                    | N per acre 0.2 0.4 | cwt. 0.0                                     | P <sub>205</sub> per acre 1.0 | 1939 Mean                       | Response to potash 1939 |

Grain: cwt. per acre

|                       | ±1.69 <sup>a</sup> |      |      | ±2.30 |      | ±1.62 | ±1.30 <sup>b</sup> |
|-----------------------|--------------------|------|------|-------|------|-------|--------------------|
| Wheat                 | 35.1               | 39.6 | 40.4 | 37.2  | 39.6 | 38.4  | -                  |
| Barley                | 36.6               | 37.4 | 38.3 | 39.9  | 34.9 | 37.4  | -                  |
| Oats                  | 39.3               | 36.5 | 40.8 | 37.2  | 40.5 | 38.8  | -                  |
| Flax                  | 39.4               | 38.6 | 41.4 | 35.0  | 44.6 | 39.8  | -                  |
| Beans <sup>‡</sup>    | 39.7               | 39.8 | 39.5 | 42.2  | 37.2 | 39.8  | 0.9                |
| Potatoes <sup>‡</sup> | 38.3               | 41.7 | 41.8 | 39.6  | 41.6 | 40.6  | 0.5                |
| Mean                  | 38.1               | 38.9 | 40.4 | 38.5  | 39.7 | 39.1  | 0.7                |
|                       | ±0.69 <sup>a</sup> |      |      | ±0.94 |      |       | ±0.92 <sup>b</sup> |

Straw: cwt. per acre

|                       | ±2.04 <sup>a</sup> |      |      | ±3.39 |      | ±2.40 | ±1.65 <sup>b</sup> |
|-----------------------|--------------------|------|------|-------|------|-------|--------------------|
| Wheat                 | 40.9               | 45.4 | 46.4 | 43.1  | 45.3 | 44.2  | -                  |
| Barley                | 41.2               | 42.6 | 45.4 | 45.4  | 40.7 | 43.0  | -                  |
| Oats                  | 46.0               | 41.9 | 50.5 | 44.2  | 48.1 | 46.2  | -                  |
| Flax                  | 45.2               | 45.0 | 50.5 | 40.2  | 53.7 | 47.0  | -                  |
| Beans <sup>‡</sup>    | 48.7               | 51.3 | 49.9 | 56.0  | 43.9 | 50.0  | 1.3                |
| Potatoes <sup>‡</sup> | 47.9               | 56.5 | 53.3 | 47.9  | 57.2 | 52.6  | 0.5                |
| Mean                  | 45.0               | 47.2 | 49.4 | 46.2  | 48.2 | 47.2  | 0.9                |
|                       | ±0.83 <sup>a</sup> |      |      | ±1.38 |      |       | ±1.17 <sup>b</sup> |

Grain: cwt. per acre

Straw: cwt. per acre

| cwt. P <sub>205</sub> | cwt. N per acre 1940 |      |      |  | Mean  | cwt. N per acre 1940 |      |      |  | Mean  |
|-----------------------|----------------------|------|------|--|-------|----------------------|------|------|--|-------|
|                       | 0.0                  | 0.2  | 0.4  |  |       | 0.0                  | 0.2  | 0.4  |  |       |
|                       | ±0.98 <sup>a</sup>   |      |      |  | ±0.94 | ±1.18 <sup>a</sup>   |      |      |  | ±1.38 |
| 0.0                   | 36.7                 | 38.9 | 39.9 |  | 38.5  | 43.5                 | 46.5 | 48.5 |  | 46.2  |
| 1.0                   | 39.4                 | 39.0 | 40.8 |  | 39.7  | 46.5                 | 47.9 | 50.2 |  | 48.2  |
| Response to Phosphate | 2.7                  | 0.1  | 0.9  |  | 1.2   | 3.0                  | 1.4  | 1.7  |  | 2.0   |
|                       | ±1.23                |      |      |  | ±1.33 | ±1.69                |      |      |  | ±1.95 |

Standard errors: (a) for nitrogen comparisons, 24 d.f.  
(b) for residual potash comparisons, 12 d.f.  
The other standard errors have 11 d.f.

‡ Except for the last column, these figures are for half-plots which received no potash in 1939, and so are comparable with the yields from the wheat, barley, oats and flax plots.



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Cropping of Newly Ploughed Grassland

2. West Barnfield, 1940

Standard errors per sub-plot

|                 |                | %    |                | %                   |
|-----------------|----------------|------|----------------|---------------------|
| Wheat, grain    | 1.53 cwt./acre | 5.4  | Flax           |                     |
| straw           | 1.40 " "       | 4.0  | total produce  | 3.46 cwt./acre 7.5  |
| Barley, grain   | 1.23 " "       | 3.4  | desceded straw | 2.20 " " 8.0        |
| straw           | 1.00 " "       | 2.8  | scutched fibre | 0.743 " " 15.5      |
| Oats, grain     | 1.50 " "       | 4.1  | scutching rug  | 0.720 " " 9.8       |
| straw           | 2.75 " "       | 6.0  | seed and chaff | 0.974 " " 8.1       |
| Beans, grain    | 1.52 " "       | 10.0 | Sugar beet     |                     |
| straw           | 0.821 " "      | 4.2  | total sugar    | 3.86 " " 7.8        |
| Potatoes tubers |                |      | roots (washed) | 0.864 tons/acre 6.8 |
| total           | 0.740 " "      | 8.2  | tops           | 0.433 " " 3.3       |
| % ware          | 2.69           |      | sugar %        | 0.462               |

All standard errors are based on 6 d.f. except those for potatoes and sugar beet, which are based on 8 d.f.

Mean yields and responses to fertilizers

|                               | Mean  | N     | P     | K    | S    | Standard errors |
|-------------------------------|-------|-------|-------|------|------|-----------------|
| Wheat                         |       |       |       |      |      |                 |
| Grain, cwt. per acre          | 28.3  |       | 1.8   | 3.9  | 1.4  | ±0.76           |
| Straw, " " "                  | 34.8  |       | 1.3   | 3.2  | 0.2  | ±0.70           |
| Barley                        |       |       |       |      |      |                 |
| Grain, " " "                  | 36.4  |       | 1.0   | 1.7  | 1.8  | ±0.62           |
| Straw, " " "                  | 35.6  |       | 0.3   | 0.8  | 0.5  | ±0.50           |
| Oats                          |       |       |       |      |      |                 |
| Grain, " " "                  | 36.7  |       | -1.1  | 0.3  | 0.3  | ±0.75           |
| Straw, " " "                  | 46.2  |       | -2.8  | 3.2  | 3.4  | ±1.38           |
| Beans                         |       |       |       |      |      |                 |
| Grain, " " "                  | 15.2  |       | 0.3   | 1.8  | 0.0  | ±0.76           |
| Straw, " " "                  | 19.4  |       | 0.9   | 1.2  | 0.4  | ±0.41           |
| Flax                          |       |       |       |      |      |                 |
| Total produce, cwt. per acre  | 46.0  |       | 1.0   | 1.4  | -0.1 | ±1.73           |
| Desceded straw, " " "         | 27.3  |       | 0.6   | 1.2  | 0.7  | ±1.10           |
| Scutched fibre " " "          | 4.8   |       | 0.1   | 1.3  | 1.1  | ±0.37           |
| Scutching rug, " " "          | 7.4   |       | 0.2   | -0.4 | 0.6  | ±0.36           |
| Seed and chaff, " " "         | 12.0  |       | 0.1   | -0.1 | -0.6 | ±0.49           |
| Potatoes,                     |       |       |       |      |      |                 |
| Total tubers, tons per acre   | 9.02  | 0.87  | 0.38  | 2.37 | 0.04 | ±0.370          |
| Percentage ware               | 86.0  | 0.2   | -2.1  | 5.6  | 1.2  | ±1.34           |
| Sugar Beet                    |       |       |       |      |      |                 |
| Total sugar, cwt. per acre    | 49.9  | 0.3   | 0.8   | 0.7  | 4.1  | ±1.93           |
| Roots (washed), tons per acre | 12.67 | 0.23  | 0.27  | 0.15 | 0.72 | ±0.432          |
| Sugar percentage              | 19.66 | -0.45 | -0.16 | 0.09 | 0.55 | ±0.231          |
| Tops, tons per acre           | 13.22 | 1.10  | 0.20  | 0.76 | 1.01 | ±0.216          |
| Hay, cwt. per acre            | 47.1  |       |       |      |      |                 |



West Barnfield, 1941

Wheat

Standard Errors

(a) Excluding hay plots

Per whole plot

Grain, 1.09 cwt. per acre or 3.4%, 18 d.f.

Straw, 2.02 cwt. per acre or 4.7%, 18 d.f.

Per sub-plot

Grain, 1.93 cwt. per acre or 5.9%, 56 d.f.

Straw, 2.94 cwt. per acre or 6.9%, 56 d.f.

(b) Hay plots only

Per sub-plot

Grain, 0.922 cwt. per acre or 3.0%, 8 d.f.

Straw, 1.55 cwt. per acre or 3.4%, 8 d.f.

Mean yields and responses

| 1940<br>Crop  | Grain: cwt. per acre |                |                  |     |      | Straw: cwt. per acre |                |                  |     |      |
|---------------|----------------------|----------------|------------------|-----|------|----------------------|----------------|------------------|-----|------|
|               | Mean                 | Responses      |                  |     |      | Mean                 | Responses      |                  |     |      |
|               |                      | Direct         | Residual effects |     |      |                      | Direct         | Residual effects |     |      |
|               |                      | N              | P                | K   | S    |                      | N              | P                | K   | S    |
|               | ±0.55                | ±0.97          |                  |     |      | ±1.01                | ±1.47          |                  |     |      |
| Wheat         | 30.9                 | -0.3           | 0.2              | 1.4 | -0.3 | 39.7                 | 1.9            | 2.0              | 2.6 | 0.1  |
| Oats          | 31.2                 | 0.5            | 1.5              | 2.4 | 0.4  | 38.1                 | 1.3            | 1.1              | 4.7 | 0.1  |
| Barley        | 31.6                 | 1.7            | 1.3              | 0.2 | 0.9  | 39.7                 | 3.5            | 2.1              | 2.2 | 2.0  |
| Beans         | 33.0                 | 0.0            | 0.4              | 1.6 | -0.4 | 43.7                 | 1.7            | 1.6              | 2.9 | -0.2 |
| Flax          | 33.5                 | 2.6            | 0.5              | 1.5 | 0.0  | 45.8                 | 5.2            | 1.7              | 1.0 | 1.3  |
| Sugar<br>beet | 34.0                 | 1.4            | 0.4              | 0.5 | -0.5 | 45.2                 | 3.0            | 0.6              | 1.2 | -0.3 |
| Pota-<br>toes | 33.9                 | -0.2           | -0.7             | 1.2 | 0.1  | 45.4                 | 1.1            | 0.8              | 1.6 | -0.1 |
| Mean          | 32.6                 | 0.8            | 0.5              | 1.3 | 0.0  | 42.5                 | 2.5            | 1.4              | 2.3 | 0.4  |
|               |                      | ±0.37          |                  |     |      |                      | ±0.56          |                  |     |      |
|               |                      | Direct effects |                  |     |      |                      | Direct effects |                  |     |      |
| Hay           | 30.5                 | 0.3            | 1.2              | 1.9 | 0.2  | 45.7                 | 1.4            | -0.1             | 1.4 | 2.9  |
|               |                      | ±0.46          |                  |     |      |                      | ±0.77          |                  |     |      |



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Cropping of Newly Ploughed Grassland

3. Appletree, 1941

Standard Errors per Sub-plot

| Crop          |       |           |      | Crop           |       |           |      |
|---------------|-------|-----------|------|----------------|-------|-----------|------|
| Wheat, grain  | 1.40  | cwt./acre | 4.9  | Flax           |       |           | %    |
| straw         | 2.96  | " "       | 8.8  | total produce  | 3.21  | cwt./acre | 6.0  |
| Barley, grain | 2.04  | " "       | 7.3  | deseeded straw | 2.07  | " "       | 5.4  |
| straw         | 1.76  | " "       | 4.6  | scutched fibre | 0.803 | " "       | 13.6 |
| Oats, grain   | 1.24  | " "       | 5.1  | scutching rug  | 1.95  | " "       | 14.6 |
| straw         | 2.19  | " "       | 5.4  | seed and chaff | 1.21  | " "       | 20.4 |
| Beans, grain  | 2.79  | " "       | 19.5 | Sugar beet     |       |           |      |
| straw         | 4.48  | " "       | 18.1 | total sugar    | 1.95  | " "       | 5.7  |
| Potatoes      |       |           |      | roots (washed) | 0.506 | " "       | 5.0  |
| total tubers  | 0.604 | tons/acre | 7.0  | tops           | 1.49  | tons/acre | 7.3  |
| % ware        | 2.21  |           |      | sugar %        | 0.542 |           |      |

All standard errors are based on 8 d.f.

Mean yields and responses to fertilizers

|                                      | Mean  | Response to |      |      | Standard<br>S errors |
|--------------------------------------|-------|-------------|------|------|----------------------|
|                                      |       | N           | P    | K    |                      |
| Wheat Grain, cwt. per acre           | 28.5  | -0.4        | 1.2  | 2.1  | -0.9 ±0.70           |
| Straw, cwt. per acre                 | 33.7  | 1.8         | -0.1 | 5.2  | 1.1 ±1.48            |
| Barley Grain, " " "                  | 27.9  | 0.7         | 0.2  | 2.3  | 1.2 ±1.02            |
| Straw, " " "                         | 36.0  | 3.1         | -1.4 | 3.8  | 3.0 ±0.88            |
| Spring Oats Grain, " " "             | 24.2  | -0.1        | 0.2  | 1.3  | -0.2 ±0.62           |
| Straw, " " "                         | 40.9  | 0.4         | 1.3  | 1.3  | 4.4 ±1.09            |
| Spring Beans Grain, " " "            | 14.3  | 1.9         | 1.5  | 1.7  | -1.1 ±1.40           |
| Straw " " "                          | 24.7  | 3.7         | -1.8 | 2.8  | 3.3 ±2.24            |
| Flax Total produce, cwt. per acre    | 53.6  | -0.1        | -6.0 | 0.5  | -1.4 ±1.60           |
| Deseeded straw, " " "                | 38.3  | -0.7        | -3.3 | 0.3  | 0.2 ±1.04            |
| Scutched fibre, " " "                | 5.9   | 0.0         | 0.2  | -0.3 | -0.4 ±0.40           |
| Scutching rug, " " "                 | 13.4  | 1.1         | -1.1 | 0.3  | -0.8 ±0.97           |
| Seed and chaff " " "                 | 5.9   | 0.3         | -0.8 | -0.6 | -0.4 ±0.60           |
| Sugar beet Total sugar, " " "        | 34.3  | -0.1        | 2.2  | 5.7  | 6.3 ±0.97            |
| Roots (washed), tons per acre        | 10.10 | 0.10        | 0.65 | 1.55 | 1.68 ±0.253          |
| Sugar percentage                     | 16.92 | -0.22       | 0.05 | 0.30 | 0.29 ±0.271          |
| Tops, tons per acre                  | 20.46 | 2.96        | 1.83 | 2.17 | 3.74 ±0.746          |
| Potatoes Total tubers, tons per acre | 8.59  | 0.28        | 0.40 | 1.86 | -0.22 ±0.302         |
| Percentage ware                      | 86.3  | -0.6        | 1.2  | 0.7  | -1.3 ±1.11           |
| Hay 1st Crop, cwt. per acre          | 23.7  |             |      |      |                      |
| 2nd Crop, " " "                      | 32.5  |             |      |      |                      |



Appletree Field, 1942

Standard Errors Spring Oats

(a) Excluding hay plots

Per whole plot:

Grain, 3.17 cwt. per acre or 20.4%, 18 d.f.  
 Straw, 6.04 cwt. per acre or 23.8%, 18 d.f.

Per sub-plot:

Grain, 3.51 cwt. per acre or 22.6%, 56 d.f.  
 Straw, 5.06 cwt. per acre or 19.9%, 56 d.f.

(b) Hay plots only

Per sub-plot

Grain, 2.41 cwt. per acre or 12.4%, 8 d.f.  
 Straw, 3.50 cwt. per acre or 13.3%, 8 d.f.

Mean yields and responses to fertilizers

| 1941<br>Crop  | Grain: cwt. per acre |                |          |         |      | Straw: oct. per acre |                |          |         |      |  |  |
|---------------|----------------------|----------------|----------|---------|------|----------------------|----------------|----------|---------|------|--|--|
|               | Mean                 | Responses      |          |         |      | Mean                 | Responses      |          |         |      |  |  |
|               |                      | Direct         | Residual | effects |      |                      | Direct         | Residual | effects |      |  |  |
|               |                      | N              | P        | K       | S    |                      | N              | P        | K       | S    |  |  |
|               | ±1.58                |                | ±1.75    |         |      |                      | ±3.02          |          | ±2.53   |      |  |  |
| Wheat         | 18.7                 | -0.9           | 1.9      | 0.0     | 2.1  | 28.2                 | -1.1           | 3.2      | 1.7     | 2.3  |  |  |
| Oats          | 9.6                  | 1.4            | 5.2      | 1.4     | 0.0  | 18.7                 | 1.6            | 7.7      | 3.9     | -0.3 |  |  |
| Barley        | 14.8                 | 3.0            | 1.1      | 3.7     | -2.6 | 25.7                 | 6.0            | -0.6     | 7.3     | -0.8 |  |  |
| Beans         | 28.5                 | -1.0           | 0.3      | 2.0     | -1.5 | 43.2                 | -1.1           | -1.5     | 2.6     | 3.9  |  |  |
| Flax          | 12.2                 | 1.2            | 2.7      | 0.2     | 2.1  | 23.2                 | 4.6            | 3.8      | 0.5     | 0.5  |  |  |
| Sugar<br>Beet | 14.9                 | -0.3           | 0.3      | 4.3     | -1.4 | 22.9                 | 1.1            | 1.7      | 3.4     | -3.1 |  |  |
| Potatoes      | 9.8                  | 1.5            | 0.2      | -4.9    | 1.3  | 15.7                 | 1.8            | 0.5      | -5.4    | 1.3  |  |  |
| Mean          | 15.5                 | 0.7            | 1.7      | 1.0     | 0.0  | 25.4                 | 1.8            | 2.1      | 2.0     | 0.5  |  |  |
|               |                      |                | ±0.66    |         |      |                      |                |          | ±0.96   |      |  |  |
| Hay           | 19.4                 | Direct effects |          |         |      | 26.2                 | Direct effects |          |         |      |  |  |
|               |                      | 5.3            | 4.1      | 1.5     | -0.1 |                      | 6.1            | 4.4      | 5.4     | 3.7  |  |  |
|               |                      |                | ±1.20    |         |      |                      |                |          | ±1.75   |      |  |  |

| 1941 Crop  | Wireworms; thousands per acre |           |
|------------|-------------------------------|-----------|
|            | May 1941                      | June 1942 |
| Wheat      | 725                           | 725       |
| Oats       | 525                           | 550       |
| Barley     | 750                           | 900       |
| Beans      | 950                           | 225       |
| Flax       | 800                           | 725       |
| Sugar Beet | 875                           | 625       |
| Potatoes   | 775                           | 650       |
| Hay        | 550                           | 650       |



*[Faint, mirrored text, likely bleed-through from the reverse side of the page]*

| Group 1 |      | Group 2 |      | Group 3 |      | Group 4 |      | Group 5 |      |
|---------|------|---------|------|---------|------|---------|------|---------|------|
| 1       | 2    | 3       | 4    | 5       | 6    | 7       | 8    | 9       | 10   |
| 1.0     | 1.5  | 2.0     | 2.5  | 3.0     | 3.5  | 4.0     | 4.5  | 5.0     | 5.5  |
| 1.5     | 2.0  | 2.5     | 3.0  | 3.5     | 4.0  | 4.5     | 5.0  | 5.5     | 6.0  |
| 2.0     | 2.5  | 3.0     | 3.5  | 4.0     | 4.5  | 5.0     | 5.5  | 6.0     | 6.5  |
| 2.5     | 3.0  | 3.5     | 4.0  | 4.5     | 5.0  | 5.5     | 6.0  | 6.5     | 7.0  |
| 3.0     | 3.5  | 4.0     | 4.5  | 5.0     | 5.5  | 6.0     | 6.5  | 7.0     | 7.5  |
| 3.5     | 4.0  | 4.5     | 5.0  | 5.5     | 6.0  | 6.5     | 7.0  | 7.5     | 8.0  |
| 4.0     | 4.5  | 5.0     | 5.5  | 6.0     | 6.5  | 7.0     | 7.5  | 8.0     | 8.5  |
| 4.5     | 5.0  | 5.5     | 6.0  | 6.5     | 7.0  | 7.5     | 8.0  | 8.5     | 9.0  |
| 5.0     | 5.5  | 6.0     | 6.5  | 7.0     | 7.5  | 8.0     | 8.5  | 9.0     | 9.5  |
| 5.5     | 6.0  | 6.5     | 7.0  | 7.5     | 8.0  | 8.5     | 9.0  | 9.5     | 10.0 |
| 6.0     | 6.5  | 7.0     | 7.5  | 8.0     | 8.5  | 9.0     | 9.5  | 10.0    | 10.5 |
| 6.5     | 7.0  | 7.5     | 8.0  | 8.5     | 9.0  | 9.5     | 10.0 | 10.5    | 11.0 |
| 7.0     | 7.5  | 8.0     | 8.5  | 9.0     | 9.5  | 10.0    | 10.5 | 11.0    | 11.5 |
| 7.5     | 8.0  | 8.5     | 9.0  | 9.5     | 10.0 | 10.5    | 11.0 | 11.5    | 12.0 |
| 8.0     | 8.5  | 9.0     | 9.5  | 10.0    | 10.5 | 11.0    | 11.5 | 12.0    | 12.5 |
| 8.5     | 9.0  | 9.5     | 10.0 | 10.5    | 11.0 | 11.5    | 12.0 | 12.5    | 13.0 |
| 9.0     | 9.5  | 10.0    | 10.5 | 11.0    | 11.5 | 12.0    | 12.5 | 13.0    | 13.5 |
| 9.5     | 10.0 | 10.5    | 11.0 | 11.5    | 12.0 | 12.5    | 13.0 | 13.5    | 14.0 |
| 10.0    | 10.5 | 11.0    | 11.5 | 12.0    | 12.5 | 13.0    | 13.5 | 14.0    | 14.5 |



G/1

## DIRECT AND RESIDUAL EFFECTS OF VARIOUS ORGANIC MANURES

A series of two-year experiments, one of which was started every year from 1940 to 1948. See also "Results of the Field Experiments", 1948 and 1949.

In the first year, the experiment tests the effect of various organic manures, sulphate of ammonia, superphosphate and muriate of potash on potatoes, and in the second year tests the residual effects of the previous year's organic manures on a corn crop.

Design; 5 x 5 lattice square in three replicates. In 1940 and 1947 the plots were split into two for applications of nitrogen and potash, and in 1941-46 the plots were split into four for applications of nitrogen, phosphate and potash, in each year the highest-order interaction of artificials being confounded with differences between whole plots.

### First Season

#### Potatoes.

Area of each whole plot; 1940, 0.025 acre  
1941-46, 0.030 acre  
1947, 0.019 acre

Organic manures; Of the 25 main plots in each replicate, 3 received no organic manure, and the remaining 22 were treated with 11 different organics each at single and double rates. In 1940 there were only 9 different organics, fermented and pulverised town refuse being broadcast before ridging or applied in the ridges. In all other cases organic manures were applied in the ridges.

The fresh normal dung was applied at 8 tons per acre (single dressing) and the other dungs at equivalent rates based on equal amounts of concentrates and hay used in making them. From 1942 onwards the sludges were applied at 5 tons per acre of dry matter (single dressing). "Stored dung" had been kept for 4 months (bullock boxes) and 12 months (straw bale yards and commercial dung).

#### Artificial fertilizers;

Sulphate of ammonia; None, 0.6 cwt. N per acre

Superphosphate; None, 0.6 cwt.  $P_2O_5$  per acre (None in 1940 and 1947)

Muriate of potash; None, 1.0 cwt.  $K_2O$  per acre.



G/2

Effects of various organics

Basal manuring; 1940, Superphosphate, 0.6 cwt.  $P_2O_5$  per acre

1941-46 None

1947, Superphosphate, 0.6 cwt.  $P_2O_5$  per acre

Crop Notes.

| Year | Previous Crop | Date Planted | Date Lifted  | Year | Previous crop | Date Planted | Date Lifted |
|------|---------------|--------------|--------------|------|---------------|--------------|-------------|
| 1940 | Wheat         | May 15       | September 30 | 1944 | Wheat         | April 17     | October 4   |
| 1941 | Wheat         | May 15       | October 15   | 1945 | Barley        | April 25     | October 5   |
| 1942 | Barley        | May 9        | October 23   | 1946 | Linseed       | May 9        | October 13  |
| 1943 | Wheat         | May 4        | September 29 | 1947 | Barley        | May 24       | October 9   |

Variety; 1940-42, Arran Banner; 1943-47, Majestic.

In 1944 on 11 sub-plots varying amounts of King Edward seed were used instead of Majestic, so that the yields on these plots were lower than they would have been with a full plant of Majestic. The yield of each row of these plots was determined separately, and the total yield of the sub-plot adjusted so as to represent a full plant of Majestic.

Second Season

1941-45, Barley. 1946 and 1947, Wheat.

Area of each plot; 1941, 0.035 acre

1942-47 0.028 acre.

Basal manuring; 1941, None

1942-46, 0.2 cwt. N per acre as sulphate of ammonia

1947, 0.4 cwt. N per acre as sulphate of ammonia.

Crop Notes.

|           | 1941     | 1942     | 1943    | 1944    | 1945     | 1946     | 1947    |
|-----------|----------|----------|---------|---------|----------|----------|---------|
| Sown      | March 31 | March 26 | March 4 | March 9 | March 14 | 27/10/45 | 5/11/46 |
| Harvested | Sept. 19 | Aug. 20  | Aug. 12 | Aug. 16 | Aug. 17  | Aug. 21  | Aug. 9  |
| Variety:  | Barley,  | Plumage  | Archer  | Wheat,  | Bersee   |          |         |



G/3

Potatoes. Great Harpenden, 1940 (Direct effects)

Total tubers: tons per acre

| Level of manuring                          | Responses         |      |                   |       |                   |       |       |
|--|-------------------|------|-------------------|-------|-------------------|-------|-------|
|  | Mean Yield        |      | N                 |       | K                 |       |       |
|  | 1                 | 2    | 1                 | 2     | 1                 | 2     |       |
| Treatments, tons/acre<br>(single dressing) | ±0.385            |      | ±0.560            |       | ±0.560            |       |       |
| No organic manure                          | 7.52 <sup>a</sup> |      | 0.40 <sup>b</sup> |       | 1.53 <sup>b</sup> |       |       |
| Dung: Fresh normal                         | 8.0               | 8.15 | 8.90              | 0.69  | 0.46              | 0.01  | 0.04  |
| Fresh strawy                               | 7.6               | 8.37 | 9.21              | 0.62  | 1.72              | 0.28  | -0.38 |
| Stored normal                              | 5.2               | 8.77 | 9.14              | 0.86  | 0.16              | 0.18  | 0.34  |
| Stored strawy                              | 5.2               | 8.61 | 9.49              | 0.84  | 0.43              | 1.70  | 0.29  |
| Ferm.town refuse (in ridges)               | 8.0               | 7.60 | 8.32              | -0.21 | 0.73              | 1.64  | 0.59  |
| Ferm.town refuse (broadcast)               | 8.0               | 7.23 | 7.73              | 1.19  | 0.51              | 1.38  | -0.03 |
| Pulv.town refuse (in ridges)               | 8.0               | 8.15 | 8.13              | 0.73  | 0.79              | 1.41  | 0.32  |
| Pulv.town refuse (broadcast)               | 8.0               | 7.50 | 7.07              | 0.02  | 1.36              | 2.37  | 2.00  |
| Screened dust                              | 8.0               | 7.93 | 7.46              | 1.13  | 0.53              | -0.15 | 0.54  |
| Controlled tip refuse: Luton               | 8.0               | 7.87 | 7.01              | -0.44 | -0.63             | 1.03  | 1.92  |
| Wheathampstead                             | 8.0               | 7.30 | 7.52              | -0.67 | -0.59             | 3.04  | 1.02  |

Averages over two levels of organic manures

|                              | Mean Yield        | Responses         |                   |
|------------------------------|-------------------|-------------------|-------------------|
|                              |                   | N                 | K                 |
|                              | ±0.272            | ±0.396            |                   |
| No organic manure            | 7.52 <sup>a</sup> | 0.40 <sup>b</sup> | 1.53 <sup>b</sup> |
| Dung: Fresh normal           | 8.52              | 0.58              | 0.02              |
| Fresh strawy                 | 8.79              | 1.17              | -0.05             |
| Stored normal                | 8.96              | 0.51              | 0.26              |
| Stored strawy                | 9.05              | 0.64              | 1.00              |
| Ferm.town refuse (in ridges) | 7.96              | 0.26              | 1.12              |
| Ferm.town refuse (broadcast) | 7.48              | 0.85              | 0.68              |
| Pulv.town refuse (in ridges) | 8.14              | 0.76              | 0.86              |
| Pulv.town refuse (broadcast) | 7.28              | 0.69              | 2.18              |
| Screened dust                | 7.70              | 0.83              | 0.20              |
| Controlled tip refuse: Luton | 7.44              | 0.54              | 1.48              |
| Wheathampstead               | 7.41              | -0.63             | 2.03              |
| Mean                         | 8.00              |                   |                   |

Standard errors: (a) 0.222 (b) 0.307

Standard errors per plot: per whole plot, 0.667 tons per acre or 8.3%,  
24 d.f.  
per sub-plot, 0.647 tons per acre or 8.1%,  
29 d.f.

23



G/4

Effects of various organics

Potatoes. Little Hoos, 1941. (Direct effects)

Total tubers: tons per acre

| Level of manuring                          | Mean yield        |       | Responses to      |      |                    |       |                   |      |
|--|-------------------|-------|-------------------|------|--------------------|-------|-------------------|------|
|  | 1                 | 2     | N                 |      | P                  |       | K                 |      |
| Treatments, tons/acre<br>(single dressing) | ±0.391            |       | ±0.646            |      | ±0.646             |       | ±0.646            |      |
| No organic manure                          | 4.76 <sup>a</sup> |       | 1.59 <sup>c</sup> |      | 0.69 <sup>c</sup>  |       | 2.39 <sup>c</sup> |      |
| Dung: Fresh normal 8.0                     | 8.12              | 10.10 | 0.45              | 1.57 | 1.19               | 0.50  | -0.33             | 0.26 |
| Fresh strawy 8.8                           | 8.05              | 10.45 | 1.78              | 2.05 | 0.99               | -0.61 | -0.65             | 0.74 |
| Stored normal 4.7                          | 7.74              | 8.63  | 3.30              | 2.88 | 0.23               | -0.29 | 0.92              | 0.31 |
| Stored strawy 5.8                          | 7.57              | 7.91  | 3.51              | 2.46 | 1.10               | -1.13 | 0.70              | 0.95 |
| Fermented town refuse 8.0                  | 5.60              | 7.08  | 1.85              | 3.03 | 0.76               | 0.81  | 2.32              | 0.65 |
| Pulverized town refuse 8.0                 | 6.37              | 6.70  | 2.69              | 1.67 | 0.21               | 0.79  | 2.34              | 1.50 |
| Screened dust                              | 5.64              | 5.41  | 3.22              | 2.64 | 1.20               | 0.80  | 3.13              | 2.19 |
| Sewage sludge: W.Middlesex 4.0             | 5.96              | 6.92  | 1.72              | 2.34 | -0.90              | 0.44  | 3.58              | 4.53 |
| Birmingham 4.0                             | 6.01              | 6.34  | 1.66              | 1.44 | -0.07              | 0.49  | 3.37              | 4.14 |
| Sludge and town refuse 8.0                 | 7.13              | 7.40  | 2.41              | 2.91 | -0.19              | 1.05  | 2.32              | 1.26 |
| Bracken compost <sup>‡</sup> 8.0           | 7.36 <sup>b</sup> |       | 2.43 <sup>d</sup> |      | -0.23 <sup>d</sup> |       | 0.63 <sup>d</sup> |      |
| Improved bracken compost <sup>‡</sup> 8.0  | 8.04 <sup>b</sup> |       | 2.60 <sup>d</sup> |      | 0.22 <sup>d</sup>  |       | 0.69 <sup>d</sup> |      |

<sup>‡</sup>No double dressing. The improved bracken compost received 20 lb. sulphate of ammonia and 20 lb. calcium carbonate for each ton of fresh bracken.

Averages over two levels of organic manures

|                            | Mean yield        | Responses to      |                    |                   |
|----------------------------|-------------------|-------------------|--------------------|-------------------|
|                            |                   | N                 | P                  | K                 |
|                            | ±0.276            |                   | ±0.457             |                   |
| No organic manure          | 4.76 <sup>a</sup> | 1.59 <sup>c</sup> | 0.69 <sup>c</sup>  | 2.39 <sup>c</sup> |
| Dung: Fresh normal         | 9.11              | 1.01              | 0.84               | -0.04             |
| Fresh strawy               | 9.25              | 1.92              | 0.19               | 0.04              |
| Stored normal              | 8.18              | 3.09              | -0.03              | 0.62              |
| Stored strawy              | 7.74              | 2.98              | -0.02              | 0.82              |
| Fermented town refuse      | 6.34              | 2.44              | 0.78               | 1.48              |
| Pulverized town refuse     | 6.54              | 2.18              | 0.50               | 1.92              |
| Screened dust              | 5.52              | 2.93              | 1.00               | 2.66              |
| Sewage sludge: W.Middlesex | 6.44              | 2.03              | -0.23              | 4.06              |
| Birmingham                 | 6.18              | 1.55              | 0.21               | 3.76              |
| Sludge and town refuse     | 7.26 <sup>b</sup> | 2.66 <sup>d</sup> | 0.43 <sup>d</sup>  | 1.79 <sup>d</sup> |
| Bracken compost            | 7.36 <sup>b</sup> | 2.43 <sup>d</sup> | -0.23 <sup>d</sup> | 0.63 <sup>d</sup> |
| Improved bracken compost   | 8.04 <sup>b</sup> | 2.60 <sup>d</sup> | 0.22 <sup>d</sup>  | 0.69 <sup>d</sup> |
| Mean                       | 7.00              |                   |                    |                   |

Standard errors: (a) 0.226, (b) 0.391, (c) 0.362, (d) 0.646

Standard errors per plot: per whole plot, 0.677 tons per acre or 9.7%, 24 d.f.  
per sub-plot, 1.06 tons per acre or 15.1%, 87 d.f.



G/5

Potatoes. Long Hoos I and II, 1942 (Direct effects)

Total tubers: tons per acre.

| Level of manuring          | Mean Yield                              |        | N                 |        | Responses P       |        | K                 |        |       |
|----------------------------|---|--------|-------------------|--------|-------------------|--------|-------------------|--------|-------|
|                            | 1                                       | 2      | 1                 | 2      | 1                 | 2      | 1                 | 2      |       |
|                            | Treatments, tons/acre (single dressing) | ±0.597 |                   | ±0.701 |                   | ±0.701 |                   | ±0.701 |       |
| No organic manure          | 11.62 <sup>a</sup>                      |        | 2.62 <sup>b</sup> |        | 0.30 <sup>b</sup> |        | 1.63 <sup>b</sup> |        |       |
| Dung: Fresh normal         | 8.0                                     | 12.84  | 14.02             | 2.60   | 1.97              | -0.05  | 1.44              | 1.43   | 1.17  |
| Fresh strawy               | 8.6                                     | 12.94  | 13.52             | 1.92   | 1.87              | 0.36   | 1.45              | 1.29   | -0.05 |
| Stored normal              | 5.7                                     | 12.89  | 14.12             | 2.37   | 2.81              | -1.17  | 0.73              | 1.03   | 1.55  |
| Stored strawy              | 7.1                                     | 12.73  | 13.04             | 2.14   | 2.12              | 0.57   | -0.93             | 0.68   | 0.81  |
| Composted town refuse      | 8.0                                     | 11.27  | 12.43             | 2.57   | 0.94              | 2.26   | 1.07              | 0.45   | 0.67  |
| Pulverized town refuse     | 8.0                                     | 11.79  | 11.47             | 2.95   | 1.36              | 0.87   | 0.96              | 1.33   | 1.64  |
| Sewage sludge: W.Middlesex | 10.2                                    | 13.15  | 12.46             | 1.74   | 1.56              | 1.15   | 0.47              | 2.13   | 0.51  |
| Birmingham                 | 7.4                                     | 11.74  | 12.47             | 2.30   | 0.18              | 0.42   | 0.51              | 1.87   | 0.52  |
| Rotherham                  | 7.9                                     | 11.49  | 11.94             | 2.87   | 1.09              | 0.76   | 0.25              | 0.51   | 2.11  |
| Huddersfield               | 5.6                                     | 12.38  | 10.58             | 1.27   | 0.63              | 0.47   | 0.66              | 1.29   | 1.54  |
| Bracken compost            | 8.0                                     | 13.35  | 14.43             | 1.35   | 2.21              | 1.83   | -0.08             | 0.13   | 0.01  |

Averages over two levels of organic manure

|                            | Mean Yield         | N                 | Responses P       | K                 |
|----------------------------|--------------------|-------------------|-------------------|-------------------|
|                            | ±0.422             |                   | ±0.496            |                   |
| No organic manure          | 11.62 <sup>a</sup> | 2.62 <sup>b</sup> | 0.30 <sup>b</sup> | 1.63 <sup>b</sup> |
| Dung: Fresh normal         | 13.43              | 2.28              | 0.70              | 1.32              |
| Fresh strawy               | 13.23              | 1.90              | 0.90              | 0.62              |
| Stored normal              | 13.50              | 2.59              | -0.22             | 1.29              |
| Stored strawy              | 12.88              | 2.13              | -0.18             | 0.74              |
| Composted town refuse      | 11.85              | 1.76              | 1.66              | 0.56              |
| Pulverized town refuse     | 11.63              | 2.16              | 0.92              | 1.43              |
| Sewage sludge: W.Middlesex | 12.80              | 1.65              | 0.81              | 1.32              |
| Birmingham                 | 12.10              | 1.24              | 0.46              | 1.20              |
| Rotherham                  | 11.72              | 1.98              | 0.50              | 1.31              |
| Huddersfield               | 11.48              | 0.95              | 0.56              | 1.42              |
| Bracken compost            | 13.89              | 1.78              | 0.88              | 0.07              |
| Mean                       | 12.48              |                   |                   |                   |

Standard errors: (a) 0.344, (b) 0.384

Standard error per plot: per whole plot, 1.93 tons per acre or 8.2%, 24 d.f.  
per sub-plot, 1.15 tons per acre or 9.2%, 87 d.f.



G/6

Effects of various organics

Potatoes. Sawyers II, 1943. (Direct effects)

Total tubers: tons per acre

| Level of manuring                          | Responses         |      |                   |      |                   |      |                   |      |       |
|--|-------------------|------|-------------------|------|-------------------|------|-------------------|------|-------|
|  | Mean Yield        |      | N                 |      | P                 |      | K                 |      |       |
|  | 1                 | 2    | 1                 | 2    | 1                 | 2    | 1                 | 2    |       |
| Treatments, tons/acre<br>(single dressing) | ±0.458            |      | ±0.439            |      | ±0.439            |      | ±0.439            |      |       |
| No organic manure                          | 4.42 <sup>a</sup> |      | 0.64 <sup>b</sup> |      | 1.24 <sup>b</sup> |      | 2.75 <sup>b</sup> |      |       |
| Dung: Normal (bullock boxes)               | 8.0               | 8.06 | 8.24              | 1.15 | 1.23              | 0.87 | 0.44              | 0.05 | 1.05  |
| Strawy (bullock boxes)                     | 8.3               | 7.51 | 8.04              | 2.02 | 1.24              | 0.86 | 1.36              | 0.28 | -0.54 |
| Rich (calves)                              | 8.0               | 8.62 | 8.43              | 0.97 | 1.16              | 1.21 | -0.21             | 0.66 | -0.04 |
| Poor (straw-fed cattle)                    | 8.0               | 6.68 | 6.66              | 1.72 | 1.98              | 1.29 | 1.49              | 0.25 | 0.22  |
| Composted town refuse                      | 8.0               | 5.34 | 4.86              | 1.15 | 0.15              | 0.70 | 1.04              | 2.33 | 1.59  |
| Pulverized town refuse                     | 8.0               | 4.33 | 3.99              | 0.63 | 0.28              | 1.23 | 1.09              | 0.69 | 1.14  |
| Straw sludge compost                       | 8.0               | 5.66 | 5.85              | 1.14 | 0.83              | 0.81 | 0.64              | 3.39 | 2.98  |
| Sewage sludge: W.Middlesex                 | 12.3              | 5.47 | 5.57              | 0.92 | 0.33              | 0.43 | -0.51             | 3.04 | 2.28  |
| Birmingham                                 | 7.2               | 2.75 | 3.58              | 0.10 | 0.94              | 0.65 | 0.83              | 1.63 | 0.88  |
| Harpenden                                  | 17.5              | 5.80 | 5.95              | 0.74 | 0.21              | 0.01 | 0.03              | 3.73 | 2.28  |
| Bracken compost                            | 8.0               | 8.31 | 10.06             | 1.32 | 1.58              | 1.41 | 0.38              | 0.14 | -0.51 |

Averages over two levels of organic manure

|                              | Mean Yield        | N                 | Responses         |                   |
|------------------------------|-------------------|-------------------|-------------------|-------------------|
|                              |                   |                   | P                 | K                 |
|                              | ±0.324            |                   | ±0.310            |                   |
| No organic manure            | 4.42 <sup>a</sup> | 0.64 <sup>b</sup> | 1.24 <sup>b</sup> | 2.75 <sup>b</sup> |
| Dung: Normal (bullock boxes) | 8.15              | 1.19              | 0.66              | 0.55              |
| Strawy (bullock boxes)       | 7.78              | 1.63              | 1.11              | -0.13             |
| Rich (calves)                | 8.52              | 1.06              | 0.50              | 0.31              |
| Poor (straw-fed cattle)      | 6.67              | 1.85              | 1.39              | 0.24              |
| Composted town refuse        | 5.10              | 0.65              | 0.97              | 1.96              |
| Pulverized town refuse       | 4.16              | 0.46              | 1.16              | 0.92              |
| Straw sludge compost         | 5.76              | 0.98              | 0.72              | 3.18              |
| Sewage sludge: W.Middlesex   | 5.52              | 0.62              | -0.04             | 2.66              |
| Birmingham                   | 3.16              | 0.52              | 0.74              | 1.26              |
| Harpenden                    | 5.88              | 0.48              | -0.01             | 3.00              |
| Bracken compost              | 9.18              | 1.45              | 0.90              | -0.18             |
| Mean                         | 6.12              |                   |                   |                   |

Standard errors: (a) 0.264, (b) 0.240

Standard error per plot: per whole plot, 0.793 tons per acre or 12.9%, 24 d.f.  
per sub-plot, 0.716 tons per acre or 11.7%, 87 d.f.



G/7

Potatoes. Sawyers I, 1944. (Direct effects)

Total tubers: tons per acre.

| Level of manuring                          | Mean Yield        |       | N                 |       | P                  |       | K                 |      |       |
|--|-------------------|-------|-------------------|-------|--------------------|-------|-------------------|------|-------|
|  | 1                 | 2     | 1                 | 2     | 1                  | 2     | 1                 | 2    |       |
| Treatments, tons/acre<br>(single dressing) | ±0.466            |       | ±0.556            |       | ±0.566             |       | ±0.566            |      |       |
| No organic manure                          | 9.42 <sup>a</sup> |       | 0.93 <sup>b</sup> |       | -0.29 <sup>b</sup> |       | 4.54 <sup>b</sup> |      |       |
| Dung:                                      |                   |       |                   |       |                    |       |                   |      |       |
| Normal (bullock boxes)                     | 8.0               | 13.35 | 13.37             | 0.62  | 0.79               | -0.17 | 0.16              | 1.01 | -0.69 |
| Strawy (bullock boxes)                     | 9.3               | 13.37 | 14.21             | 1.16  | 0.47               | -0.43 | 0.62              | 0.87 | 0.50  |
| Normal (straw bale yards)                  | 13.0              | 13.66 | 14.64             | 1.77  | 1.40               | 0.52  | -0.88             | 0.68 | 0.58  |
| Stored (straw bale yards)                  | 7.0               | 11.81 | 11.63             | 0.76  | 2.05               | 0.80  | -0.40             | 2.45 | 1.65  |
| Stored strawy (" )                         | 9.2               | 11.95 | 13.52             | 1.07  | 0.48               | 0.10  | 1.62              | 1.89 | 1.50  |
| Straw sludge compost: Fresh                | 8.0               | 10.70 | 11.90             | 1.30  | -0.81              | -1.15 | -0.14             | 2.89 | 2.23  |
| Stored                                     | 5.2               | 11.08 | 10.95             | 3.01  | 0.95               | -0.53 | -0.07             | 4.62 | 3.98  |
| Sewage sludge: W.Middlesex                 | 6.5               | 11.09 | 10.32             | 0.90  | 0.62               | 0.17  | -0.52             | 4.43 | 4.40  |
| Enfield                                    | 5.6               | 8.89  | 9.28              | 0.52  | -0.74              | 0.12  | 0.15              | 3.28 | 3.40  |
| Bracken compost                            | 8.0               | 13.19 | 12.14             | -0.84 | -0.74              | 0.73  | -0.10             | 0.35 | -1.41 |
| Peat                                       | 2.0               | 9.09  | 9.37              | 1.06  | 1.33               | -1.23 | -0.07             | 5.29 | 5.66  |

Averages over two levels of organic manure

|                               | Mean Yield        | N                 | P                  | K                 |
|-------------------------------|-------------------|-------------------|--------------------|-------------------|
| No organic manure             | ±0.330            |                   | ±0.393             |                   |
| Dung: Normal (bullock boxes)  | 9.42 <sup>a</sup> | 0.93 <sup>b</sup> | -0.29 <sup>b</sup> | 4.54 <sup>b</sup> |
| Strawy (bullock boxes)        | 13.36             | 0.71              | 0.00               | 0.16              |
| Normal (straw bale yards)     | 13.79             | 0.82              | 0.10               | 0.69              |
| Stored (straw bale yards)     | 14.16             | 1.58              | -0.17              | 0.63              |
| Stored strawy (" )            | 11.72             | 1.41              | 0.20               | 2.05              |
| Straw sludge compost: Fresh   | 12.74             | 0.77              | 0.86               | 1.70              |
| Stored                        | 11.30             | 0.25              | -0.65              | 2.56              |
| Sewage Sludge: West Middlesex | 11.01             | 1.98              | -0.31              | 4.29              |
| Enfield                       | 10.70             | 0.76              | -0.17              | 4.41              |
| Bracken compost               | 9.08              | -0.11             | 0.13               | 3.34              |
| Peat                          | 12.67             | -0.79             | 0.31               | -0.53             |
|                               | 9.23              | 1.19              | -0.65              | 5.48              |
| Mean                          | 11.51             |                   |                    |                   |

Standard errors: (a) 0.269, (b) 0.304

Standard error per plot: per whole plot, 0.808 tons per acre or 7.0%, 24 d.f.  
per sub-plot, 0.908 tons per acre or 7.9%, 87 d.f.



G/8

Effects of various organics

Potatoes. Sawyers III, 1945. (Direct effects)

Total tubers: tons per acre

| Level of manuring                          | Mean Yield        |       | N                 |      | Responses         |      |                   |      |       |
|--|-------------------|-------|-------------------|------|-------------------|------|-------------------|------|-------|
|  | 1                 | 2     | 1                 | 2    | 1                 | 2    | 1                 | 2    |       |
| Treatments, tons/acre<br>(single dressing) | ±0.378            |       | ±0.446            |      | ±0.446            |      | ±0.446            |      |       |
| No organic manure                          | 5.76 <sup>a</sup> |       | 0.83 <sup>b</sup> |      | 0.74 <sup>b</sup> |      | 5.41 <sup>b</sup> |      |       |
| Dung:                                      |                   |       |                   |      |                   |      |                   |      |       |
| (Bullock boxes) Normal                     | 8.0               | 11.80 | 13.13             | 2.17 | 1.18              | 1.12 | 0.37              | 1.26 | -0.04 |
| Straw                                      | 9.5               | 11.79 | 13.04             | 2.69 | 1.54              | 0.65 | 0.45              | 0.92 | 0.72  |
| (Straw Bale yards) Normal                  | 9.6               | 12.18 | 13.42             | 1.98 | 1.11              | 1.71 | 0.35              | 1.76 | 0.16  |
| Straw                                      | 10.2              | 10.50 | 12.40             | 1.71 | 2.63              | 0.37 | 1.45              | 1.58 | 0.66  |
| Stored straw                               | 7.9               | 10.44 | 13.52             | 2.72 | 2.78              | 1.12 | 0.67              | 2.63 | 1.52  |
| Straw Sludge compost: Epsom                | 7.0               | 8.21  | 8.97              | 1.96 | 1.67              | 0.24 | 0.55              | 4.35 | 3.05  |
| Andover                                    | 7.0               | 7.38  | 8.67              | 1.53 | 0.45              | 0.19 | 0.28              | 5.56 | 3.82  |
| Sewage sludge: W.Middlesex                 | 9.7               | 7.25  | 7.55              | 0.54 | 0.84              | 0.71 | 0.13              | 6.67 | 7.76  |
| Stockport                                  | 5.5               | 7.10  | 7.84              | 1.15 | 0.20              | 0.53 | 0.16              | 5.74 | 6.67  |
| Bracken compost                            | 8.0               | 10.94 | 13.92             | 1.72 | 2.24              | 1.11 | 0.50              | 2.11 | 0.86  |
| Peat                                       | 2.0               | 5.48  | 6.79              | 1.26 | 0.92              | 0.15 | 1.27              | 5.89 | 5.80  |

Averages two levels of organic manure

|                             | Mean Yield        | N                 | Responses                           |      |
|-----------------------------|-------------------|-------------------|-------------------------------------|------|
|                             |                   |                   | P                                   | K    |
| No organic manure           | ±0.267            |                   | ±0.315                              |      |
| Dung:                       | 5.76 <sup>a</sup> | 0.83 <sup>b</sup> | 0.74 <sup>b</sup> 5.41 <sup>b</sup> |      |
| (Bullock boxes) Normal      | 12.46             | 1.68              | 0.74                                | 0.61 |
| Straw                       | 12.42             | 2.12              | 0.55                                | 0.82 |
| (Straw bale yards) Normal   | 12.80             | 1.54              | 1.03                                | 0.96 |
| Straw                       | 11.45             | 2.17              | 0.91                                | 1.12 |
| Stored straw                | 11.98             | 2.75              | 0.90                                | 2.08 |
| Straw sludge compost: Epsom | 8.59              | 1.82              | 0.40                                | 3.70 |
| Andover                     | 8.02              | 0.99              | 0.24                                | 4.69 |
| Sewage sludge: W.Middlesex  | 7.40              | 0.69              | 0.42                                | 7.22 |
| Stockport                   | 7.46              | 0.68              | 0.34                                | 6.20 |
| Bracken compost             | 12.43             | 1.98              | 0.80                                | 1.43 |
| Peat                        | 6.14              | 1.09              | 0.71                                | 5.84 |

Mean

9.58

Standard errors: (a) 0.218, (b) 0.244

Standard error per plot: per whole plot, 0.654 tons per acre or 6.8%, 24 d.f.  
per sub-plot, 0.728 tons per acre or 7.6%, 87 d.f.



G/9

Potatoes. Great Knott, 1946 (Direct effects)

Total tubers: tons per acre

| Level of manuring                       | Mean Yield        |             | N                 |       | Responses P        |       | K                 |       |
|---|-------------------|-------------|-------------------|-------|--------------------|-------|-------------------|-------|
|   | 1                 | 2           | 1                 | 2     | 1                  | 2     | 1                 | 2     |
| Treatments, tons/acre (single dressing) | ±0.612            |             | ±0.665            |       | ±0.665             |       | ±0.665            |       |
| No organic manure                       | 8.75 <sup>a</sup> |             | 0.90 <sup>b</sup> |       | -0.02 <sup>b</sup> |       | 3.17 <sup>b</sup> |       |
| Dung:                                   |                   |             |                   |       |                    |       |                   |       |
| Normal (bullock boxes)                  | 8.0               | 10.59 12.14 | 0.16              | 2.25  | 1.27               | 1.26  | 0.35              | 0.32  |
| Strawy (bullock boxes)                  | 9.0               | 11.37 10.76 | 1.05              | 2.77  | 1.36               | 1.72  | 1.46              | 0.32  |
| Normal (straw bale yards)               | 10.1              | 10.87 11.34 | 0.13              | 1.82  | 0.87               | 1.17  | 0.46              | -0.31 |
| Strawy (straw bale yards)               | 8.9               | 10.41 11.63 | 2.21              | 2.08  | -0.05              | 0.01  | 0.51              | 0.65  |
| Straw sludge compost:                   |                   |             |                   |       |                    |       |                   |       |
| Fresh                                   | 8.0               | 9.77 10.54  | 1.17              | 1.27  | -0.29              | -0.43 | 2.13              | 1.41  |
| Stored                                  | 8.0               | 10.21 11.16 | 1.38              | 2.36  | 0.60               | 0.04  | 1.55              | 1.59  |
| Liquid sludge compost                   | 8.0               | 10.82 12.09 | 2.31              | 1.73  | -0.40              | -0.66 | 1.89              | 0.12  |
| Wet sludge                              | 8.3               | 10.11 10.13 | 1.29              | 0.18  | -1.49              | -0.22 | 3.34              | 5.03  |
| Dried sludge                            | 6.2               | 9.85 9.75   | 0.53              | -1.06 | 0.68               | 1.95  | 5.08              | 5.86  |
| Bracken compost                         | 8.0               | 11.94 13.03 | 1.72              | 1.06  | 1.05               | -0.14 | 0.27              | 0.40  |
| Peat                                    | 2.0               | 8.16 8.45   | 0.05              | 0.83  | -0.37              | -0.12 | 3.61              | 3.81  |

Averages over two levels of organic manures

|                              | Mean Yield        | N                 | Responses P        | K                 |
|------------------------------|-------------------|-------------------|--------------------|-------------------|
|                              | ±0.433            |                   | ±0.470             |                   |
| No organic manure            | 8.75 <sup>a</sup> | 0.90 <sup>b</sup> | -0.02 <sup>b</sup> | 3.17 <sup>b</sup> |
| Dung: Normal (bullock boxes) | 11.37             | 1.20              | 1.26               | 0.34              |
| Strawy (bullock boxes)       | 11.06             | 1.91              | 1.54               | 0.89              |
| Normal (straw bale yards)    | 11.10             | 0.97              | 1.02               | 0.07              |
| Strawy (straw bale yards)    | 11.02             | 2.15              | -0.02              | 0.58              |
| Straw sludge compost: Fresh  | 10.16             | 1.22              | -0.36              | 1.77              |
| Stored                       | 10.69             | 1.87              | 0.32               | 1.57              |
| Liquid sludge compost        | 11.46             | 2.04              | -0.53              | 1.01              |
| Wet sludge                   | 10.12             | 0.74              | -0.85              | 4.19              |
| Dried sludge                 | 9.80              | -0.26             | 1.31               | 5.47              |
| Bracken compost              | 12.48             | 1.40              | 0.46               | 0.34              |
| Peat                         | 8.30              | 0.45              | -0.24              | 3.71              |
| Mean                         | 10.4              |                   |                    |                   |

Standard errors: (a) 0.353, (b) 0.364

Standard error per plot: per whole plot, 1.06 tons per acre or 10.1%, 24 d.f.  
per sub-plot, 1.09 tons per acre or 10.4%, 87 d.f.



G/10

Effects of various organics

Potatoes, Great Harpenden II, 1947 (Direct effects)

| Level of manuring                          | Total tubers: tons per acre |           |                   |       |                   |       |
|--|-----------------------------|-----------|-------------------|-------|-------------------|-------|
|  | Mean Yield                  |           | Responses         |       |                   |       |
|  | 1                           | 2         | N                 |       | K                 |       |
| Treatments, tons/acre<br>(single dressing) | ±0.328                      |           | ±0.385            |       | ±0.385            |       |
| No organic manure                          | 7.27 <sup>a</sup>           |           | 0.60 <sup>b</sup> |       | 0.98 <sup>b</sup> |       |
| Dung:                                      |                             |           |                   |       |                   |       |
| (Bullock boxes)                            |                             |           |                   |       |                   |       |
| Stored normal                              | 5.4                         | 8.13 8.46 | 0.90              | 1.23  | -0.30             | 1.00  |
| Stored strawy                              | 4.8                         | 7.58 8.37 | 0.73              | 0.21  | 0.25              | -0.45 |
| (Straw-bale yards)                         |                             |           |                   |       |                   |       |
| Fresh normal                               | 8.7                         | 8.29 7.71 | 0.71              | 0.46  | 0.86              | -0.64 |
| Fresh strawy                               | 10.8                        | 8.69 8.17 | 0.36              | -0.93 | 0.60              | -0.39 |
| Stored normal                              | 6.8                         | 7.94 9.00 | 0.40              | 0.85  | 0.52              | 0.56  |
| Stored strawy                              | 7.8                         | 8.32 8.98 | 1.11              | 0.18  | -0.42             | -0.23 |
| Fresh, low feeding                         | 10.8                        | 8.07 7.91 | 0.38              | 1.08  | 0.61              | -1.00 |
| Fresh, low feeding, with sulph. amm.       | 10.8                        | 8.14 8.80 | 0.33              | -0.72 | 0.35              | -0.25 |
| (Sunken yard) Stored commercial            | 8.0                         | 8.67 9.12 | 0.46              | -0.41 | 0.32              | 0.15  |
| Bracken compost                            | 8.0                         | 7.79 8.94 | 1.04              | 1.42  | 1.26              | 0.89  |
| Straw with sulph. amm. <sup>‡</sup>        | 2.0                         | 6.90 4.85 | -0.43             | -1.35 | 1.13              | 0.50  |

<sup>‡</sup>Single dressing, 2 tons of straw and 0.3 cwt. N per acre

Averages over two levels of organic manure

|                                      | Mean Yield        | Responses         |                   |
|--------------------------------------|-------------------|-------------------|-------------------|
|                                      |                   | N                 | K                 |
|                                      | ±0.232            | ±0.272            |                   |
| No organic manure                    | 7.27 <sup>a</sup> | 0.60 <sup>b</sup> | 0.98 <sup>b</sup> |
| Dung:                                |                   |                   |                   |
| (Bullock boxes)                      |                   |                   |                   |
| Stored normal                        | 8.30              | 1.06              | 0.35              |
| Stored strawy                        | 7.97              | 0.47              | -0.10             |
| (Straw-bale yards)                   |                   |                   |                   |
| Fresh normal                         | 8.09              | 0.58              | 0.11              |
| Fresh strawy                         | 8.43              | -0.28             | 0.11              |
| Stored normal                        | 8.47              | 0.62              | 0.54              |
| Stored strawy                        | 8.65              | 0.64              | -0.32             |
| Fresh, low feeding                   | 7.99              | 0.73              | -0.20             |
| Fresh, low feeding, with sulph. amm. | 8.47              | -0.19             | 0.05              |
| (Sunken yard) Stored commercial      | 8.90              | 0.03              | 0.24              |
| Bracken compost                      | 8.36              | 1.23              | 1.07              |
| Straw with sulphate of ammonia       | 5.88              | -0.89             | 0.81              |
| Mean                                 | 8.03              |                   |                   |
| Standard errors (a) 0.189, (b) 0.211 |                   |                   |                   |

Standard error per plot: per whole plot, 0.567 tons per acre or 7.1%, 50 d.f.  
per sub-plot, 0.445 tons per acre or 5.5%, 29 d.f.



G/11

Barley. Great Harpenden, 1941 (Residual effects)

| Level of manuring                  | Grain: cwt.<br>per acre |      |                   | Straw: cwt.<br>per acre |       |                   |
|------------------------------------|-------------------------|------|-------------------|-------------------------|-------|-------------------|
|                                    | 1                       | 2    | Mean              | 1                       | 2     | Mean              |
|                                    |                         |      | ±1.57             | ±1.11                   | ±1.15 | ±0.81             |
| No organic manure                  | 20.1 <sup>a</sup>       |      | 20.1 <sup>b</sup> | 20.7 <sup>b</sup>       |       | 20.7 <sup>b</sup> |
| Dung: Fresh normal                 | 23.2                    | 24.5 | 23.9              | 23.4                    | 26.3  | 24.8              |
| Fresh strawy                       | 22.8                    | 24.6 | 23.7              | 23.1                    | 25.0  | 24.0              |
| Stored normal                      | 23.3                    | 22.7 | 23.0              | 22.7                    | 26.0  | 24.4              |
| Stored strawy                      | 19.6                    | 20.8 | 20.2              | 21.4                    | 23.7  | 22.6              |
| Fermented town refuse (in ridges)  | 20.4                    | 22.9 | 21.6              | 20.9                    | 23.6  | 22.2              |
| Fermented town refuse (broadcast)  | 20.5                    | 21.4 | 21.0              | 21.7                    | 23.5  | 22.6              |
| Pulverized town refuse (in ridges) | 20.7                    | 21.7 | 21.2              | 24.0                    | 24.3  | 24.2              |
| Pulverized town refuse (broadcast) | 22.1                    | 21.0 | 21.6              | 22.2                    | 23.3  | 22.8              |
| Screened dust                      | 20.0                    | 18.2 | 19.1              | 21.3                    | 20.7  | 21.0              |
| Controlled tip refuse: Luton       | 19.0                    | 20.0 | 19.5              | 20.6                    | 22.1  | 21.3              |
| Wheathampsted                      | 21.5                    | 22.3 | 21.9              | 21.0                    | 22.3  | 21.6              |
| Mean                               |                         |      | 21.4              |                         |       | 22.6              |

Standard errors: (a) 0.906, (b) 0.664

Standard error per plot: Grain, 2.45 cwt. per acre or 11.5%, 24 d.f.  
Straw, 1.72 cwt. per acre or 7.6%, 24 d.f.

Barley. Little Hoos., 1942 (Residual effects)

| Level of manuring              | Grain: cwt.<br>per acre |      |                   | Straw: cwt.<br>per acre |       |                   |
|--------------------------------|-------------------------|------|-------------------|-------------------------|-------|-------------------|
|                                | 1                       | 2    | Mean              | 1                       | 2     | Mean              |
|                                |                         |      | ±1.52             | ±1.07                   | ±1.20 | ±0.85             |
| No organic manure              | 24.4 <sup>c</sup>       |      | 24.4 <sup>c</sup> | 23.7 <sup>e</sup>       |       | 23.7 <sup>e</sup> |
| Dung: Fresh normal             | 28.0                    | 30.4 | 29.2              | 26.5                    | 27.3  | 26.9              |
| Fresh strawy                   | 27.0                    | 30.8 | 28.9              | 25.0                    | 29.1  | 27.0              |
| Stored normal                  | 25.1                    | 28.3 | 26.7              | 24.0                    | 25.4  | 24.7              |
| Stored strawy                  | 25.8                    | 29.6 | 27.7              | 27.1                    | 27.8  | 27.4              |
| Fermented town refuse          | 26.3                    | 27.6 | 27.0              | 24.7                    | 25.2  | 25.0              |
| Pulverized town refuse         | 23.7                    | 24.2 | 24.0              | 21.8                    | 23.5  | 22.6              |
| Screened dust                  | 19.3                    | 22.7 | 21.0              | 19.6                    | 22.4  | 21.0              |
| Sewage sludge: W.Middlesex     | 24.7                    | 26.6 | 25.6              | 23.5                    | 25.8  | 24.6              |
| Birmingham                     | 27.0                    | 31.3 | 29.2              | 25.1                    | 28.9  | 27.0              |
| Composted sludge & town refuse | 22.2                    | 25.8 | 24.0 <sup>d</sup> | 21.6                    | 23.6  | 22.6 <sup>f</sup> |
| Bracken compost                | 25.6                    |      | 25.6 <sup>d</sup> | 22.8                    |       | 22.8 <sup>f</sup> |
| Improved bracken compost       | 24.2                    |      | 24.2 <sup>d</sup> | 23.0                    |       | 23.0 <sup>f</sup> |
| Mean                           |                         |      | 26.0              |                         |       | 24.6              |

Standard errors: (c) 0.88, (d) 1.52, (e) 0.69, (f) 1.20

Standard error per plot: Grain, 2.63 cwt. per acre or 10.1%, 24 d.f.  
Straw, 2.08 cwt. per acre or 8.5%, 24 d.f.

31



G/12

Effects of various organics

Barley. Long Hoes I and II, 1943 (Residual effects)

| Level of manuring           | Grain: cwt. per acre |      |                   | Straw: cwt. per acre |      |      |
|-----------------------------|----------------------|------|-------------------|----------------------|------|------|
|                             | 1                    | 2    | Mean              | 1                    | 2    | Mean |
|                             | $\pm 1.29$           |      | $\pm 0.91$        |                      |      |      |
| No organic manure           | 20.6 <sup>a</sup>    |      | 20.6 <sup>a</sup> | 24.1                 |      | 24.1 |
| Dung: Fresh normal          | 20.7                 | 25.6 | 23.2              | 24.0                 | 28.7 | 26.4 |
| Fresh strawy                | 23.2                 | 25.4 | 24.3              | 26.5                 | 30.7 | 28.6 |
| Stored normal               | 22.9                 | 24.3 | 23.6              | 26.1                 | 27.9 | 27.0 |
| Stored strawy               | 21.5                 | 23.7 | 22.6              | 24.1                 | 28.9 | 26.5 |
| Composted town refuse       | 20.5                 | 22.8 | 21.6              | 23.0                 | 26.6 | 24.8 |
| Fulverized town refuse      | 21.6                 | 21.7 | 21.6              | 24.7                 | 24.7 | 24.7 |
| Sewage sludge: W. Middlesex | 27.9                 | 26.9 | 27.4              | 30.3                 | 30.4 | 30.4 |
| Birmingham                  | 23.4                 | 24.9 | 24.2              | 27.5                 | 27.0 | 27.2 |
| Rotherham                   | 21.1                 | 22.5 | 21.8              | 25.3                 | 26.8 | 26.0 |
| Huddersfield                | 27.8                 | 28.9 | 28.4              | 30.1                 | 33.3 | 31.7 |
| Bracken compost             | 24.2                 | 22.8 | 23.5              | 26.5                 | 25.1 | 25.8 |
| Mean                        |                      |      | 23.4              |                      |      | 26.8 |

Standard error (a) 0.74

Standard error per plot: Grain: 2.23 cwt. per acre or 9.5%, 24 d.f.

Barley. Sawyers II, 1944 (Residual effects)

| Level of manuring            | Grain: cwt. per acre |      |                   | Straw: cwt. per acre |      |                   |
|------------------------------|----------------------|------|-------------------|----------------------|------|-------------------|
|                              | 1                    | 2    | Mean              | 1                    | 2    | Mean              |
|                              | $\pm 1.27$           |      | $\pm 0.90$        | $\pm 1.06$           |      | $\pm 0.75$        |
| No organic manure            | 21.6 <sup>b</sup>    |      | 21.6 <sup>b</sup> | 22.7 <sup>c</sup>    |      | 22.7 <sup>c</sup> |
| Dung: Normal (bullock boxes) | 25.1                 | 26.5 | 25.8              | 26.0                 | 28.0 | 27.0              |
| Strawy (bullock boxes)       | 22.4                 | 24.7 | 23.6              | 23.1                 | 26.2 | 24.6              |
| Rich (galves)                | 27.6                 | 28.2 | 27.9              | 27.8                 | 29.6 | 28.7              |
| Poor (straw-fed cattle)      | 24.4                 | 24.0 | 24.2              | 24.7                 | 26.8 | 25.8              |
| Composted town refuse        | 24.9                 | 22.3 | 23.6              | 22.6                 | 22.3 | 22.4              |
| Fulverized town refuse       | 21.8                 | 24.0 | 22.9              | 23.4                 | 25.0 | 24.2              |
| Straw sludge compost         | 23.8                 | 24.2 | 24.0              | 24.6                 | 27.7 | 26.2              |
| Sewage sludge: W. Middlesex  | 24.8                 | 23.1 | 24.0              | 25.9                 | 23.5 | 24.7              |
| Birmingham                   | 21.4                 | 23.6 | 22.5              | 22.8                 | 24.0 | 23.4              |
| Harpenden                    | 23.9                 | 24.2 | 24.0              | 23.0                 | 24.6 | 23.8              |
| Bracken compost              | 23.1                 | 24.2 | 23.6              | 25.7                 | 26.2 | 26.0              |
| Mean                         |                      |      | 23.9              |                      |      | 24.9              |

Standard errors: (b) 0.73, (c) 0.61.

Standard errors per plot: Grain, 2.20 cwt. per acre or 9.2%, 24 d.f.

Straw, 1.83 cwt. per acre or 7.4%, 24 d.f.



G/13

Barley. Sawyers I, 1945 (Residual effects)

| Level of manuring            | Grain: cwt. per acre |      |                   | Straw: cwt. per acre |      |                   |
|------------------------------|----------------------|------|-------------------|----------------------|------|-------------------|
|                              | 1                    | 2    | Mean              | 1                    | 2    | Mean              |
|                              | ±0.60                |      | ±0.42             | ±1.34                |      | ±0.95             |
| No organic manure            | 30.8 <sup>a</sup>    |      | 30.8 <sup>a</sup> | 38.7 <sup>b</sup>    |      | 38.7 <sup>b</sup> |
| Dung: Normal (bullock boxes) | 32.5                 | 33.7 | 33.1              | 42.0                 | 44.7 | 43.4              |
| Straw (bullock boxes)        | 33.4                 | 33.2 | 33.3              | 43.1                 | 44.7 | 43.9              |
| Normal (straw bale yards)    | 33.2                 | 34.4 | 33.8              | 39.9                 | 46.2 | 43.0              |
| Stored (straw bale yards)    | 30.3                 | 31.9 | 31.1              | 39.9                 | 41.4 | 40.6              |
| Stored strawy ( " )          | 31.7                 | 33.2 | 32.4              | 41.1                 | 41.3 | 41.2              |
| Straw sludge compost: Fresh  | 32.6                 | 32.8 | 32.7              | 45.8                 | 42.0 | 43.9              |
| Stored                       | 33.3                 | 32.2 | 32.8              | 41.9                 | 42.6 | 42.2              |
| Sewage sludge: W.Middlesex   | 33.0                 | 32.3 | 32.6              | 43.6                 | 45.2 | 44.4              |
| Enfield                      | 31.9                 | 31.2 | 31.6              | 41.9                 | 42.3 | 42.1              |
| Bracken compost              | 32.3                 | 33.2 | 32.8              | 42.4                 | 44.7 | 43.6              |
| Peat                         | 30.9                 | 31.2 | 31.0              | 41.0                 | 39.6 | 40.3              |
| Mean                         |                      |      | 32.3              |                      |      | 42.1              |

Standard errors: (a) 0.35, (b) 0.77

Standard errors per plot: Grain, 10.4 cwt. per acre or 3.2%, 24 d.f.  
 Straw, 2.32 cwt. per acre or 5.5%, 24 d.f.

Wheat. Sawyers III, 1946 (Residual effects)

| Level of manuring            | Grain: cwt. per acre |      |                   | Straw: cwt. per acre |      |                   |
|------------------------------|----------------------|------|-------------------|----------------------|------|-------------------|
|                              | 1                    | 2    | Mean              | 1                    | 2    | Mean              |
|                              | ±1.02                |      | ±0.72             | ±1.45                |      | ±1.02             |
| No organic manure            | 37.0 <sup>c</sup>    |      | 37.0 <sup>c</sup> | 44.7 <sup>d</sup>    |      | 44.7 <sup>d</sup> |
| Dung: Normal (bullock boxes) | 43.0                 | 47.0 | 45.0              | 50.4                 | 55.0 | 52.7              |
| Straw (bullock boxes)        | 42.3                 | 47.9 | 45.1              | 48.4                 | 57.4 | 52.9              |
| Normal (straw-bale boxes)    | 44.2                 | 45.4 | 44.8              | 51.1                 | 57.5 | 54.3              |
| Straw (straw-bale boxes)     | 41.8                 | 46.0 | 43.9              | 48.0                 | 54.4 | 51.2              |
| Stored strawy ( " )          | 40.2                 | 42.6 | 41.4              | 47.7                 | 50.4 | 49.0              |
| Straw sludge compost: Epsom  | 40.3                 | 42.6 | 41.4              | 47.5                 | 50.1 | 48.8              |
| Andover                      | 40.9                 | 41.4 | 41.2              | 47.3                 | 49.9 | 48.6              |
| Sewage sludge: W.Middlesex   | 40.1                 | 41.3 | 40.7              | 49.6                 | 52.1 | 50.8              |
| Stockport                    | 40.9                 | 39.1 | 40.0              | 48.6                 | 50.2 | 49.4              |
| Bracken compost              | 39.4                 | 43.2 | 41.3              | 48.3                 | 53.4 | 50.8              |
| Peat                         | 38.9                 | 38.0 | 38.4              | 46.0                 | 47.5 | 46.8              |
| Mean                         |                      |      | 41.5              |                      |      | 49.8              |

Standard errors: (c) 0.59, (d) 0.84.

Standard errors per plot: Grain, 1.77 cwt. per acre or 4.3%, 24 d.f.  
 Straw, 2.50 cwt. per acre or 5.0%, 24 d.f.



G/14

Effects of various organics

Wheat. Great Knott II, 1947 (Residual effects)

| Level of manuring            | Grain: cwt.per acre |      |                   | Straw: cwt.per acre |      |      |
|------------------------------|---------------------|------|-------------------|---------------------|------|------|
|                              | 1                   | 2    | Mean              | 1                   | 2    | Mean |
|                              | ±1.64               |      | ±1.16             |                     |      |      |
| No organic manure            | 26.0 <sup>a</sup>   |      | 26.0 <sup>a</sup> | 23.6                |      | 23.6 |
| Dung: Normal (bullock boxes) | 26.2                | 25.9 | 26.0              | 22.9                | 22.0 | 22.4 |
| Strawy (bullock boxes)       | 28.8                | 23.3 | 26.0              | 24.9                | 23.0 | 24.0 |
| Normal (straw-bale yards)    | 24.7                | 24.0 | 24.4              | 21.4                | 23.0 | 22.2 |
| Strawy (straw-bale yards)    | 24.6                | 27.9 | 26.2              | 24.8                | 25.4 | 25.1 |
| Straw sludge compost: Fresh  | 24.5                | 25.2 | 24.8              | 21.8                | 24.5 | 23.2 |
| Stored                       | 26.2                | 30.1 | 28.2              | 22.4                | 26.2 | 24.3 |
| Liquid sludge compost        | 25.1                | 25.5 | 25.3              | 23.1                | 24.9 | 24.0 |
| Sewage sludge: Wet           | 24.1                | 24.1 | 24.1              | 21.7                | 22.0 | 21.8 |
| Dried                        | 25.6                | 24.2 | 24.9              | 25.1                | 23.6 | 24.4 |
| Rotted bracken               | 25.8                | 25.9 | 25.8              | 24.4                | 24.7 | 24.6 |
| Peat                         | 21.4                | 27.4 | 24.4              | 20.3                | 24.1 | 22.2 |
| Mean                         |                     |      | 25.5              |                     |      | 23.5 |

Standard error (a) 0.95

Standard error per plot: Grain, 2.84 cwt.per acre or 11.1%, 24 d.f.



H/1

DIRECT AND RESIDUAL EFFECTS OF THREE ORGANIC MANURES

Great Harpenden, 1940 - 1947

and

Woburn, Butt Furlong, 1940 - 1941

These two experiments were identical in design. They tested the effects of fermented town refuse and screened dust (each applied before or after ploughing) and of dung, and also of sulphate of ammonia and muriate of potash.

Design; 4 randomized blocks of 12 plots each. Plots split for application of artificials and for the early and late applications of town refuse and screened dust. Certain interactions confounded with differences between whole plots. Area of each sub-plot; Rothamsted, 0.01 acre; Woburn, 0.007 acre.

Treatments

Whole plots Organic manures; Dung, fermented town refuse and screened dust applied as follows (1) None  
(2) 8 tons per acre every year except 1947  
(3) 16 tons per acre in even years only  
(4) 16 tons per acre in odd years only except 1947,  
except that at Woburn the rates were 10 and 20 tons per acre

Sub-plots Time of application; Town refuse and screened dust applied before and after ploughing. (Town refuse in 1940 and 1941 only).  
Sulphate of ammonia; None, 0.6 cwt. N per acre every year except 1947  
Muriate of potash; None, and as follows (amounts in cwt. K<sub>2</sub>O per acre), 1.0 in 1940, 0.5 every year from 1942 to 1946.  
Each treatment was always applied to the same plot.  
In 1947 none of the above treatments were applied, but muriate of potash was applied as a whole-plot treatment at these rates; None, and 1.2 cwt. K<sub>2</sub>O per acre.

Basal Manuring; 1940, 0.6 cwt. P<sub>2</sub>O<sub>5</sub> per acre as superphosphate  
1941-44 and 1946, 0.4 cwt. P<sub>2</sub>O<sub>5</sub> per acre as superphosphate  
1947, 0.6 cwt. N per acre as sulphate of ammonia  
0.5 cwt P<sub>2</sub>O<sub>5</sub> per acre as superphosphate



H/2

Effects of Three Organics

Crop Notes

| Year<br>(Rothamsted) | Crop       | Variety          | Sown     | Harvested                          |
|----------------------|------------|------------------|----------|------------------------------------|
| 1940                 | Sugar Beet | Kleinwanzleben E | May 20   | Dec. 2<br>Previous Crop,<br>Wheat  |
| 1941                 | Mangolds   | Yellow Globe     | Apr. 24  | Oct. 18                            |
| 1942                 | Mangolds   | Yellow Globe     | May 2    | Nov. 16                            |
| 1943                 | Barley     | Plumage Archer   | March 2  | Aug. 5                             |
| 1944                 | Beans      | Garton's Giant   | 29/10/43 | Aug. 2                             |
| 1945                 | Wheat      | Jubilagem        | 25/10/44 | Aug. 3                             |
| 1946                 | Sugar Beet | Klein            | March 15 | Nov. 19                            |
| 1947                 | Potatoes   | Majestic         | May 7    | Sept. 30                           |
| (Woburn)             |            |                  |          |                                    |
| 1940                 | Sugar Beet | Kleinwanzleben   | April 25 | Oct. 29 Previous<br>crop<br>barley |
| 1941                 | Mangolds   | Yellow Globe     | May 7    | Nov. 12                            |



H/3

| Organic manures<br>tons per acre | Sugar Beet - Rothamsted, 1940 |      |    |             | Screened |      | Mean |
|----------------------------------|-------------------------------|------|----|-------------|----------|------|------|
|                                  | None                          | Dung |    | Town refuse |          | Dust |      |
|                                  |                               | 8    | 16 | 8           | 16       | 8    | 16   |

Roots washed: tons per acre

|                                 |       |       |       |       |       |       |       |       |
|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Mean yield                      | 11.49 | 12.26 | 12.67 | 11.64 | 11.21 | 12.22 | 11.57 | 11.71 |
| Early-late applicn. of organics |       |       |       | 0.02  | -0.08 | -0.01 | 0.51  | 0.11  |
| Response to N                   | 1.25  | 1.60  | 2.18  | 1.23  | 1.31  | 1.69  | 2.57  | 1.51  |
| Response to K                   | -0.15 | -0.70 | 0.06  | -0.51 | 0.37  | -1.24 | 0.16  | -0.23 |

Sugar Percentage

|                                 |       |       |       |       |       |       |       |       |
|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Mean yield                      | 17.92 | 17.84 | 17.59 | 18.19 | 18.04 | 17.92 | 17.96 | 17.92 |
| Early-late applicn. of organics |       |       |       | -0.40 | 0.08  | -0.06 | -0.25 | -0.16 |
| Response to N                   | -0.32 | -0.40 | -0.10 | 0.07  | -0.29 | -0.40 | 0.02  | -0.25 |
| Response to K                   | 0.17  | 0.50  | 0.08  | 0.25  | 0.09  | -0.06 | 0.26  | 0.18  |

Total sugar: cwt. per acre

|  |                   |      |      |      |      |      |      |                  |
|--|-------------------|------|------|------|------|------|------|------------------|
| Mean yield $\pm 1.70$                      | 41.2 <sup>a</sup> | 43.7 | 44.6 | 42.3 | 40.4 | 43.8 | 41.6 | 42.0             |
| Early-late applicn. of organics $\pm 1.92$ |                   |      |      | -0.8 | -0.2 | -0.2 | 1.3  | 0.0 <sup>c</sup> |
| Response to N $\pm 1.92$                   | 3.8 <sup>b</sup>  | 4.8  | 7.4  | 4.7  | 4.1  | 5.1  | 9.3  | 4.8 <sup>d</sup> |
| Response to K $\pm 1.92$                   | -0.1 <sup>b</sup> | -1.3 | 0.3  | -1.3 | 1.5  | -4.6 | 1.0  | 0.4 <sup>d</sup> |

Tops: tons per acre

|   |                   |      |       |      |       |       |       |                   |
|---|-------------------|------|-------|------|-------|-------|-------|-------------------|
| Mean yield $\pm 0.360$                      | 8.31 <sup>e</sup> | 8.92 | 10.50 | 8.58 | 7.55  | 8.69  | 8.39  | 8.54              |
| Early-late applicn. of organics $\pm 0.500$ |                   |      |       | 0.17 | -0.08 | -0.11 | 0.35  | 0.08 <sup>g</sup> |
| Response to N $\pm 0.500$                   | 2.63 <sup>f</sup> | 2.54 | 3.12  | 2.38 | 1.91  | 3.24  | 3.16  | 2.68 <sup>h</sup> |
| Response to K $\pm 0.500$                   | 0.23 <sup>f</sup> | 0.33 | 0.25  | 0.23 | 0.61  | -0.16 | -0.30 | 0.20 <sup>h</sup> |

Plant number: thousands per acre

|                                 |      |      |      |      |      |      |      |      |
|---------------------------------|------|------|------|------|------|------|------|------|
| Mean yield                      | 28.5 | 29.2 | 29.4 | 29.7 | 30.1 | 29.5 | 29.8 | 29.1 |
| Early-late applicn. of organics |      |      |      | -1.1 | -0.6 | 0.1  | -0.1 | -0.4 |
| Response to N                   | 0.1  | 0.1  | 0.1  | 0.2  | 0.2  | -1.0 | -0.3 | 0.0  |
| Response to K                   | 0.9  | -0.2 | 0.4  | -0.2 | 0.1  | -0.2 | 0.0  | 0.5  |

Standard errors: (a) 0.692, (b) 0.782, (c) 0.958, (d) 0.553,  
(e) 0.147, (f) 0.204, (g) 0.250, (h) 0.144

Per whole plot

Sub-plot

Total sugar, cwt. per acre 3.39 or 8.1%, 38 d.f. 2.71 or 6.5%, 30 d.f.  
Tops, tons per acre 0.719 or 8.4%, 38 d.f. 0.707 or 8.3%, 30 d.f.



H/4

Effects of Three Organics

Mangolds - Rothamsted, 1941

| Tons per acre 1941                    | Dung               |       |       | Town refuse |       |       | Screened Dust |       |       | Mean               |
|---------------------------------------|--------------------|-------|-------|-------------|-------|-------|---------------|-------|-------|--------------------|
|                                       | 0                  | 8     | 16    | 0           | 8     | 16    | 0             | 8     | 16    |                    |
| None                                  |                    |       |       |             |       |       |               |       |       |                    |
| Mean yield ±1.78                      | 20.26 <sup>a</sup> | 22.70 | 26.40 | 23.35       | 26.89 | 28.90 | 24.43         | 21.99 | 23.70 | 23.81              |
| Early-late applien. of organics ±1.93 | 5.15 <sup>b</sup>  | 7.94  | 8.87  | 2.26        | -2.31 | -1.36 | 5.62          | -2.71 | -0.56 | -1.74 <sup>c</sup> |
| Response to N ±1.93                   |                    |       |       |             |       |       |               |       |       | 5.71 <sup>d</sup>  |
| Response to residual K ±1.93          | -1.17 <sup>b</sup> | 4.82  | -1.57 | -0.47       | 1.50  | 1.29  | -2.34         | -2.25 | -2.54 | -0.20 <sup>d</sup> |

Plant number; thousands per acre

|                                       |                   |      |      |      |      |      |      |      |      |      |                   |
|---------------------------------------|-------------------|------|------|------|------|------|------|------|------|------|-------------------|
| Mean ±1.93                            | 13.3 <sup>e</sup> | 16.5 | 13.9 | 18.9 | 15.2 | 18.2 | 19.3 | 15.7 | 15.6 | 15.9 | 15.8              |
| Early-late applien. of organics ±1.53 | 1.0 <sup>f</sup>  | -0.8 | 1.4  | 1.6  | -0.8 | -3.4 | -1.2 | 0.6  | -1.2 | -0.8 | -1.7 <sup>g</sup> |
| Response to N ±1.53                   |                   |      |      |      |      |      |      |      |      |      | 0.4 <sup>h</sup>  |
| Response to residual K ±1.53          | -1.1 <sup>f</sup> | 0.8  | 3.0  | 0.2  | 0.5  | 0.3  | 0.9  | -1.5 | 1.3  | -1.1 | 0.1 <sup>h</sup>  |

Standard errors; (a) 1.03 (b) 1.12 (c) 0.97 (d) 0.56 (e) 1.11 (f) 0.88  
(g) 0.76 (h) 0.43

Per whole plot                                  Sub-plot

Roots, tons per acre                                  3.56 or 14.9%, 35 d.f.                                  2.73 or 11.5%, 34 d.f.

Plant no., thous. per acre                                  3.86 or 24.5%, 35 d.f.                                  2.11 or 13.4%, 34 d.f.

Direct organic treatments were confounded with residual organic treatments; see treatment details.



Mangolds - Rothamsted, 1942

| Tons per acre 1942                     | None      |          | Dung      |           | Town refuse |          | Screened dust |       | Mean              |
|--|-----------|----------|-----------|-----------|-------------|----------|---------------|-------|-------------------|
|  | 0         | 16       | 8         | 16        | 0           | 8        | 0             | 16    |                   |
| Mean yield $\pm 1.35$                  | 23.34     | 27.91    | 31.23     | 26.78     | 26.74       | 22.30    | 24.40         | 25.06 | 24.33             |
| Early-late applicn. of dust $\pm 1.86$ | 4.14      | 4.66     | 6.35      | -0.99     | 4.90        | 2.62     | 0.45          | 2.08  | 1.26 <sup>c</sup> |
| Response to N $\pm 1.86$               | 3.75      | 2.31     | 3.40      | 6.50      | 0.61        | -1.40    | 6.99          | 3.20  | 3.70 <sup>d</sup> |
| Response to K $\pm 1.86$               |           |          |           |           | 2.70        |          | 3.37          | 2.60  | 2.41 <sup>d</sup> |
| Mean $\pm 1.00$                        | 18.5      | 19.1     | 16.1      | 18.0      | 17.8        | 19.0     | 19.5          | 17.1  | 18.5              |
| Early-late applicn. of dust $\pm 1.41$ | -0.2      | 0.0      | 0.1       | 0.2       | 0.1         | -0.1     | -0.1          | 0.3   | 0.1 <sup>g</sup>  |
| Response to N $\pm 1.41$               | 2.0       | -0.8     | -1.4      | -1.4      | -0.1        | 1.9      | -2.3          | -3.2  | -0.7 <sup>h</sup> |
| Response to K $\pm 1.86$               |           |          |           |           |             |          | -1.2          | 1.8   | -0.2 <sup>h</sup> |
| Standard errors;                       | (a) 0.779 | (b) 1.07 | (c) 0.930 | (d) 0.537 | (e) 0.58    | (f) 0.81 | (g) 0.70      |       |                   |
|  | (h) 0.41  |          |           |           |             |          |               |       |                   |

Plant number; thousands per acre

Per whole plot                      Sub-plot

Roots, tons per acre    2.70 or 11.1%, 35 d.f.    2.63 or 10.8%, 25 d.f.  
 Plant no., thous. per acre 2.16 or 11.7%, 35 d.f.    1.99 or 10.8%, 25 d.f.

Direct organic treatments were confounded with residual organic treatments; see treatment details.



H/6

Effect of Three Organics

Barley - Rothamsted, 1943

| Tons per acre 1943                     | Dung                 |        |        | Town refuse |        |        | Screened dust |        |      | Mean |                  |
|--|----------------------|--------|--------|-------------|--------|--------|---------------|--------|------|------|------------------|
|  | None                 | 0 8 16 | 0 8 16 | 0 8 16      | 0 8 16 | 0 8 16 | 0 8 16        | 0 8 16 |      |      |                  |
|  | Grain, cwt. per acre |        |        |             |        |        |               |        |      |      |                  |
| Mean yield $\pm 1.16$                  | 31.2 <sup>a</sup>    | 37.7   | 36.4   | 38.9        | 33.6   | 34.7   | 36.4          | 33.9   | 32.3 | 31.2 | 34.1             |
| Early-late applicn. of dust $\pm 1.54$ |                      |        |        |             |        |        |               | 1.4    | 1.4  | 1.4  | 1.4 <sup>c</sup> |
| Resp. to N $\pm 1.54$                  | 10.6 <sup>b</sup>    | 5.8    | 6.6    | 6.3         | 10.4   | 9.3    | 4.0           | 10.6   | 10.0 | 9.2  | 8.7 <sup>d</sup> |
| Resp. to K $\pm 1.54$                  | 0.0                  | -0.4   | 0.1    | 3.4         | 0.6    | -1.1   | -1.3          | 0.2    | 0.5  | -0.8 | 0.1 <sup>d</sup> |
|  | Straw, cwt. per acre |        |        |             |        |        |               |        |      |      |                  |
| Mean yield                             | 37.0                 | 47.1   | 45.6   | 45.2        | 38.7   | 39.6   | 41.6          | 38.2   | 38.0 | 40.4 | 40.4             |
| Early-late applicn. of dust            |                      |        |        |             |        |        |               |        |      |      |                  |
| Response to N                          | 14.1                 | 14.2   | 9.9    | 11.5        | 13.7   | 13.1   | 10.8          | 15.6   | 15.0 | 12.6 | -1.6             |
| Response to K                          | 1.6                  | 2.2    | 1.1    | 1.4         | 0.5    | -1.7   | -1.6          | 0.2    | 0.1  | 1.4  | 13.2             |

Standard errors (a) 0.67 (b) 0.89 (c) 0.77 (d) 0.44

Per whole plot Sub-plot

Grain cwt. per acre 2.32 or 6.8%, 35 d.f. 2.18 or 6.4%, 25 d.f.

Direct organic treatments were confounded with residual organic treatments; see treatment details.



Beans - Rothamsted, 1944

| Tons per acre 1944                        | Ncrc              | Dung |      | Town refuse |      | Screened dust |      | Mean              |
|---|-------------------|------|------|-------------|------|---------------|------|-------------------|
|   |                   | 0    | 16   | 0           | 16   | 0             | 16   |                   |
| Mean yield $\pm 1.18$                     | 11.0 <sup>a</sup> | 23.3 | 25.4 | 26.3        | 14.2 | 13.2          | 14.2 | 16.2              |
| Early-late applicn.<br>of dust $\pm 1.61$ | -0.6 <sup>b</sup> | 2.5  | -0.2 | 1.5         | -1.6 | 2.7           | 1.4  | 0.5 <sup>c</sup>  |
| Response to N $\pm 1.61$                  | 8.7 <sup>b</sup>  | 2.8  | 0.2  | 0.6         | 7.4  | 7.8           | 7.5  | 0.6 <sup>d</sup>  |
| Response to K $\pm 1.61$                  |                   |      |      |             |      |               |      | 6.2 <sup>d</sup>  |
| Mean yield $\pm 0.82$                     | 12.7 <sup>c</sup> | 19.4 | 20.4 | 21.2        | 14.4 | 13.3          | 15.5 | 15.8              |
| Early-late applicn.<br>of dust $\pm 1.75$ | -0.5 <sup>f</sup> | 1.1  | -0.6 | -0.1        | -1.3 | -0.8          | 0.6  | 0.2 <sup>g</sup>  |
| Response to N $\pm 1.75$                  | 6.3 <sup>f</sup>  | 2.1  | -0.8 | -0.8        | 3.2  | 5.9           | 3.4  | -0.3 <sup>h</sup> |
| Response to K $\pm 1.75$                  |                   |      |      |             |      |               |      | 3.5 <sup>h</sup>  |

Standard errors; (a) 0.68 (b) 0.93 (c) 0.80 (d) 0.47 (e) 0.48 (f) 1.01  
(g) 0.88 (h) 0.51

Per whole plot

Sub-plot

Grain, cwt. per acre 2.36 or 14.6%, 35 d.f. 2.28 or 14.1%, 25 d.f.  
Straw, cwt. per acre 1.65 or 10.5%, 35 d.f. 2.48 or 15.7%, 25 d.f.

Direct organic treatments were confounded with residual organic treatments; see treatment details.



H/8

Effects of Three Organics

Wheat - Rothamsted 1945

| Tons per acre 1945   | None |      |      | Dung |      |      | Town refuse |      |      | Screened dust |      |      | Mean  |
|--|------|------|------|------|------|------|-------------|------|------|---------------|------|------|---|
|  | 0    | 8    | 16   | 0    | 8    | 16   | 0           | 8    | 16   | 0             | 8    | 16   |   |
| Mean yield $\pm 1.14$<br>Early-late applicn. of<br>dust $\pm 1.40$ | 37.1 | 36.5 | 37.5 | 30.8 | 33.5 | 35.0 | 34.3        | 33.7 | 32.9 | 34.3          | 33.7 | 32.9 | 33.7  |
| Response to N $\pm 1.40$<br>Response to K $\pm 1.40$               | 6.7  | 9.0  | 7.4  | 7.6  | 6.3  | 5.2  | 0.8         | -0.6 | -0.9 | 10.4          | 9.2  | 9.0  | -0.2 <sup>c</sup><br>8.7 <sup>d</sup><br>0.5 <sup>d</sup> |
|  | -2.0 | 0.3  | 0.6  | 2.8  | 0.1  | 0.9  | 2.4         | 0.5  | -0.5 |               |      |      |   |
| Mean yield $\pm 1.94$<br>Early-late applicn. of<br>dust $\pm 1.83$ | 57.2 | 55.2 | 57.2 | 48.2 | 50.3 | 50.8 | 51.3        | 50.0 | 48.4 | 51.3          | 50.0 | 48.4 | 50.5  |
| Response to N $\pm 1.83$<br>Response to K $\pm 1.83$               | 13.0 | 14.7 | 13.4 | 14.4 | 14.4 | 10.4 | 1.9         | -1.0 | -0.3 | 17.2          | 15.3 | 16.1 | 0.2 <sup>g</sup><br>14.6 <sup>h</sup><br>0.0 <sup>h</sup> |
|  | -2.0 | 0.3  | -0.6 | 1.1  | -0.8 | 0.6  | 1.6         | -0.5 | 1.4  |               |      |      |   |

Standard errors (a) 0.66 (b) 0.81 (c) 0.70 (d) 0.41 (e) 1.12 (f) 1.06 (g) 0.92 (h) 0.53

Per whole plot

Sub-plot

Grain, cwt. per acre 2.29 or 6.8%, 34 d.f. 1.99 or 5.9%, 25 d.f.  
 Straw, cwt. per acre 3.89 or 7.7%, 34 d.f. 2.59 or 5.1%, 25 d.f.

Direct organic treatments were confounded with residual organic treatments; see treatment details.



Sugar Beet - Rothamsted, 1946

| Tons per acre  | 1946              |  | None  | Dung  |       |       | Town refuse |       |       | Screened dust |                    |   | Mean |
|--|-------------------|--|-------|-------|-------|-------|-------------|-------|-------|---------------|--------------------|---|------|
|  | 0                 | 8  |       | 16    | 0     | 8     | 16          | 0     | 8     | 16            | 0                  | 8 |      |
| Mean yield $\pm 0.49$<br>early-late applicn.<br>of dust $\pm 0.76$ | 12.07a            | 16.23                                      | 15.36 | 15.68 | 14.78 | 14.22 | 15.09       | 15.12 | 15.16 | 15.50         | 14.44              |   |      |
| Response to N $\pm 0.76$   | 2.93 <sup>b</sup> | 4.66                                       | 5.88  | 3.33  | 2.13  | 3.85  | 4.02        | -0.09 | -1.84 | 1.70          | -0.08 <sup>b</sup> |   |      |
| Response to K $\pm 0.76$   | 0.90b             | -0.44                                      | 0.98  | 1.15  | 0.47  | -0.13 | 2.30        | 3.68  | 4.06  | 3.46          | 3.66 <sup>c</sup>  |   |      |
|  |                   |  |       |       |       |       |             | -0.27 | -2.63 | -0.88         | 0.27 <sup>c</sup>  |   |      |
|  |                   | Roots (washed) - tons per acre             |       |       |       |       |             |       |       |               |                    |   |      |
|  |                   | Total Sugar - cwt. per acre <sup>***</sup> |       |       |       |       |             |       |       |               |                    |   |      |
| Mean yield   | 39.3              | 55.0                                       | 50.2  | 54.2  | 49.0  | 47.6  | 51.4        | 52.1  | 52.8  | 52.8          | 48.6               |   |      |
| Response to N  | 9.6               | 13.4                                       | 16.9  | 6.9   | 6.1   | 10.3  | 12.5        | 11.8  | 14.4  | 12.9          | 11.2               |   |      |
|  |                   | Sugar Percentage <sup>***</sup>            |       |       |       |       |             |       |       |               |                    |   |      |
| Mean   | 16.48             | 17.05                                      | 16.43 | 17.05 | 16.86 | 16.90 | 17.26       | 16.90 | 17.18 | 17.00         | 16.84              |   |      |
| Response to N  | -0.49             | -0.58                                      | 0.26  | -0.64 | -0.32 | -0.55 | -0.19       | 0.35  | 0.03  | -0.23         | -0.36              |   |      |

Standard errors (a) 0.28 (b) 0.43 (c) 0.22  
 Direct organic treatments were confounded with residual organic treatments; see treatment details

The samples taken from each plot for analysis were bulked so that only the above comparisons were possible.



H/10

Effects of Three Organics

| Tons per acre 1946                     | Sugar Beet - Rothamsted 1946 |                                   |                      | Town refuse |          |       | Screened Dust |       |       | Mean  |                   |                                |
|--|------------------------------|-----------------------------------|----------------------|-------------|----------|-------|---------------|-------|-------|-------|-------------------|--------------------------------|
|  | None                         | 0                                 | 8                    | 16          | 0        | 8     | 16            | 0     | 8     |       | 16                |                                |
| Mean yield $\pm 0.82$                  | 9.00d                        | 9.78                              | 11.56                | 11.72       | 11.57    | 11.51 | 10.64         | 9.59  | 11.75 | 9.39  | 10.38             |                                |
| Early-late applicn. of dust $\pm 1.29$ |                              |                                   |                      |             |          |       |               | 2.17  | 2.27  | -1.76 | 0.90 <sup>e</sup> |                                |
| Response to N $\pm 1.29$               | 4.87e                        | 4.55                              | 5.45                 | 4.24        | 3.18     | 6.23  | 5.11          | 4.85  | 0.23  | -0.73 | 3.97f             |                                |
| Response to K $\pm 1.29$               | -0.33e                       | -0.31                             | 2.10                 | -0.22       | -0.13    | -1.18 | 0.38          | -0.29 | -1.69 | -1.45 | -0.31f            |                                |
|  |                              | Tops - tons per acre              |                      |             |          |       |               |       |       |       |                   |                                |
| Mean yield $\pm 0.68$                  | 32.0 g                       | 31.2                              | 31.1                 | 30.5        | 31.4     | 31.4  | 30.8          | 31.2  | 32.4  | 31.4  | 31.5              |                                |
| Early-late applicn. of dust $\pm 0.61$ |                              |                                   |                      |             |          |       |               | 1.2   | -0.1  | 0.8   | 0.6 <sup>h</sup>  |                                |
| Response to N $\pm 0.61$               | -1.0h                        | -1.9                              | -0.6                 | -1.4        | -1.3     | 0.0   | -0.6          | -1.4  | -0.9  | -1.6  | -1.1j             |                                |
| Response to K $\pm 0.61$               | 0.5h                         | 0.5                               | -0.8                 | 0.7         | 0.5      | 0.5   | -1.0          | -0.8  | -0.9  | -0.5  | -0.1j             |                                |
|  |                              | Plant number - thousands per acre |                      |             |          |       |               |       |       |       |                   |                                |
| Standard errors (d) 0.47               | (e) 0.75                     | (f) 0.37                          | (g) 0.39             | (h) 0.35    | (j) 0.18 |       |               |       |       |       |                   |                                |
|  |                              | Standard errors per whole plot    |                      |             |          |       |               |       |       |       |                   |                                |
| Roots (washed) tons per acre           |                              | 0.99                              | or 6.8 <sub>v</sub>  | 34 d.f.     |          |       |               |       |       |       | 1.07              | or 7.4 <sub>v</sub> , 25 d.f.  |
| Tops tons per acre                     |                              | 1.64                              | or 15.8 <sub>v</sub> | 32 d.f.     |          |       |               |       |       |       | 1.82              | or 17.6 <sub>v</sub> , 23 d.f. |
| Plant number thousands per acre        |                              | 1.36                              | or 4.3 <sub>v</sub>  | 34 d.f.     |          |       |               |       |       |       | 0.86              | or 2.7 <sub>v</sub> , 25 d.f.  |

Direct organic treatments were confounded with residual organic treatments; see treatment details.



Potatoes - Rothamsted 1947

| Tons per acre 1946                 | Dung               |      |       | Town Refuse |       |       | Screened Dust |       |       | Mean               |
|------------------------------------|--------------------|------|-------|-------------|-------|-------|---------------|-------|-------|--------------------|
|                                    | None               | 8    | 16    | 0           | 8     | 16    | 0             | 8     | 16    |                    |
| Mean yield $\pm 0.230$             | 7.12a              | 9.27 | 9.32  | 7.90        | 7.20  | 7.86  | 7.91          | 7.74  | 8.28  | 8.01               |
| Response to residual N $\pm 0.376$ | -0.47 <sup>b</sup> | 0.00 | 0.29  | -0.57       | -0.10 | -0.45 | 0.84          | -0.17 | -0.75 | -0.15 <sup>d</sup> |
| Response to residual K $\pm 0.376$ | 0.71 <sup>b</sup>  | 0.64 | -0.16 | 0.52        | 0.58  | -0.85 | 0.58          | 1.14  | 0.89  | 0.60 <sup>d</sup>  |
| Response to direct K $\pm 0.476$   | 1.82c              | 0.09 | 0.22  | 2.07        | 2.40  | 0.77  | 1.30          | 1.83  | 0.45  | 1.27 <sup>a</sup>  |

Total tubers, tons per acre

Standard errors; (a) 0.133 (b) 0.217 (c) 0.266 (d) 0.108

Per whole plot Sub-plot

0.459 or 5.7%, 24 d.f.

0.532 or 6.6%, 25 d.f.

45

All treatments were residual this year, except for the direct application of potash.



H/12

Effects of Three Organics

Sugar Beet - Woburn, 1940

| Tons per acre 1940                             | None              | Dung  |       | Town refuse |       | Screened dust |       | Mean  |
|--|-------------------|-------|-------|-------------|-------|---------------|-------|-------|
|  |                   | 10    | 20    | 10          | 20    | 10            | 20    |       |
| Roots washed: tons per acre                    |                   |       |       |             |       |               |       |       |
| Mean yield                                     | 12.54             | 14.97 | 16.24 | 11.75       | 11.83 | 13.27         | 12.84 | 13.01 |
| Early-late application of organics             |                   |       |       | 0.48        | 1.43  | 1.29          | 0.77  | 0.99  |
| Response to N                                  | 3.97              | 3.21  | 2.23  | 5.64        | 6.62  | 5.16          | 4.54  | 4.27  |
| Response to K                                  | 0.24              | -0.44 | 0.60  | -0.11       | 1.52  | 0.13          | 0.42  | 0.30  |
| Sugar percentage                               |                   |       |       |             |       |               |       |       |
| Mean yield                                     | 18.50             | 18.58 | 18.41 | 18.77       | 18.62 | 18.47         | 18.55 | 18.53 |
| Early-late application of organics             |                   |       |       | 0.39        | -0.48 | -0.30         | 0.38  | 0.00  |
| Response to N                                  | -0.15             | -0.13 | -0.53 | 0.48        | -0.49 | -0.48         | -0.10 | -0.18 |
| Response to K                                  | 0.15              | 0.20  | 0.00  | 0.32        | -0.17 | 0.10          | 0.06  | 0.12  |
| Total sugar: cwt. per acre                     |                   |       |       |             |       |               |       |       |
| Mean yield $\pm 2.57$                          | 46.4a             | 55.6  | 59.8  | 44.2        | 43.7  | 48.7          | 47.6  | 48.2  |
| Early-late application of organics $\pm 3.12$  |                   |       |       | 2.3         | 4.3   | 3.8           | 3.6   | 3.5c  |
| Response to N $\pm 3.12$                       | 14.4 <sup>b</sup> | 11.6  | 6.5   | 22.3        | 23.3  | 17.9          | 16.6  | 15.4d |
| Response to K $\pm 3.12$                       | 1.2 <sup>b</sup>  | -0.8  | 2.1   | 0.4         | 5.2   | 1.1           | 1.9   | 1.4d  |
| Tops: tons per acre                            |                   |       |       |             |       |               |       |       |
| Mean yield $\pm 0.494$                         | 7.02e             | 9.01  | 10.19 | 6.88        | 7.42  | 7.18          | 7.32  | 7.51  |
| Early-late application of organics $\pm 0.653$ |                   |       |       | -0.55       | 1.48  | 1.18          | 0.33  | 0.61g |
| Response to N $\pm 0.653$                      | 2.60f             | 3.33  | 2.47  | 3.51        | 4.31  | 2.34          | 3.41  | 2.91h |
| Response to K $\pm 0.653$                      | 0.38f             | 0.72  | 1.40  | 0.11        | 1.63  | 0.55          | -0.11 | 0.55h |

Standard errors: (a) 1.05, (b) 1.28, (c) 1.56, (d) 0.902, (e) 0.202  
(f) 0.266 (g) 0.326 (h) 0.188

Per whole plot

Sub-plot

Total sugar, cwt. per acre 5.14 or 10.7%, 38 d.f. 4.42 or 9.2%, 30 d.f.  
Tops, tons per acre 0.989 or 13.2%, 38 d.f. 0.923 or 12.3%, 30 d.f.

There was a very even stand, and so the plants were not counted.



Mangolds - Woburn 1941

| Tons per acre 1941                       | None              |       |       | Dung  |       |       | Town refuse |      |       | Screened Dust |                    |    | Mean |
|--|-------------------|-------|-------|-------|-------|-------|-------------|------|-------|---------------|--------------------|----|------|
|  | 0                 | 10    | 20    | 0     | 10    | 20    | 0           | 10   | 20    | 0             | 10                 | 20 |      |
| Mean yield $\pm$ 1.22                    | 9.56a             | 9.93  | 13.08 | 14.60 | 11.40 | 10.18 | 13.18       | 8.69 | 9.42  | 9.27          | 10.70              |    |      |
| Early-late applicn. organics $\pm$ 0.954 |                   |       |       |       | -0.12 | -2.80 |             | 0.96 | -0.94 |               | -0.73 <sup>c</sup> |    |      |
| Response to N $\pm$ 0.954                | 5.16 <sup>b</sup> | 6.64  | 6.16  | 4.28  | 6.60  | 5.44  | 7.22        | 6.22 | 5.36  | 4.72          | 5.68 <sup>d</sup>  |    |      |
| Response to residual K $\pm$ 0.954       | 0.12 <sup>b</sup> | -0.68 | -1.16 | 0.04  | 1.68  | -0.12 | -1.46       | 0.08 | 0.56  | 0.32          | -0.03 <sup>d</sup> |    |      |

Roots, tons per acre

Standard errors; (a) 0.704 (b) 0.551 (c) 0.477 (d) 0.276

Per whole plot

Sub-plot

2.44 or 22.8%, 35 d.f.

1.35 or 12.6%, 25 d.f.

Direct organic treatments were confounded with residual organic treatments; see treatment details.







J/1

PHOSPHATE SERIES

The experiments in this section J form part of a country-wide series of about 250 similar experiments on the effects of various kinds of phosphate. Results for the whole series are given in Ministry of Supply Permanent Records of Research and Development, 11.108 and 11.109

POTATOES

Long Hoos I 1942

Design: 4 randomized blocks of 12 plots.

Area of each plot: 0.0175 acre

Treatments

None, superphosphate at 0.25, 0.50, 0.75 and 1.00 cwt.  $P_2O_5$  per acre, high temperature phosphates (Chem. Dept Ref. Nos. F 347, 348, 349), each at 0.50 and 1.00 cwt.  $P_2O_5$  per acre.

Basal manuring: Sulphate of ammonia: 0.6 cwt. N per acre  
Muriate of potash: 1.0 cwt.  $K_2O$  per acre

Crop Notes

Potatoes planted: May 4. Harvested Nov. 10. Variety: Arran Banner. Previous crop, Barley.

Standard error per plot: Total tubers, 1.21 tons per acre or 8.8%, 34 d.f.

Total tubers, tons per acre. Mean yield: 13.78 tons per acre

| cwt. $P_2O_5$<br>per acre | None               | 0.25  | 0.50  | 0.75   | 1.00  | Mean               |
|---------------------------|--------------------|-------|-------|--------|-------|--------------------|
|                           |                    |       |       | ±0.605 |       | ±0.428             |
| Superphosphate            |                    | 14.18 | 14.25 | 14.36  | 13.79 | 14.02 <sup>b</sup> |
| H.T. P347                 |                    |       | 14.00 |        | 13.05 | 13.53              |
| H.T. P348                 |                    |       | 14.23 |        | 12.57 | 13.40              |
| H.T. P349                 |                    |       | 14.01 |        | 14.01 | 14.01              |
| Mean ± 0.302              | 13.45 <sup>a</sup> |       | 14.12 |        | 13.36 | 13.78 <sup>c</sup> |

Standard error (a) 0.428

Means (b) of 0.5 and 1.0  $P_2O_5$  levels only, (c) of all plots.



J/2

POTATOES AND BARLEY

Sawyers 1943-1944

Design: 8 randomized blocks of 6 plots each.

Area of each plot: 1943: 0.0133 acre  
1944: 0.0125 acre

1943 - Potatoes

Treatments

None, superphosphate at 0.33 and 0.66 cwt. P<sub>2</sub>O<sub>5</sub> per acre, high temperature phosphate, basic slag and super slag product all at 0.50 cwt. P<sub>2</sub>O<sub>5</sub> per acre.

Basal manuring: Sulphate of ammonia: 0.6 cwt. N per acre  
Muriate of potash: 1.0 cwt. K<sub>2</sub>O per acre

Crop Notes

Potatoes planted: May 4. Harvested: Sept.30. Variety: Majestic  
Previous crop, Wheat.

Standard error per plot. Total tubers: 0.969 tons per acre or 9.7%, 20 d.f.  
High

|                             | Superphosphate |       |       | High temp. Phos. | Basic Slag | Super Slag | Mean |
|-----------------------------|----------------|-------|-------|------------------|------------|------------|------|
|                             | 0              | 0.33  | 0.66  |                  |            |            |      |
| Total tubers, tons per acre | 9.48           | 10.08 | 10.08 | 10.24            | 9.86       | 10.04      | 9.96 |
|                             | ±0.396         |       |       |                  |            |            |      |

1944 - Barley

Basal manuring: Sulphate of ammonia: 0.2 cwt. N per acre

Crop Notes

Seed sown: March 9. Harvested: Aug.14-16. Variety: Plumage Archer

Standard errors per plot:

Grain: 2.65 cwt. per acre or 11.2%, 35 d.f.

Straw: 2.72 cwt. per acre or 11.1%, 35 d.f.

Residual effects of

|                     | Superphosphate |      |      | High temp. Phos. | Basic Slag | Super Slag | Mean |
|---------------------|----------------|------|------|------------------|------------|------------|------|
|                     | 0              | 0.33 | 0.66 |                  |            |            |      |
| Grain cwt. per acre | 24.2           | 23.3 | 23.8 | 23.7             | 23.6       | 23.6       | 23.7 |
|                     | ±0.94          |      |      |                  |            |            |      |
| Straw cwt. per acre | 25.0           | 23.7 | 24.8 | 24.8             | 24.0       | 25.3       | 24.6 |
|                     | ±0.96          |      |      |                  |            |            |      |



J/3

POTATOES AND BARLEY

Sawyers I 1944 - 1945

Design; 6 randomized blocks of 8 plots each.

Area of each plot: 1944: 0.0111 acre  
1945: 0.0104 acre

1944 - Potatoes

Treatments

Phosphates: None, superphosphate, high temperature phosphate, and basic Bessemer slag

Levels: 0.33 and 0.66 cwt.  $P_2O_5$  per acre

Basal manuring: Sulphate of ammonia: 0.6 cwt N per acre  
Muriate of potash: 1.0 cwt  $K_2O$  per acre

Crop Notes

Potatoes planted: April 14-17. Lifted: Sept. 29  
Variety: Majestic Previous crop, Wheat

Standard error per plot: Total tubers: 0.97 tons per acre or  
8.4%, 36 d.f.

Total tubers: tons per acre

| Cwt. $P_2O_5$<br>per acre | 0.33  | 0.66  | Mean               |
|---------------------------|-------|-------|--------------------|
|                           |       |       | $\pm 0.28$         |
|                           |       |       | $\pm 0.40$         |
| No phosphate              |       |       | 10.76              |
| Superphosphate            | 12.13 | 11.27 | 11.70              |
| H.T.P.                    | 11.88 | 12.32 | 12.10              |
| Bessemer slag             | 11.21 | 11.91 | 11.56              |
| Mean $\pm 0.23$           | 11.74 | 11.83 | 11.53 <sup>a</sup> |

Mean (a) of all plots.



J/4

Potatoes and Barley - Sawyer's

1945 - Barley

Basal manuring: Sulphate of ammonia: 0.2 cwt. N per acre

Seed sown: March 14. Harvested: Aug. 17

Variety: Plumage Archer

Standard errors per plot:

Grain: 1.88 cwt. per acre or 5.9%, 36 d.f.

Straw: 2.50 cwt. per acre or 6.6%, 36 d.f.

Residual effects

| Cwt. P <sub>2</sub> O <sub>5</sub> | No phosphates        | Super | H.T.P. | Basic Bessemer Slag | Mean              |
|------------------------------------|----------------------|-------|--------|---------------------|-------------------|
|                                    | Grain: cwt. per acre |       |        |                     | ±0.44             |
|                                    | ±0.77                |       |        |                     |                   |
| 0.33                               |                      | 31.5  | 31.3   | 30.2                | 31.0              |
| 0.66                               |                      | 32.5  | 33.1   | 32.7                | 32.8              |
| Mean ±0.54                         | 31.0                 | 32.0  | 32.2   | 31.4                | 31.7 <sup>a</sup> |
|                                    | Straw: cwt. per acre |       |        |                     | ±0.59             |
|                                    | ±1.02                |       |        |                     |                   |
| 0.33                               |                      | 37.8  | 37.9   | 35.2                | 37.0              |
| 0.66                               |                      | 40.5  | 38.7   | 37.9                | 39.0              |
| Mean ±0.72                         | 38.6                 | 39.2  | 38.3   | 36.6                | 38.1 <sup>a</sup> |

Means (a) of all plots.



J/5

TURNIPS

Appletree 1941

Design; 4 randomized blocks of 12 plots each  
 Area of each plot; 0.00055 acre

Treatments

Types of phosphate; Superphosphate, Basic slag, High temperature phosphates RR1 and RR3F, Metaphosphate

Levels; None, 0.5, 1.0 cwt P<sub>2</sub>O<sub>5</sub> per acre

Basal manuring; 0.4 cwt N per acre as Sulphate of ammonia and  
 0.5 cwt. K<sub>2</sub>O as Muriate of potash

Crop Notes

Sown, Sept. 4 Harvested, Dec.17 Variety, Green Globe

Previous crop, Permanent grass

Standard error per plot, 1.196 tons per acre or 10.2%, 34 d.f.

Roots; tons per acre

| Cwt.P <sub>2</sub> O <sub>5</sub> per acre | None              | 0.5    | 1.0   | Mean               |
|--|-------------------|--------|-------|--------------------|
|  |                   | ±0.598 |       | ±0.423             |
| Superphosphate                             |                   | 12.11  | 12.80 | 12.46              |
| Basic slag                                 |                   | 11.67  | 12.05 | 11.86              |
| H.T. RR1                                   |                   | 12.48  | 12.07 | 12.28              |
| H.T. RR3F                                  |                   | 11.79  | 12.80 | 12.30              |
| Metaphosphate                              |                   | 11.79  | 12.05 | 11.92              |
| Mean ±0.267                                | 9.57 <sup>a</sup> | 11.97  | 12.36 | 11.73 <sup>b</sup> |

Standard error (a) 0.423

Mean (b) of all plots.



J/6

TURNIPS

Appletree 1941

Design; 4 randomized blocks of 10 plots each

Area of each plot; 0.00055 acre

Treatments

Types of phosphate; Superphosphate, Florida, Curacao, Gafsa

Levels; None, 0.25 (Superphosphate only), 0.5, 1.0 cwt.  $P_2O_5$  per acre

Basal manuring; 0.6 cwt. N per acre as Sulphate of ammonia and 0.5 cwt.  $K_2O$  per acre as Muriate of potash.

Crop Notes

Sown, Sept. 4 Harvested, Dec.17 Variety, Green Globe

Previous crop, Permanent Grass

Standard error per plot, 1.064 tons per acre or 10.8%, 27 d.f.

Roots; tons per acre

| Cwt. $P_2O_5$<br>per acre | None              | 0.25        | 0.5   | 1.0   | Mean               |
|---------------------------|-------------------|-------------|-------|-------|--------------------|
|                           |                   | $\pm 0.532$ |       |       |                    |
| Superphosphate            |                   | 9.34        | 10.92 | 11.22 | 11.07 <sup>b</sup> |
| Florida                   |                   |             | 9.12  | 9.72  | 9.42               |
| Gafsa                     |                   |             | 10.15 | 10.19 | 10.17              |
| Curacao                   |                   |             | 10.25 | 9.44  | 9.84               |
| Mean $\pm 0.266$          | 8.33 <sup>a</sup> |             | 10.11 | 10.14 | 9.87 <sup>c</sup>  |

Standard error (a) 0.532

Means (b) of 0.5 and 1.0  $P_2O_5$  levels only, (c) of all plots.



J/7

TURNIPS

Deacon's Field 1942

Design; 4 randomized blocks of 20 plots each

Area of each plot; 0.0024 acre

Treatments

None, 0.3 and 0.6 cwt.  $P_2O_5$  each of superphosphate, basic slag, calcium metaphosphate, "Metaphos" and triple superphosphate.

Triple superphosphate only; Powdered and granular

Broadcast and placed below drills

Basal manuring; 3 cwt. sulphate of ammonia and 1 cwt. muriate of potash per acre

Crop Notes

Sown, Aug. 18 Lifted, December. Variety, Pomeranian White.  
Previous crop (in 1942), Spring Wheat

Standard errors  
per plot:

Roots, 0.449 tons per acre or 14.9%, 60 d.f.

Tops, 0.865 tons per acre or 13.0%, 60 d.f.



J/8

Turnips - Deacon's

| P <sub>2</sub> O <sub>5</sub> , cwt. per acre | Roots, tons per acre |                   |                   | Tops, tons per acre |                   |                   |
|---|----------------------|-------------------|-------------------|---------------------|-------------------|-------------------|
|   | 0.3                  | 0.6               | Mean              | 0.3                 | 0.6               | Mean              |
|   | ±0.224               |                   | ±0.159            | ±0.432              |                   | ±0.306            |
| None  |                      |                   | 2.96 <sup>a</sup> |                     |                   | 6.62 <sup>b</sup> |
| Superphosphate                                | 3.15                 | 3.22              | 3.19              | 6.32                | 6.65              | 6.49              |
| Basic slag                                    | 2.66                 | 2.95              | 2.81              | 6.56                | 6.93              | 6.74              |
| Calcium metaphosphate                         | 2.90                 | 2.99              | 2.95              | 6.74                | 6.93              | 6.84              |
| "Metaphos"                                    | 2.74                 | 2.95              | 2.84              | 5.67                | 6.79              | 6.23              |
| Triple superphosphate                         | 2.92 <sup>a</sup>    | 3.28 <sup>a</sup> | 3.10 <sup>c</sup> | 6.63 <sup>b</sup>   | 6.80 <sup>b</sup> | 6.72 <sup>d</sup> |
| Mean  | 2.89                 | 3.15              | 3.01 <sup>e</sup> | 6.48                | 6.81              | 6.64 <sup>e</sup> |

Means of 2 levels of triple superphosphate

|          | Broad-cast        | Below drills      | Mean | Broad-cast        | Below drills      | Mean |
|----------|-------------------|-------------------|------|-------------------|-------------------|------|
|          |                   | ±0.158            |      | ±0.112            | ±0.305            |      |
| Powdered | 2.83              | 3.05              | 2.94 | 6.34              | 6.82              | 6.58 |
| Granular | 3.09              | 3.41              | 3.25 | 6.56              | 7.14              | 6.85 |
| Mean     | 2.96 <sup>a</sup> | 3.23 <sup>a</sup> | 3.10 | 6.45 <sup>b</sup> | 6.98 <sup>b</sup> | 6.72 |

Standard errors (a) 0.112 (b) 0.216 (c) 0.079 (d) 0.153

Means (e) of all plots



J/9

SWEDES AND WHEAT

Delharding 1942 - 1943

Design; 5 x 5 Lattice square in 3 replicates

Area of each plot: 1942 0.0100 acre  
1943 0.0125 acre

1942 - Swedes

Treatments

None, superphosphate at 0.25, 0.50, 0.75 and 1.00cwt. P<sub>2</sub>O<sub>5</sub> per acre and the following fertilizers at 0.50 and 1.00 cwt. P<sub>2</sub>O<sub>5</sub> per acre, Bessemer slag, Curacao rock phosphate (65% through 100 mesh), Curacao rock phosphate (85% through 100 mesh), Gafsa rock phosphate (85% through 100 mesh), metaphosphate, high temperature phosphates A, B, C and D.

Basal manuring: Sulphate of ammonia: 0.4 cwt. N per acre  
Muriate of potash: 0.5 cwt. K<sub>2</sub>O per acre

Crop Notes

Seed sown: May 22 Harvested: Nov. 4-9  
Variety: Magnificent Previous crop, Permanent grass

Standard errors per plot:  
Roots, 1.38 tons per acre or 12.1%, 24 d.f.

Plant numbers, 2.89 thousands per acre or 14.2%, 24 d.f.

About one-third of the roots in this experiment were body rotted as a result of infection with *Bacterium carotovorum*; half the roots were in some measure affected.



J/10

Swedes and Wheat - Delharding

1942 - Swedes

| Cwt. P <sub>2</sub> O <sub>5</sub> per acre | 0.25   | 0.50              | 0.75  | 1.00  | Mean               |
|---|--------|-------------------|-------|-------|--------------------|
| Roots tons per acre                         |        |                   |       |       |                    |
|   |        | ±0.800            |       |       | ±0.565             |
| No phosphatic fertilizer                    |        | 8.03 <sup>a</sup> |       |       | 8.03 <sup>a</sup>  |
| Superphosphate                              | 10.19  | 11.01             | 10.81 | 12.83 | 11.92 <sup>c</sup> |
| Bessemer slag                               |        | 10.96             |       | 13.75 | 12.36              |
| Curacao rock phosphate (coarse)             |        | 10.95             |       | 12.35 | 11.65              |
| Curacao rock phosphate (fine)               |        | 11.24             |       | 13.14 | 12.19              |
| Gafsa rock phosphate (fine)                 |        | 10.98             |       | 14.02 | 12.50              |
| Metaphosphate                               |        | 9.96              |       | 12.10 | 11.03              |
| High temperature phosphate A                |        | 10.77             |       | 13.33 | 12.05              |
| High temperature phosphate B                |        | 12.02             |       | 13.07 | 12.54              |
| High temperature phosphate C                |        | 11.12             |       | 11.67 | 11.39              |
| High temperature phosphate D                |        | 11.92             |       | 13.87 | 12.89              |
| Mean  | ±0.253 |                   |       | 13.01 | 11.45 <sup>d</sup> |
| Plant number thousands per acre             |        |                   |       |       |                    |
|   |        | ±1.67             |       |       | ±1.18              |
| No phosphatic fertilizer                    |        | 19.6 <sup>b</sup> |       |       | 19.6 <sup>b</sup>  |
| Superphosphate                              | 20.3   | 21.4              | 21.5  | 21.8  | 21.6 <sup>c</sup>  |
| Bessemer slag                               |        | 20.7              |       | 21.1  | 20.9               |
| Curacao rock phosphate (coarse)             |        | 20.4              |       | 20.8  | 20.6               |
| Curacao rock phosphate (fine)               |        | 20.1              |       | 21.2  | 20.6               |
| Gafsa rock phosphate (fine)                 |        | 20.7              |       | 20.4  | 20.6               |
| Metaphosphate                               |        | 19.8              |       | 19.0  | 19.4               |
| High temperature phosphate A                |        | 19.9              |       | 20.8  | 20.4               |
| High temperature phosphate B                |        | 20.4              |       | 19.7  | 20.0               |
| High temperature phosphate C                |        | 20.0              |       | 18.9  | 19.4               |
| High temperature phosphate D                |        | 20.1              |       | 20.8  | 20.4               |
| Mean  | ±0.528 |                   |       | 20.5  | 20.3 <sup>d</sup>  |

Standard errors (a) 0.462, (b) 0.963

Means (c) of 0.5 and 1.0 cwt. P<sub>2</sub>O<sub>5</sub> levels only, (d) of all plots.



J/11

1943 - Wheat

Basal manuring: Sulphate of ammonia, 0.45 cwt. N per acre

Crop Notes

Seed sown: Nov. 19. Harvested: Aug. 9 Variety: Wilma

Standard errors per plot:

Grain: 1.66 cwt. per acre or 5.6%, 24 d.f.

Straw: 2.48 cwt. per acre or 4.2%, 24 d.f.

| Cwt. P <sub>2</sub> O <sub>5</sub> per acre | 0.25   | 0.50              | 0.75 | 1.00 | Mean              |
|---|--------|-------------------|------|------|-------------------|
| Grain: cwt. per acre                        |        |                   |      |      |                   |
|   |        | ±0.956            |      |      | ±0.676            |
| No phosphatic fertilizer                    |        | 27.6 <sup>a</sup> |      |      | 27.6 <sup>a</sup> |
| Superphosphate                              | 29.4   | 29.7              | 29.1 | 30.0 | 29.8 <sup>c</sup> |
| Bessemer slag                               |        | 29.7              |      | 30.3 | 30.0              |
| Curacao rock phosphate (coarse)             |        | 29.8              |      | 30.6 | 30.2              |
| Curacao rock phosphate (fine)               |        | 29.0              |      | 30.2 | 29.6              |
| Gafsa rock phosphate (fine)                 |        | 29.5              |      | 32.4 | 31.0              |
| Metaphosphate                               |        | 29.5              |      | 30.9 | 30.2              |
| High temperature phosphate A                |        | 28.7              |      | 30.4 | 29.6              |
| High temperature phosphate B                |        | 28.7              |      | 31.6 | 30.2              |
| High temperature phosphate C                |        | 28.2              |      | 28.0 | 28.1              |
| High temperature phosphate D                |        | 29.9              |      | 30.6 | 30.2              |
| Mean  | ±0.302 | 29.3              |      | 30.5 | 29.6 <sup>d</sup> |
| Straw: cwt. per acre                        |        |                   |      |      |                   |
|   |        | ±1.43             |      |      | ±1.01             |
| No phosphatic fertilizer                    |        | 55.6 <sup>b</sup> |      |      | 55.6 <sup>b</sup> |
| Superphosphate                              | 57.6   | 58.9              | 59.7 | 58.0 | 58.4 <sup>c</sup> |
| Bessemer slag                               |        | 57.6              |      | 57.4 | 57.5              |
| Curacao rock phosphate (coarse)             |        | 53.9              |      | 60.6 | 57.2              |
| Curacao rock phosphate (fine)               |        | 58.9              |      | 59.6 | 59.2              |
| Gafsa rock phosphate (fine)                 |        | 55.1              |      | 60.9 | 58.0              |
| Metaphosphate                               |        | 60.5              |      | 61.9 | 61.2              |
| High temperature phosphate A                |        | 59.0              |      | 60.6 | 59.8              |
| High temperature phosphate B                |        | 58.9              |      | 61.7 | 60.3              |
| High temperature phosphate C                |        | 57.8              |      | 59.9 | 58.8              |
| High temperature phosphate D                |        | 59.0              |      | 61.2 | 60.1              |
| Mean  | ±0.453 | 58.0              |      | 60.2 | 58.6 <sup>d</sup> |

Standard errors: (a) 0.553 (b) 0.826

Means (c) of 0.5 and 1.0 cwt. P<sub>2</sub>O<sub>5</sub> levels only, (d) of all plots



J/12

SWEDES AND BARLEY

Sawyers II 1943-1944

Design: 5 x 5 lattice square in 3 replicates.

Area of each plot: 0.00979 acre

1943 - Swedes

Treatments

None, superphosphate and high temperature phosphate at 0.16, 0.33, 0.66 and 1.00 cwt. P<sub>2</sub>O<sub>5</sub> per acre, basic slag (Bessemer), super slag product, super-lime product, super-serpentine product, super-mineral phosphate (cold mix), super-mineral phosphate (hot mix), Morocco mineral phosphate, all at 0.33 and 0.66 cwt. P<sub>2</sub>O<sub>5</sub> per acre.

Basal manuring. Sulphate of ammonia: 0.4 cwt. N per acre  
Muriate of potash: 0.5 cwt. K<sub>2</sub>O per acre

The crop failed, after three sowings, because of attack by flea beetle. The 1944 results are not included in the published report on the Phosphate Series (see page J/1).



J/13

1944 - Barley

Basal Manuring: Sulphate of ammonia. 0.2 cwt. N per acre

Crop Notes

Seed sown: March 9. Harvested Aug. 14 Variety: Plumage Archer

Standard errors per plot:

Grain: 2.52 cwt. per acre or 8.9%, 24 d.f.

Straw: 1.54 cwt. per acre or 6.0%, 24 d.f.

|                              | Cwt. P <sub>2</sub> O <sub>5</sub> per acre |                   |                   |                   | Mean              |
|------------------------------|---|-------------------|-------------------|-------------------|-------------------|
|                              | 0.16  | 0.33              | 0.66              | 1.00              |                   |
| Grain: cwt. per acre         | ±1.45                                       |                   |                   |                   | ±1.03             |
| No phosphatic fertilizer     |   |                   |                   |                   | 27.5 <sup>a</sup> |
| Superphosphate               | 29.3  | 27.3              | 28.6              | 29.9              | 28.0 <sup>e</sup> |
| High temperature phosphate   | 29.1  | 27.1              | 29.1              | 30.1              | 28.1 <sup>g</sup> |
| Basic slag (Bessemer)        |   | 30.4              | 28.4              |                   | 29.4              |
| Super slag product           |   | 27.9              | 26.9              |                   | 27.4              |
| Super lime product           |   | 28.5              | 30.1              |                   | 29.3              |
| Super serpentine product     |   | 28.9              | 27.0              |                   | 28.0              |
| Super min.phosph. (cold mix) |   | 29.1              | 28.1              |                   | 28.6              |
| Super min.phosph. (hot mix)  |   | 28.4              | 29.3              |                   | 28.8              |
| Morroco min. phosph.         |   | 28.6              | 25.4              |                   | 27.0              |
| Mean                         | 29.2 <sup>b</sup>                           | 28.5 <sup>c</sup> | 28.1 <sup>c</sup> | 30.0 <sup>b</sup> | 28.4 <sup>h</sup> |
| Straw: cwt. per acre         | ±0.89                                       |                   |                   |                   | ±0.63             |
| No phosphatic fertilizer     |   |                   |                   |                   | 24.5 <sup>d</sup> |
| Superphosphate               | 25.1  | 24.5              | 26.7              | 27.0              | 25.6 <sup>g</sup> |
| High temperature phosphate   | 25.7  | 23.3              | 26.4              | 27.6              | 24.8 <sup>g</sup> |
| Basic slag (Bessemer)        |   | 26.1              | 25.9              |                   | 26.0              |
| Super slag product           |   | 23.5              | 25.1              |                   | 24.3              |
| Super lime product           |   | 25.5              | 27.5              |                   | 26.5              |
| Super serpentine product     |   | 29.3              | 24.3              |                   | 26.8              |
| Super min.phosph. (cold mix) |   | 27.3              | 26.3              |                   | 26.8              |
| Super min.phosph. (hot mix)  |   | 25.8              | 24.4              |                   | 25.1              |
| Morroco min.phosph.          |   | 25.9              | 22.0              |                   | 24.0              |
| Mean                         | 25.4 <sup>c</sup>                           | 25.7 <sup>f</sup> | 25.4 <sup>f</sup> | 27.3 <sup>c</sup> | 25.5 <sup>h</sup> |

Standard errors (a) 0.84, (b)1.03, (c) 0.48, (d) 0.51, (e) 0.63 (f) 0.30

Means (g) of 0.33 and 0.66 P<sub>2</sub>O<sub>5</sub> levels only, (h) of all plots

61



J/14

SWEDES AND BARLEY

Sawyers I 1944 - 1945

Design: 8 x 8 Latin square.

Area of each plot: 1944 0.00556 acre

1945 0.00602 acre

1944 - Swedes

Treatments

Phosphates: None, superphosphate, high temperature phosphate and basic Bessemer slag

Levels: 0.33 and 0.66 cwt.  $P_2O_5$  per acre

Basal manuring: Sulphate of ammonia: 0.4 cwt. N per acre

Muriate of potash: 0.5 cwt.  $K_2O$  per acre

Crop Notes

Seed sown: June 2. Harvested: Nov. 23

Variety: New Magnificent Previous crop, Wheat

Standard errors per plot: Roots, 0.962 tons per acre or 9.0%, 43 d.f.  
 Tops, 0.302 tons per acre or 14.9%, 43 d.f.  
 Plant number, 1.90 thousands per acre or 6.0%, 43 d.f.

| Cwt. $P_2O_5$ per acre | Roots: tons per acre |       |                    | Tops: tons per acre |      |                   | Plant No. thous. per acre |      |                   |
|------------------------|----------------------|-------|--------------------|---------------------|------|-------------------|---------------------------|------|-------------------|
|                        | 0.33                 | 0.66  | Mean               | 0.33                | 0.66 | Mean              | 0.33                      | 0.66 | Mean              |
| No phosphates          | ±0.34                |       | ±0.24              | ±0.11               |      | ±0.076            | ±0.67                     |      | ±0.48             |
| Superphosphate         | 11.45                | 13.16 | 6.41               | 2.03                | 2.48 | 1.38              | 32.2                      | 33.2 | 27.6              |
| H.T.P.                 | 10.83                | 13.23 | 12.30              | 1.81                | 2.46 | 2.26              | 32.5                      | 33.1 | 32.7              |
| Bessemer Slag          | 11.11                | 12.80 | 12.03              | 2.01                | 2.63 | 2.14              | 32.6                      | 33.0 | 32.8              |
| Mean                   | 11.13                | 13.06 | 10.67 <sup>a</sup> | 2.92                | 2.52 | 2.02 <sup>a</sup> | 32.4                      | 33.1 | 31.5 <sup>a</sup> |
|                        | ±0.20                |       |                    | ±0.062              |      |                   | ±0.39                     |      |                   |

Means (a) of all plots



J/15

1945 - Barley

Basal manuring: Sulphate of ammonia: 0.2 cwt. N per acre

Crop Notes

Seed sown: March 15. Harvested: Aug. 18  
 Variety: Plumage Archer

Standard errors per plot:

Grain: 1.31 cwt. per acre or 4.3%, 43 d.f.  
 Straw: 1.92 cwt. per acre or 5.2%, 43 d.f.

| Cwt. P <sub>2</sub> O <sub>5</sub> per acre | Grain: cwt. per acre |      |                   | Straw: cwt. per acre |      |                   |
|---|----------------------|------|-------------------|----------------------|------|-------------------|
|   | 0.33                 | 0.66 | Mean              | 0.33                 | 0.66 | Mean              |
|   | ±0.46                |      | ±0.33             | ±0.68                |      | ±0.48             |
| No phosphates                               |                      |      | 29.9              |                      |      | 37.5              |
| Superphosphate                              | 30.8                 | 30.9 | 30.8              | 36.5                 | 35.9 | 36.2              |
| H.T.P.                                      | 30.4                 | 29.9 | 30.2              | 36.0                 | 37.3 | 36.6              |
| Bessemer slag                               | 30.8                 | 31.1 | 31.0              | 36.4                 | 36.0 | 36.2              |
| Mean  | 30.7                 | 30.6 | 30.5 <sup>a</sup> | 36.3                 | 36.4 | 36.6 <sup>a</sup> |
|   | ±0.27                |      |                   | ±0.39                |      |                   |

Means (a) of all plots



Table 1

Summary of the results of the analysis of variance for the dependent variable of the study

| Source  | df | SS     | MS    | F    | p   |
|---------|----|--------|-------|------|-----|
| Between | 1  | 10.00  | 10.00 | 1.00 | .32 |
| Within  | 19 | 190.00 | 10.00 |      |     |
| Total   | 20 | 200.00 |       |      |     |

| Source  | df | SS     | MS    | F    | p   |
|---------|----|--------|-------|------|-----|
| Between | 1  | 10.00  | 10.00 | 1.00 | .32 |
| Within  | 19 | 190.00 | 10.00 |      |     |
| Total   | 20 | 200.00 |       |      |     |



K/1

## WHEAT

Observations on the incidence of *Cercospora herpotrichoides* Fron. (Eyespot), and other diseases and pests, were taken on all wheat experiments, of which some were ordinary variety and fertilizer trials and some were specially laid down to test the effects of various treatments for the control of Eyespot.

The figures for percentage Eyespot infection are transformed to degrees for the purpose of analysis, and the mean percentages shown are derived from the transformed data.

### Pennell's Piece and West Barnfield, 1941

Effects of rates and times of application of sulphate of ammonia on yield and extent of lodging of three varieties of wheat.

Design: 3 randomized blocks of 3 plots each, the plots being split into 3 for different rates and times of application of fertilizer, with confounding according to a Greco-Latin design.

Area of each sub-plot: Pennell's Piece, 0.0667 acre;  
W. Barnfield 0.0250 acre.

### Treatments

Varieties; Desprez 80, Wilma, Red Standard

Sulphate of ammonia; 0.0, 0.3, 0.6 cwt. N per acre

Times of application of S/A; Early (early March), half early and half late, and late (middle May).

### Crop Notes

|               | Pennell's Piece | West Barnfield |
|---------------|-----------------|----------------|
| Sown          | Oct. 26         | Nov. 27        |
| Harvested     | Aug. 21         | Sept. 1        |
| Previous crop | Wheat           | Spring oats    |

A third experiment of the same type was carried out at Woburn, but on account of bird damage and other causes, yields were very irregular; experimental errors were too high to allow any reliable results to be presented.



K/2

Wheat - Pennell's Piece and W. Barnfield, 1941

| Pennell's Piece                 |               |                          |              |      |
|---------------------------------|---------------|--------------------------|--------------|------|
| Variety                         | Desprez<br>80 | Wilma                    | Red Standard | Mean |
| Grain, cwt. per acre $\pm 0.65$ | 18.4          | 15.0                     | 14.4         | 15.9 |
| Straw, cwt. per acre $\pm 1.13$ | 30.4          | 34.3                     | 37.6         | 34.1 |
| % Lodging in August             | 4             | 23                       | 49           | 25   |
| Percentage Eyespot at harvest   | 76            | 76                       | 85           | 79   |
| Cwt. N. per acre                | 0.0           | 0.3                      | 0.6          | Mean |
| Grain, cwt. per acre $\pm 0.65$ | 11.9          | 16.3                     | 19.7         | 15.9 |
| Straw, cwt. per acre $\pm 1.13$ | 26.5          | 34.0                     | 41.7         | 34.1 |
| % Lodging in August             | 22            | 20                       | 34           | 25   |
| Percentage Eyespot at harvest   | 79            | 81                       | 79           | 79   |
| Nitrogen applied                | Early         | Half early,<br>half late | Late         | Mean |
| Grain, cwt. per acre $\pm 0.65$ | 15.8          | 16.4                     | 15.6         | 15.9 |
| Straw, cwt. per acre $\pm 1.13$ | 35.3          | 33.8                     | 33.1         | 34.1 |
| % Lodging in August             | 36            | 18                       | 21           | 25   |
| Percentage Eyespot at harvest   | 83            | 79                       | 75           | 79   |

Standard errors per plot (pooled whole-plot and sub-plot errors)

Grain 1.95 cwt. per acre or 12.2%, 14 d.f.  
 Straw 3.39 cwt. per acre or 10.0%, 14 d.f.



West Barnfield

| Variety                         | Desprez<br>80 | Wilma                    | Red Standard | Mean |
|---------------------------------|---------------|--------------------------|--------------|------|
| Grain, cwt. per acre $\pm 0.88$ | 27.0          | 27.4                     | 23.2         | 25.8 |
| Straw, cwt. per acre $\pm 1.77$ | 30.6          | 36.5                     | 34.5         | 33.9 |
| % Lodging in August             | 0             | 34                       | 72           | 35   |
| Percentage Eyespot at harvest   |               | None                     |              |      |
| Cwt. N per acre                 | 0.0           | 0.3                      | 0.6          | Mean |
| Grain, cwt. per acre $\pm 0.88$ | 24.7          | 26.7                     | 26.0         | 25.8 |
| Straw, cwt. per acre $\pm 1.77$ | 30.6          | 34.1                     | 37.0         | 33.9 |
| % Lodging in August             | 28            | 37                       | 41           | 35   |
| Percentage Eyespot at harvest   |               | None                     |              |      |
| Nitrogen applied                | Early         | Half early,<br>half late | Late         | Mean |
| Grain, cwt. per acre $\pm 0.88$ | 25.2          | 26.2                     | 26.2         | 25.8 |
| Straw, cwt. per acre $\pm 1.77$ | 34.4          | 34.0                     | 33.1         | 33.9 |
| % Lodging in August             | 36            | 34                       | 36           | 35   |
| Percentage Eyespot at harvest   |               | None                     |              |      |

Standard errors per plot (pooled whole plot and sub-plot errors)

Grain 2.63 cwt. per acre or 10.2%, 13 d.f.

Straw 5.31 cwt. per acre or 15.7%, 13 d.f.



K/4

WHEAT

Pennell's Piece, 1942

Effects of two rates of application of sulphate of ammonia to ten varieties of wheat.

Design; 4 randomized blocks of 10 plots each, the plots being split into two for rate of application of fertilizer.

Area of each plot; Plots of varying sizes in the different blocks, from 0.004 to 0.006 acre per sub-plot.

Treatments

Varieties; Red Standard, Desprez 80, Rampton Rivett, Steadfast, Holdfast, Garton's 60, Juliana, Little Joss, Cotes d'Or, Vilmorin.

Sulphate of ammonia; 0.4, 0.8 cwt. N per acre.

Basal Manuring; 3 cwt. per acre superphosphate.

Crop Notes

Sown; Nov. 27. Harvested; Aug. 17.

Previous crop; Wheat.



K/5

| Variety        | Grain: cwt. per acre |               | Straw: cwt. per acre |               |
|----------------|----------------------|---------------|----------------------|---------------|
|                | Mean                 | Response to N | Mean                 | Response to N |
|                | ±1.14                | ±1.60         |                      |               |
| Red Standard   | 25.9                 | -0.6          | 46.2                 | 3.6           |
| Desprez 80     | 32.5                 | 4.3           | 43.6                 | 7.9           |
| Rampton Rivett | 26.6                 | 4.1           | 60.3                 | -2.6          |
| Steadfast      | 27.1                 | 1.5           | 45.4                 | 6.9           |
| Holdfast       | 27.8                 | 6.3           | 45.4                 | 9.2           |
| Garton's 60    | 27.3                 | 1.4           | 40.8                 | -0.7          |
| Juliana        | 30.1                 | 1.7           | 48.5                 | 3.8           |
| Little Joss    | 25.0                 | 1.2           | 48.2                 | -0.5          |
| Cotes d'Or     | 27.1                 | 2.3           | 44.8                 | 6.0           |
| Vilmorin       | 33.2                 | 3.2           | 55.4                 | 9.5           |

|      |      |              |      |     |
|------|------|--------------|------|-----|
| Mean | 28.3 | 2.5<br>±0.51 | 47.9 | 4.3 |
|------|------|--------------|------|-----|

| Variety        | Percentage Eyespot Transformed |               | Percentage Eyespot |               |
|----------------|--------------------------------|---------------|--------------------|---------------|
|                | Mean                           | Response to N | Mean               | Response to N |
|                | ±2.33                          | ±4.41         |                    |               |
| Red Standard   | 26.5                           | 2.2           | 20                 | 3             |
| Desprez 80     | 21.9                           | -2.6          | 14                 | -4            |
| Rampton Rivett | 20.2                           | -5.6          | 12                 | -6            |
| Steadfast      | 21.4                           | -4.4          | 13                 | -5            |
| Holdfast       | 29.2                           | 0.4           | 24                 | 0             |
| Garton's 60    | 24.4                           | -3.1          | 17                 | -4            |
| Juliana        | 27.0                           | -6.9          | 21                 | -10           |
| Little Joss    | 25.2                           | -4.8          | 18                 | -6            |
| Cotes d'Or     | 27.1                           | 3.6           | 21                 | 5             |
| Vilmorin       | 21.4                           | -3.6          | 13                 | -5            |

|      |      |               |    |    |
|------|------|---------------|----|----|
| Mean | 24.4 | -2.5<br>±1.39 | 17 | -3 |
|------|------|---------------|----|----|

Standard errors per Plot:

Grain, per whole plot, 2.28 cwt. per acre or 8.1%, 27 d.f.  
per sub-plot, 2.27 cwt. per acre or 8.0%, 28 d.f.

Transformed Percent: Eyespot

per whole plot, 4.66, 27 d.f.  
per sub-plot, 6.24, 28 d.f.



K/6

WHEAT  
Foster's 1943

Effect on the yield and Eyespot infection of sulphuric acid spraying on four varieties, sulphate of ammonia applied in early and late spring, and time of sowing.

Design; 8 randomized blocks of 8 plots each, the plots being split in half for applications of sulphate of ammonia. Spraying effects and certain high-order interactions confounded with block differences.

Area of each sub-plot; 0.0125 acre.

Treatments

On blocks; Untreated, sprayed with sulphuric acid (100 gallons per acre 10% B.O.V.) immediately after second sowing date and before emergence of plants (S), sprayed with sulphuric acid as above after raking off stubble (RS), inoculated with stubble raked off blocks receiving the RS treatment (I).

On plots;

Varieties: Red Standard (R), Juliana (W), Vilmorin (V), Desprez 80 (D).

Time of sowing: Early (Oct.), late (Nov.)

On sub-plots;

Sulphate of ammonia: None, 0.6 cwt. N per acre

Time of application of S/A: Early spring (E), late spring (L), half early and half late (EL).

Crop Notes

Stubble raked off RS plots and spread on I plots, Sept. 17.

Seed sown, Oct. 9 or Nov. 13. Harvested: Aug. 6

Previous crop: Barley.

Standard errors per plot:

Grain: Per block, 1.86 cwt. per acre or 10.5%, 4 d.f.  
per whole plot, 1.58 cwt. per acre or 9.0%, 27 d.f.  
per sub-plot, 1.41 cwt. per acre or 8.0%, 18 d.f.

Straw: Per block, 0.81 cwt. per acre or 3.3%, 4 d.f.  
per whole plot, 2.42 cwt per acre or 9.9%, 27 d.f.  
per sub-plot, 2.38 cwt. per acre or 9.8%, 18 d.f.

Transformed Percent. Eyespot: per block 2.22, 4 d.f.  
per whole plot, 4.58, 27 d.f.  
per sub-plot, 11.67, 18 d.f.



K/7

| Grain, cwt. per acre     |            |      |            |      |      |            |         |      |      |      |
|--------------------------|------------|------|------------|------|------|------------|---------|------|------|------|
|                          | Mean       | R    | Variety    |      |      | Late-Early | O       | I    | S    | RS   |
|                          |            |      | W          | V    | D    | Sowing     |         |      |      |      |
|                          | (a)&(b)    |      | (c)&(d)    |      |      | (c)&(d)    | (c)&(d) |      |      |      |
| O                        | 14.0       | 14.2 | 13.9       | 13.2 | 14.9 | -0.7       | 12.6    | 13.1 | 14.6 | 15.9 |
| E                        | 20.0       | 19.8 | 18.1       | 20.9 | 21.3 | -1.3       | 18.3    | 18.3 | 22.2 | 21.4 |
| L                        | 17.4       | 17.8 | 17.3       | 16.7 | 17.7 | -0.1       | 14.8    | 16.9 | 18.2 | 19.7 |
| EL                       | 19.2       | 20.6 | 17.8       | 18.0 | 20.5 | -2.0       | 16.3    | 19.2 | 19.7 | 21.6 |
| Mean                     | 17.7       | 18.1 | 16.8       | 17.2 | 18.6 | -1.0       |         |      |      |      |
| Late-<br>Early<br>Sowing |            | 0.0  | -2.4       | -0.6 | -1.0 |            |         |      |      |      |
|                          | $\pm 1.32$ |      | $\pm 0.79$ |      |      | $\pm 0.79$ |         |      |      |      |
| O                        | 15.5       | 16.7 | 14.8       | 14.5 | 16.0 | -0.3       |         |      |      |      |
| I                        | 16.9       | 18.6 | 15.0       | 15.3 | 18.5 | -0.8       |         |      |      |      |
| S                        | 18.7       | 18.4 | 17.8       | 18.5 | 19.9 | -1.7       |         |      |      |      |
| RS                       | 19.6       | 18.5 | 19.5       | 20.6 | 19.9 | -1.3       |         |      |      |      |

(a) 0.25 (c) 0.50 for use in comparisons of E v. L and O v. EL only  
(b) 0.98 (d) 1.95 for use in all other within-block comparisons

| Straw, cwt. per acre     |            |      |            |      |      |            |         |      |      |      |
|--------------------------|------------|------|------------|------|------|------------|---------|------|------|------|
|                          | Mean       | R    | W          | V    | D    | Late-Early | O       | I    | S    | RS   |
|                          |            |      |            |      |      | Sowing     |         |      |      |      |
|                          | (a)&(b)    |      | (c)&(d)    |      |      | (c)&(d)    | (c)&(d) |      |      |      |
| O                        | 18.5       | 20.3 | 18.9       | 16.4 | 18.7 | -0.3       | 19.2    | 17.7 | 18.3 | 19.1 |
| E                        | 30.0       | 32.8 | 29.4       | 29.4 | 28.3 | -1.3       | 30.3    | 27.7 | 30.7 | 31.1 |
| L                        | 22.1       | 23.7 | 22.6       | 20.8 | 21.2 | -0.2       | 20.2    | 22.0 | 22.3 | 23.7 |
| EL                       | 26.8       | 31.6 | 24.9       | 24.1 | 26.5 | -2.5       | 25.3    | 27.3 | 26.0 | 28.6 |
| Mean                     | 24.3       | 27.1 | 23.9       | 22.7 | 23.7 | -1.1       |         |      |      |      |
| Late-<br>Early<br>Sowing |            | -1.5 | -1.4       | -0.6 | -1.0 |            |         |      |      |      |
|                          | $\pm 0.57$ |      | $\pm 1.21$ |      |      | $\pm 1.21$ |         |      |      |      |
| O                        | 23.8       | 28.3 | 23.5       | 21.2 | 22.0 | -1.5       |         |      |      |      |
| I                        | 23.7       | 27.4 | 21.2       | 21.7 | 24.4 | -1.4       |         |      |      |      |
| S                        | 24.3       | 25.8 | 24.5       | 23.2 | 23.7 | -1.0       |         |      |      |      |
| RS                       | 25.6       | 26.8 | 26.5       | 24.6 | 24.7 | -0.6       |         |      |      |      |

Standard Errors  
(a) 0.42 (c) 0.84 for use in vertical comparisons of E v. L and O v. EL only.  
(b) 0.59 (d) 1.18 for use in all other within-block comparisons

Standard errors shown for the block treatments O, I, S, RS are for use in within-block comparisons, except for the S.E.'s shown for the means of these treatments.



K/8

Wheat - Foster's 1943

| Transformed Percentage Eyespot |         |      |         |      |      |            |                            |      |      |      |
|--------------------------------|---------|------|---------|------|------|------------|----------------------------|------|------|------|
|                                | Mean    | R    | Variety |      |      | Late-Early | O                          | I    | S    | RS   |
|                                | (a)&(b) |      | W       | V    | D    | Sowing     |                            |      |      |      |
|                                |         |      | (c)&(d) |      |      | (c)&(d)    | (c)&(d)                    |      |      |      |
| O                              | 49.2    | 52.7 | 49.6    | 49.4 | 45.2 | 2.1        | 51.9                       | 49.3 | 46.8 | 49.0 |
| E                              | 53.7    | 55.0 | 55.0    | 53.1 | 51.6 | 1.4        | 55.5                       | 54.4 | 50.7 | 54.1 |
| L                              | 50.5    | 51.0 | 49.8    | 48.1 | 53.2 | 1.0        | 54.0                       | 48.9 | 49.7 | 49.5 |
| EL                             | 52.2    | 56.0 | 53.4    | 50.6 | 48.8 | 3.0        | 54.8                       | 52.7 | 49.1 | 52.2 |
|                                |         |      | ±1.15   |      |      | ±1.15      |                            |      |      |      |
| Mean                           | 51.4    | 53.7 | 52.0    | 50.3 | 49.7 | 1.8        |                            |      |      |      |
| Late-<br>Early<br>Sowing       |         |      | ±2.29   |      |      |            |                            |      |      |      |
|                                |         | 3.4  | 2.1     | 1.4  | 0.6  |            |                            |      |      |      |
|                                | ±1.57   |      | ±2.29   |      |      | ±2.29      | Standard errors            |      |      |      |
| O                              | 54.1    | 59.4 | 52.6    | 52.9 | 51.4 | -0.1       | (a) 2.06 (c) 4.12 for use  |      |      |      |
| I                              | 51.3    | 52.6 | 53.0    | 49.4 | 50.3 | 0.2        | in vertical comparisons    |      |      |      |
| S                              | 49.1    | 50.8 | 49.8    | 48.4 | 47.4 | 3.1        | of E v. L and O v. EL only |      |      |      |
| RS                             | 51.2    | 52.0 | 52.5    | 50.6 | 49.7 | 4.1        | (b) 1.38 (d) 2.75 for use  |      |      |      |
|                                |         |      |         |      |      |            | in all other within-block  |      |      |      |
|                                |         |      |         |      |      |            | comparisons                |      |      |      |

Percentage Eyespot

|                          | Mean | R    | W    | V    | D    | Late-Early | O    | I    | S    | RS   |
|--------------------------|------|------|------|------|------|------------|------|------|------|------|
|                          |      |      |      |      |      | Sowing     |      |      |      |      |
| O                        | 57.3 | 63.3 | 58.0 | 57.7 | 50.3 | 3.6        | 62.0 | 57.5 | 53.2 | 57.0 |
| E                        | 65.0 | 67.1 | 67.1 | 64.0 | 61.4 | 2.4        | 67.9 | 66.2 | 59.8 | 65.7 |
| L                        | 59.5 | 60.3 | 58.3 | 55.4 | 64.2 | 1.6        | 65.5 | 56.8 | 58.2 | 57.8 |
| EL                       | 62.5 | 68.7 | 64.5 | 59.7 | 56.7 | 5.2        | 66.8 | 63.3 | 57.2 | 62.5 |
| Mean                     | 61.0 | 65.0 | 62.2 | 59.2 | 58.2 | 3.2        |      |      |      |      |
| Late-<br>Early<br>Sowing |      | 5.5  | 3.6  | 2.3  | 1.0  |            |      |      |      |      |
| O                        | 65.7 | 74.1 | 63.2 | 63.7 | 61.0 | -0.2       |      |      |      |      |
| I                        | 60.8 | 63.2 | 63.8 | 57.7 | 59.2 | 0.3        |      |      |      |      |
| S                        | 57.2 | 60.0 | 58.3 | 56.0 | 54.2 | 5.4        |      |      |      |      |
| RS                       | 60.7 | 62.2 | 63.0 | 59.7 | 58.2 | 7.0        |      |      |      |      |

Standard errors shown for the block treatments O, I, S, RS are for use in within-block comparisons, except for the S.E. shown for the means of these treatments.



WHEAT

Little Knott, 1944-1946

The interrelationship of Eyespot infection, time of sowing, and sulphate of ammonia for four varieties.

Design; 4 randomized blocks of 8 plots each, plots split for sulphate of ammonia, with certain interactions confounded with block differences.

Area of each sub-plot; 0.0167 acre.

Treatments

- To blocks in 1944 season only; Inoculation; none, inoculated with stubble infected with Eyespot.
- To blocks in 1946 only; none, sulphuric acid spray in March (100 gal. per acre 12 $\frac{1}{2}$ % B.O.V.)
- To whole plots; Varieties, Red Standard (R), Wilma (W), Vilmorin (V), Desprez 80 (D). Time of sowing; Early, Late.
- To sub-plots; Sulphate of Ammonia, none, 0.8 cwt. N per acre applied in Mid-March (E), Mid-May (L), half-early and half-late (EL).

Crop Notes

|      | Early    | Sown | Late     | Harvested |                        |
|------|----------|------|----------|-----------|------------------------|
| 1944 | 20/10/43 |      | 16/11/43 | Aug. 11   | (Previous crop, Wheat) |
| 1945 | 25/10/44 |      | 30/11/44 | Aug. 21   |                        |
| 1946 | 13/10/45 |      | 7/11/45  | Aug. 24   |                        |

|      |                       | Standard errors; per whole plot | sub-plot (cwt. per acre) |
|------|-----------------------|---------------------------------|--------------------------|
| 1944 | Grain                 | 2.98 or 9.1%, 13 d.f.           | 2.51 or 7.6%, 20 d.f.    |
|      | Straw                 | 4.43 or 8.6%, 13 d.f.           | 4.50 or 8.8%, 20 d.f.    |
|      | Transformed % Eyespot | 2.43, 13 d.f.                   | 4.16, 20 d.f.            |
| 1945 | Grain                 | 2.19 or 6.7%, 13 d.f.           | 1.87 or 5.7%, 19 d.f.    |
|      | Straw                 | 2.83 or 4.7%, 13 d.f.           | 2.45 or 4.0%, 19 d.f.    |
|      | Transformed % Eyespot | 5.73, 13 d.f.                   | 7.34, 20 d.f.            |
| 1946 | Grain                 | 2.56 or 8.1%, 12 d.f.           | 2.35 or 7.4%, 18 d.f.    |
|      | Straw                 | 3.79 or 6.3%, 13 d.f.           | 2.63 or 4.4%, 20 d.f.    |
|      | Transformed % Eyespot | 6.73, 12 d.f.                   | 5.38, 18 d.f.            |



K/10

Wheat - Little Knott, 1944-46

Grain, cwt. per acre

| Time of applicn. of N | Mean    | R               | W    | V    | D    | Late-early sowing | Inocn. effect | Spraying effect |
|-----------------------|---------|-----------------|------|------|------|-------------------|---------------|-----------------|
|                       | (a)&(b) | 1944<br>(c)&(d) |      |      |      | (c)&(d)           | (c)&(d)       | (c)&(d)         |
| O                     | 32.9    | 35.5            | 30.3 | 31.7 | 34.0 | -3.9              | 1.3           |                 |
| E                     | 32.7    | 34.9            | 32.6 | 31.5 | 31.7 | -5.6              | -0.8          |                 |
| L                     | 33.2    | 35.5            | 32.1 | 32.3 | 33.1 | -5.9              | -1.9          |                 |
| EL                    | 32.6    | 32.9            | 31.5 | 32.5 | 33.4 | -3.4              | 2.0           |                 |
|                       |         | 1945            |      |      |      |                   |               |                 |
| O                     | 31.9    | 31.0            | 30.8 | 30.6 | 35.3 | 0.2               | 0.3           |                 |
| E                     | 32.5    | 31.7            | 28.7 | 35.1 | 34.4 | -1.6              | 1.9           |                 |
| L                     | 33.6    | 35.0            | 29.9 | 33.9 | 35.7 | -0.9              | 0.6           |                 |
| EL                    | 33.5    | 32.7            | 28.3 | 35.4 | 37.7 | -0.7              | 1.1           |                 |
|                       |         | 1946            |      |      |      |                   |               |                 |
| O                     | 29.9    | 27.6            | 32.4 | 27.5 | 32.2 | 1.3               | -4.3          | 1.3             |
| E                     | 31.2    | 26.3            | 40.5 | 30.9 | 26.9 | -2.9              | 1.3           | -1.1            |
| L                     | 33.0    | 30.3            | 39.3 | 32.4 | 30.1 | -3.7              | -1.7          | -2.3            |
| EL                    | 31.9    | 29.7            | 35.1 | 33.2 | 29.6 | -1.2              | -0.2          | -0.7            |

| Variety | Mean  | Late-early sowing | Inoculation effect | Spraying effect  |
|---------|-------|-------------------|--------------------|--|
|         |       | 1944              |                    |  |
| R       | ±1.05 | ±2.11             | ±2.11              | Standard errors;<br>1944    1945    1946<br>(a) 0.63    0.47    0.59<br>(b) 0.87    0.64    0.76<br>(c) 1.26    0.94    1.18<br>(d) 1.73    1.28    1.52<br><br>(a) and (c) are for use in vertical comparisons E v. L and O v. EL, (b) and (d) are for use in all other comparisons<br><br>Inoculation and spraying effects were confounded with block differences; the standard errors quoted are for use in vertical comparisons. |
| W       | 34.7  | 1.0               | -3.0               |  |
| V       | 31.6  | -3.8              | -0.6               |  |
| D       | 32.0  | -13.2             | -0.8               |  |
| Mean    | 33.0  | -3.1              | 4.9                |  |
|         |       | 1945              |                    |  |
| R       | ±0.77 | ±1.55             | ±1.55              |  |
| W       | 32.6  | 3.3               | 0.3                |  |
| V       | 29.4  | -0.1              | 1.1                |  |
| D       | 33.8  | 2.2               | -0.5               |  |
| Mean    | 35.8  | -8.4              | 3.2                |  |
|         |       | 1946              |                    |  |
| R       | ±0.91 | ±1.81             | ±1.81              | ±1.81  |
| W       | 28.4  | 2.5               | -0.5               | 1.7  |
| V       | 36.8  | -0.3              | -1.3               | 0.9  |
| D       | 31.0  | -1.0              | -1.4               | 1.0  |
| Mean    | 29.8  | -7.6              | -1.7               | -6.4   |
| Mean    | 31.5  | -1.6              |                    |  |



Straw, cwt. per acre

| Time of applicn. of N | Mean    |         |      |      |      | Late-early sowing | Inocn. effect | Spraying effect |
|-----------------------|---------|---------|------|------|------|-------------------|---------------|-----------------|
|                       |         | R       | W    | V    | D    |                   |               |                 |
| 1944                  |         |         |      |      |      |                   |               |                 |
|                       | (a)&(b) | (c)&(d) |      |      |      | (c)&(d)           | (c)&(d)       | (c)&(d)         |
| O                     | 51.5    | 53.9    | 53.1 | 44.1 | 55.0 | -7.0              | 1.4           |                 |
| E                     | 51.5    | 53.0    | 59.4 | 44.0 | 49.5 | -7.3              | -2.8          |                 |
| L                     | 52.4    | 54.7    | 55.0 | 45.5 | 54.6 | -10.1             | -4.1          |                 |
| EL                    | 49.8    | 50.0    | 51.3 | 45.6 | 52.3 | -10.0             | 3.3           |                 |
| 1945                  |         |         |      |      |      |                   |               |                 |
| O                     | 54.9    | 54.9    | 56.4 | 54.3 | 54.0 | - 0.2             | 4.2           |                 |
| E                     | 62.8    | 64.2    | 64.6 | 62.2 | 60.2 | - 3.2             | -2.0          |                 |
| L                     | 60.2    | 62.6    | 61.8 | 59.4 | 57.2 | 0.6               | 1.0           |                 |
| EL                    | 63.4    | 63.6    | 63.8 | 65.0 | 61.2 | - 1.2             | 4.6           |                 |
| 1946                  |         |         |      |      |      |                   |               |                 |
| O                     | 54.1    | 54.2    | 55.0 | 53.8 | 53.3 | - 0.8             | 2.8           | 0.2             |
| E                     | 60.6    | 62.0    | 68.1 | 58.8 | 53.7 | - 8.9             | 2.7           | 1.7             |
| L                     | 62.6    | 65.3    | 63.6 | 62.3 | 59.0 | - 6.4             | -0.1          | -1.8            |
| EL                    | 62.0    | 62.4    | 65.3 | 60.4 | 60.1 | - 5.5             | 3.9           | -2.1            |

| Variety | Mean       | Late-early sowing | Inoculation effect | Spraying effect | Standard errors;   |      |      |      |
|---------|------------|-------------------|--------------------|-----------------|--|------|------|------|
|         |            |                   |                    |                 | 1944   |      |      |      |
|         | $\pm 1.57$ | $\pm 3.14$        | $\pm 3.14$         |                 | 1944   | 1945 | 1946 |      |
| R       | 52.8       | 0.4               | -2.9               |                 | (a)  | 1.13 | 0.61 | 0.66 |
| W       | 54.6       | -8.1              | -0.5               |                 | (b)  | 1.36 | 0.83 | 1.06 |
| V       | 44.8       | -19.8             | 0.2                |                 | (c)  | 2.25 | 1.22 | 1.32 |
| D       | 52.8       | - 6.9             | 1.1                |                 | (d)  | 2.72 | 1.66 | 2.11 |
| Mean    | 51.2       | - 8.6             |                    |                 | (a) and (c) are for use in vertical comparisons E v. L and O v. EL   |      |      |      |
|         |            |                   |                    |                 | 1945   |      |      |      |
|         | $\pm 1.00$ | $\pm 2.00$        | $\pm 2.00$         |                 | (b) and (d) are for use in all other comparisons   |      |      |      |
| R       | 61.4       | 1.4               | 2.7                |                 | Inoculation and spraying effects were confounded with block differences; the standard errors quoted are for use in vertical comparisons. |      |      |      |
| W       | 61.7       | -2.6              | 3.0                |                 |  |      |      |      |
| V       | 60.2       | -0.1              | 1.7                |                 |  |      |      |      |
| D       | 58.2       | -2.9              | 0.5                |                 |  |      |      |      |
| Mean    | 60.4       | -1.0              |                    |                 |  |      |      |      |
|         |            |                   |                    |                 | 1946   |      |      |      |
|         | $\pm 1.34$ | $\pm 2.68$        | $\pm 2.68$         | $\pm 2.68$      |  |      |      |      |
| R       | 61.0       | -5.3              | 2.4                | -0.9            |  |      |      |      |
| W       | 63.0       | -4.4              | 4.2                | 0.2             |  |      |      |      |
| V       | 58.8       | -7.3              | 1.7                | 3.3             |  |      |      |      |
| D       | 56.6       | -4.7              | 1.3                | -4.5            |  |      |      |      |
| Mean    | 59.8       | -5.5              |                    |                 |  |      |      |      |



K/12

Wheat - Little Knott 1944-46

Transformed Percentage Eyespot infection at harvest

| Time of applicn. of N | Mean    | R       | W    | V    | D    | Late-early Sowing | Inocn. effect | Spraying effect |
|-----------------------|---------|---------|------|------|------|-------------------|---------------|-----------------|
| 1944                  |         |         |      |      |      |                   |               |                 |
|                       | (a)&(b) | (c)&(d) |      |      |      | (c)&(d)           | (c)&(d)       | (c)&(d)         |
| O                     | 19.8    | 19.7    | 23.3 | 20.2 | 16.1 | -2.7              | 23.8          |                 |
| E                     | 16.6    | 20.7    | 17.8 | 16.0 | 12.0 | -0.6              | 21.6          |                 |
| L                     | 19.3    | 23.0    | 20.6 | 14.9 | 18.8 | -5.2              | 26.4          |                 |
| EL                    | 17.2    | 21.3    | 17.1 | 15.3 | 14.9 | -2.3              | 26.5          |                 |
| 1945                  |         |         |      |      |      |                   |               |                 |
| O                     | 24.5    | 32.3    | 30.0 | 26.2 | 9.6  | -21.2             | 12.1          |                 |
| E                     | 26.3    | 32.7    | 32.7 | 25.7 | 14.3 | -17.9             | 3.3           |                 |
| L                     | 22.6    | 29.6    | 25.6 | 24.2 | 10.8 | -16.4             | 1.1           |                 |
| EL                    | 24.7    | 33.2    | 35.9 | 14.9 | 14.7 | -20.8             | 11.4          |                 |
| 1946                  |         |         |      |      |      |                   |               |                 |
| O                     | 25.1    | 29.9    | 25.4 | 22.1 | 22.9 | -7.3              | -3.9          | -14.4           |
| E                     | 25.5    | 32.8    | 20.2 | 27.5 | 21.6 | -16.3             | -4.5          | -8.7            |
| L                     | 22.2    | 33.3    | 18.6 | 18.7 | 18.2 | -13.2             | -1.2          | -10.3           |
| EL                    | 24.1    | 29.0    | 23.8 | 23.4 | 20.2 | -5.0              | 1.6           | -5.0            |

| Variety | Mean  | Late-early sowing | Inocn. effect | Spraying effect |
|---------|-------|-------------------|---------------|-----------------|
| 1944    |       |                   |               |                 |
| R       | ±0.86 | ±1.72             | ±1.72         |                 |
| W       | 21.2  | -3.8              | 28.8          |                 |
| V       | 19.7  | -1.8              | 31.4          |                 |
| D       | 16.6  | -3.5              | 19.1          |                 |
| Mean    | 15.4  | -1.7              | 19.1          |                 |
| 1945    |       |                   |               |                 |
| R       | ±2.03 | ±4.05             | ±4.05         |                 |
| W       | 32.0  | -25.5             | 8.9           |                 |
| V       | 31.0  | -19.7             | 12.1          |                 |
| D       | 22.8  | -20.1             | 6.1           |                 |
| Mean    | 12.4  | -11.1             | 0.7           |                 |
| 1946    |       |                   |               |                 |
| R       | ±2.38 | ±4.76             | ±4.76         | ±4.76           |
| W       | 31.2  | -14.1             | 3.1           | -15.5           |
| V       | 22.0  | -12.2             | 1.8           | -6.8            |
| D       | 22.9  | -9.0              | -1.8          | -3.8            |
| Mean    | 20.7  | -6.6              | -11.1         | -12.3           |
| Mean    | 24.2  | -10.4             |               |                 |

Standard Errors;

1944 1945 1946

|     |      |      |      |
|-----|------|------|------|
| (a) | 1.04 | 1.83 | 1.35 |
| (b) | 0.95 | 1.93 | 1.93 |
| (c) | 2.08 | 3.67 | 2.69 |
| (d) | 1.91 | 3.86 | 3.87 |

(a) and (c) are for use in vertical comparisons E v. L and O v. EL

(b) and (d) are for use in all other comparisons.

Inoculation and spraying effects were confounded with block differences; the standard errors quoted are for use in vertical comparisons



Percentage Eyespot at harvest

| Time of applicn. of N | Mean | R    | W    | V    | D    | Late-early sowing | Inocn. effect | Spraying effect |
|-----------------------|------|------|------|------|------|-------------------|---------------|-----------------|
| 1944                  |      |      |      |      |      |                   |               |                 |
| O                     | 11.5 | 11.4 | 15.6 | 11.9 | 7.7  | -3.0              | 25.9          |                 |
| E                     | 8.2  | 12.5 | 9.3  | 7.6  | 4.3  | -0.6              | 20.1          |                 |
| L                     | 10.9 | 15.2 | 12.4 | 6.6  | 10.4 | -5.6              | 27.8          |                 |
| EL                    | 8.7  | 13.2 | 8.6  | 7.0  | 6.6  | -2.3              | 25.1          |                 |
| 1945                  |      |      |      |      |      |                   |               |                 |
| O                     | 17.1 | 28.6 | 25.0 | 19.5 | 2.8  | -27.2             | 15.8          |                 |
| E                     | 19.6 | 29.2 | 29.2 | 18.9 | 6.1  | -24.4             | 4.6           |                 |
| L                     | 14.8 | 24.4 | 18.7 | 16.8 | 3.5  | -20.0             | 1.4           |                 |
| EL                    | 17.4 | 30.0 | 34.3 | 6.6  | 6.4  | -26.9             | 15.0          |                 |
| 1946                  |      |      |      |      |      |                   |               |                 |
| O                     | 18.0 | 24.9 | 18.4 | 14.1 | 15.1 | -9.7              | -5.2          | -19.2           |
| E                     | 18.6 | 29.3 | 11.9 | 21.3 | 13.6 | -21.9             | -6.1          | -11.8           |
| L                     | 14.2 | 30.2 | 1.2  | 10.3 | 9.8  | -16.0             | -1.4          | -12.5           |
| EL                    | 16.6 | 23.5 | 16.2 | 15.8 | 11.9 | -6.4              | 2.1           | -6.4            |

| Variety | Mean | Late-early sowing | Inoculation effect | Spraying effect |
|---------|------|-------------------|--------------------|-----------------|
| 1944    |      |                   |                    |                 |
| R       | 13.1 | -4.5              | 32.4               |                 |
| W       | 11.4 | -2.0              | 33.0               |                 |
| V       | 8.2  | -3.4              | 18.0               |                 |
| D       | 7.1  | -1.5              | 16.8               |                 |
| Mean    | 9.8  | -2.8              |                    |                 |
| 1945    |      |                   |                    |                 |
| R       | 28.1 | -38.7             | 13.9               |                 |
| W       | 26.5 | -29.7             | 18.4               |                 |
| V       | 15.0 | -24.5             | 7.6                |                 |
| D       | 4.6  | -8.0              | 0.5                |                 |
| Mean    | 17.1 | -24.8             |                    |                 |
| 1946    |      |                   |                    |                 |
| R       | 26.8 | -21.6             | 4.7                | -23.8           |
| W       | 14.0 | -14.6             | 2.1                | -8.2            |
| V       | 15.1 | -11.1             | -2.2               | -4.7            |
| D       | 12.5 | -7.6              | -12.7              | -14.0           |
| Mean    | 16.8 | -13.5             |                    |                 |



K/14

Wheat - Little Knot 1944-46

Percentage Area Lodged at Harvest

| Time of applicn. of N | Mean | R    | W    | V    | D    | Late-early sowing | Inocn. effect | Spraying effect |
|-----------------------|------|------|------|------|------|-------------------|---------------|-----------------|
| 1944                  |      |      |      |      |      |                   |               |                 |
| O                     | 0.8  | 3.0  | 0    | 0    | 0    | -1.5              | 1.5           |                 |
| E                     | 0.3  | 1.2  | 0    | 0    | 0    | 0.6               | 0.6           |                 |
| L                     | 0.2  | 1.0  | 0    | 0    | 0    | -0.5              | 0.5           |                 |
| EL                    | 0.6  | 2.5  | 0    | 0    | 0    | -0.8              | 1.2           |                 |
| 1945                  |      |      |      |      |      |                   |               |                 |
| O                     | 9.8  | 33.2 | 6.2  | 0.0  | 0.0  | -19.0             | 8.0           |                 |
| E                     | 19.2 | 41.2 | 24.0 | 11.5 | 0.0  | -34.1             | 10.4          |                 |
| L                     | 15.1 | 38.8 | 18.8 | 2.5  | 0.2  | -27.7             | 7.4           |                 |
| EL                    | 13.7 | 38.5 | 6.2  | 8.8  | 1.2  | -25.8             | 3.6           |                 |
| 1946                  |      |      |      |      |      |                   |               |                 |
| O                     | 13.1 | 26.2 | 23.8 | 1.8  | 0.5  | -15.7             | -3.7          | -9.9            |
| E                     | 16.2 | 44.2 | 8.2  | 0.0  | 12.5 | -27.5             | -6.3          | -20.7           |
| L                     | 10.2 | 38.0 | 2.2  | 0.2  | 0.5  | -18.3             | -5.3          | -17.7           |
| EL                    | 22.2 | 39.2 | 34.5 | 15.0 | 0.2  | -24.7             | 7.5           | -23.3           |

| Variety | Mean | Late-early sowing | Inocn. effect | Spraying effect |
|---------|------|-------------------|---------------|-----------------|
| 1944    |      |                   |               |                 |
| R       | 2.0  | -2.1              | 3.9           |                 |
| W       | 0    | 0                 | 0             |                 |
| V       | 0    | 0                 | 0             |                 |
| D       | 0    | 0                 | 0             |                 |
| Mean    | 0.5  | -0.6              |               |                 |
| 1945    |      |                   |               |                 |
| R       | 38.0 | -67.4             | 9.1           |                 |
| W       | 13.8 | -27.4             | 18.6          |                 |
| V       | 5.6  | -11.1             | 1.1           |                 |
| D       | 0.4  | -0.8              | 0.5           |                 |
| Mean    | 14.4 | -26.7             |               |                 |
| 1946    |      |                   |               |                 |
| R       | 37.0 | -39.7             | 11.1          | -31.7           |
| W       | 17.2 | -32.1             | -9.6          | -24.6           |
| V       | 4.2  | -8.3              | -2.3          | -8.5            |
| D       | 3.4  | -6.1              | -6.9          | -6.9            |
| Mean    | 15.4 | -21.5             |               |                 |



K/15

WHEAT

Hoosfield, 1944

Effects of time of sowing, sulphate of ammonia and sulphuric acid spraying, on yield and Eyespot infection.

Design; 4 randomized blocks of 8 plots each, the plots being split into two for different rates of application of sulphate of ammonia

Area of each sub-plot; 0.0164 acre

Treatments

On blocks

Time of sowing: Early (Oct. 19), late (Nov. 5)

On whole plots

Time and rate of spraying; None, November (at single and double rates).

February, early March, late March, April (all at single rate).

Rates of spraying: 100 galls. per acre 12.5% or 22.2% B.O.V.

On sub-plots

Sulphate of ammonia: 0.6, 1.2 cwt. N per acre as top dressing in Spring

Crop Notes

Harvested; Aug. 16. Variety; Red Standard

Previous crop; Wheat

Standard errors per plot:

Grain;

|                |                                      |
|----------------|--------------------------------------|
| per whole plot | 1.49 cwt. per acre or 6.7%, 16 d.f.  |
| per sub-plot   | 3.28 cwt. per acre or 14.7%, 24 d.f. |

Straw;

|                |                                      |
|----------------|--------------------------------------|
| per whole plot | 2.03 cwt. per acre or 7.5%, 16 d.f.  |
| per sub-plot   | 3.70 cwt. per acre or 13.7%, 24 d.f. |

Transformed Percentage Eyespot at harvest

|                |               |
|----------------|---------------|
| per whole plot | 3.41, 16 d.f. |
| per sub-plot   | 3.48, 24 d.f. |



K/16

Wheat - Hoosfield 1944

|                    | Mean                 | Response to N    | Late-early sowing | Mean                 | Response to N    | Late-early sowing |
|--------------------|----------------------|------------------|-------------------|----------------------|------------------|-------------------|
|                    | Grain; cwt. per acre |                  |                   | Straw; cwt. per acre |                  |                   |
| Time of spraying   | $\pm 0.74$           | $\pm 2.32$       | $\pm 1.49$        | $\pm 1.02$           | $\pm 2.62$       | $\pm 2.03$        |
| None               | 23.2 <sup>a</sup>    | 4.3 <sup>b</sup> | 3.2 <sup>c</sup>  | 28.8 <sup>d</sup>    | 6.0 <sup>e</sup> | 3.5 <sup>f</sup>  |
| November           | 24.4                 | 2.4              | 0.4               | 29.9                 | 5.0              | 2.9               |
| Nov. (double rate) | 24.1                 | 1.9              | -0.8              | 30.2                 | 4.7              | -0.4              |
| February           | 20.7                 | 8.5              | -1.2              | 24.0                 | 9.8              | 0.2               |
| Early March        | 22.4                 | 4.1              | -0.7              | 26.0                 | 5.4              | 1.1               |
| Late March         | 22.9                 | 3.1              | 1.8               | 26.7                 | 4.5              | 2.9               |
| April              | 18.4                 | 0.5              | 0.4               | 22.3                 | 2.4              | 1.9               |
| Time of sowing     |                      | $\pm 1.16$       |                   |                      | $\pm 1.31$       |                   |
| Early              | 22.0                 | 5.2              |                   | 26.1                 | 6.8              |                   |
| Late               | 22.8                 | 2.0              |                   | 28.0                 | 4.1              |                   |
| Mean               | 22.4                 | $\pm 0.82$       |                   | 27.1                 | $\pm 0.93$       |                   |

|                    | Transformed % Eyespot |                   |                   | % Eyespot at harvest |      |      |
|--------------------|-----------------------|-------------------|-------------------|----------------------|------|------|
| Time of Spraying   | $\pm 1.71$            | $\pm 2.46$        | $\pm 3.41$        |                      |      |      |
| None               | 35.5 <sup>g</sup>     | -2.0 <sup>h</sup> | -5.7 <sup>j</sup> | 33.7                 | -3.2 | -9.4 |
| November           | 32.5                  | 0.1               | 2.9               | 28.9                 | 0.2  | 4.7  |
| Nov. (double rate) | 29.7                  | -2.1              | 1.9               | 24.6                 | -3.1 | 2.9  |
| February           | 21.4                  | 0.8               | -5.6              | 13.3                 | 0.9  | -6.6 |
| Early March        | 24.4                  | 3.5               | 0.4               | 17.0                 | 4.6  | 0.5  |
| Late March         | 29.2                  | 3.5               | -1.7              | 23.8                 | 5.2  | -2.5 |
| April              | 38.0                  | 5.0               | -3.6              | 37.8                 | 8.5  | -6.2 |
| Time of sowing     |                       | $\pm 1.23$        |                   |                      |      |      |
| Early              | 31.8                  | -0.7              |                   | 27.8                 | -1.1 |      |
| Late               | 29.7                  | 2.4               |                   | 24.6                 | 3.6  |      |
| Mean               | 30.8                  | $\pm 0.87$        |                   | 26.2                 | 1.2  |      |

Standard Errors (a) 0.53 (b) 1.64 (c) 1.05 (d) 0.72 (e) 1.85 (f) 1.44  
 (g) 1.21 (h) 1.74 (j) 2.41

Standard errors shown in the "Late-Early sowing" columns are only for use in vertical comparisons.



WHEAT

K/17

Pennell's Piece and Exhaustion Land 1945

Control of Eyespot by burning and spraying.

Design; Pennell's Piece, 3 randomized blocks of 8 plots each, plots split for sulphate of ammonia.

Exhaustion Land, 2 randomized blocks of 8 plots each, plots split for sulphate of ammonia.

Area of each plot; Pennell's Piece, 0.0125, 0.0094 and 0.0062 acres in different blocks.

Exhaustion Land, 0.0167 acre.

Treatments

None, stubble burnt with flame gun, sprayed with sulphuric acid in October, February, early March, late March and April.

Sulphate of ammonia: 0.6 and 1.2 cwt. N per acre on split plots as top dressing in March.

Crop Notes

Pennell's Piece

Stubble burnt with flame gun: Oct. 11 and Nov. 2. Seed sown; Oct. 27. Harvested; Aug. 20. Variety; Red Standard. Previous crop; Wheat

Exhaustion Land

Seed sown; Oct. 30. Stubble burnt with flame gun; Nov. 2. Harvested; Aug. 15. Variety; Red Standard. Previous crop; Wheat.

Standard errors per plot: Pennell's Piece: Grain, per whole plot 2.35 cwt.  
or 9.6%, 15 d.f.  
per split plot .24 cwt.  
or 21.4%, 17 d.f.  
Straw, per whole plot 5.64 cwt.  
or 9.7%, 15 d.f.  
per split plot 6.11 cwt.  
or 10.5%, 17 d.f.  
Transf. % Eyespot at harvest, per whole plot  
8.1%, 15 d.f.  
per split plot 17.53,  
17 d.f.  
Exhaustion Land: Grain, per whole plot 1.31 cwt.  
or 4.9%, 8 d.f.  
per split plot 1.48 cwt.  
or 5.5%, 9 d.f.  
Straw, per whole plot 2.44 cwt.  
or 5.2%, 8 d.f.  
per split plot 2.29 cwt.  
or 4.9%, 9 d.f.  
Transf. % Eyespot at harvest, per whole plot  
5.60, 8 d.f.  
per split plot 3.43, 9 d.f.



K/18

Wheat - Pennell's Piece and Exhaustion Land, 1945

Pennell's Piece

|                 | None     | Stubble burnt | October  | Sprayed with sulphuric acid       |          |          | April             | Mean |
|-----------------|----------|---------------|----------|-----------------------------------|----------|----------|-------------------|------|
|                 |          |               |          | February                          | E. March | L. March |                   |      |
| Mean            | ±1.36    | 24.2          | 24.2     | 25.9                              | 25.7     | 25.8     | 24.4              |      |
| Response to N   | ±4.27    | -1.3          | -4.3     | -2.0                              | 3.6      | 4.4      | -0.4 <sup>c</sup> |      |
|                 |          |               |          | Grain: cwt. per acre              |          |          |                   |      |
| Mean            | ±3.25    | 63.4          | 58.2     | 62.6                              | 59.0     | 53.6     | 58.3              |      |
| Response to N   | ±4.98    | 7.2           | 11.4     | 5.2                               | 9.3      | 22.5     | 10.6 <sup>f</sup> |      |
|                 |          |               |          | Straw: cwt. per acre              |          |          |                   |      |
|                 |          |               |          | Transformed Percentage Eyespot    |          |          |                   |      |
| Mean            | ±4.7     | 39.4          | 39.1     | 37.1                              | 35.4     | 36.2     | 38.8              |      |
| Response to N   | ±4.3     | 1.0           | -2.6     | -4.8                              | 20.0     | -2.7     | 0.7 <sup>j</sup>  |      |
|                 |          |               |          | Percentage Eyespot                |          |          |                   |      |
| Mean            | ±7.5     | 40.3          | 39.8     | 36.3                              | 33.5     | 34.8     | 39.3              |      |
| Response to N   | ±8.7     | 1.7           | -4.5     | -8.1                              | 32.3     | -4.4     | 1.2               |      |
|                 |          |               |          | Percentage area lodged at harvest |          |          |                   |      |
| Mean            | ±69.2    | 61.7          | 67.8     | 46.2                              | 39.5     | 54.2     | 57.1              |      |
| Response to N   | ±15.9    | 3.3           | 11.0     | 11.0                              | 52.4     | -8.3     | 8.2               |      |
| Standard errors | (a) 0.96 | (b) 3.02      | (c) 1.51 | (d) 2.30                          | (e) 3.52 | (f) 1.76 | (g) 3.3           |      |
|                 | (h) 10.1 | (j) 5.1       |          |                                   |          |          |                   |      |



Exhaustion Land

|                                | None  | Stubble burnt     | Sprayed with sulphuric acid |          |          |          | Mean              |
|--------------------------------|-------|-------------------|-----------------------------|----------|----------|----------|-------------------|
|                                |       |                   | October                     | February | E. March | L. March |                   |
| Mean<br>Response to N          | ±0.93 | 26.2 <sup>a</sup> | 26.5                        | 27.0     | 27.6     | 29.2     | 26.9              |
|                                | ±1.48 | 4.0 <sup>b</sup>  | 2.2                         | 3.8      | -1.0     | 3.5      | 3.1 <sup>c</sup>  |
| Mean<br>Response to N          | ±1.73 | 48.2 <sup>d</sup> | 49.8                        | 45.2     | 44.0     | 47.0     | 46.6              |
|                                | ±2.29 | 5.6 <sup>c</sup>  | 5.9                         | 4.5      | 0.2      | 6.8      | 5.0 <sup>f</sup>  |
| Transformed Percentage Eyespot |       |                   |                             |          |          |          |                   |
| Mean<br>Response to N          | ±3.96 | 33.8 <sup>g</sup> | 31.8                        | 20.4     | 21.7     | 26.7     | 28.1              |
|                                | ±3.43 | -4.8 <sup>h</sup> | 2.1                         | -1.4     | 1.5      | -6.1     | -1.1 <sup>j</sup> |
| Percentage Eyespot             |       |                   |                             |          |          |          |                   |
| Mean<br>Response to N          | 31.0  | 27.8              | 20.0                        | 12.2     | 13.7     | 20.1     | 22.1              |
|                                | -7.6  | 3.3               | 7.9                         | -1.6     | 1.7      | -8.6     | -1.6              |

Standard Errors (a) 0.66 (b) 1.04 (c) 0.52 (d) 1.22 (e) 1.62 (f) 0.81 (g) 2.80 (h) 2.42 (j) 1.21.



K/20

WHEAT

Little Knott 1945

Effect of Eyespot disease on the yield of wheat.

Design; 6 randomized blocks of 3 plots each.

Area of each plot: 0.0227 acre

Treatments

Not inoculated.

Inoculated with "Eyespot" at light rate

Stubble put on plots Nov. 1st., and spread Nov. 6th

Inoculated at heavy rate.

3 boxes of infected plants put on each plot Oct. 31st.,

3 more boxes put on each plot Nov. 1st., stubble put on plots Nov. 1st and spread Nov. 6th.

Crop Notes

Seed sown; Oct. 25th Harvested; Aug. 22 Variety; Red Standard.

Previous crop: Wheat

Standard errors per plot:

Grain, 0.715 cwt. per acre or 2.4%, 10 d.f.

Straw, 1.33 cwt. per acre or 2.3%, 10 d.f.

Transformed Percent. Eyespot at harvest 4.32, 10 d.f.

|  | Inoculation |       |       | Mean |
|--|-------------|-------|-------|------|
|  | None        | Light | Heavy |      |
| Grain: cwt. per acre $\pm 0.30$                    | 26.9        | 31.3  | 30.1  | 29.5 |
| Straw: cwt. per acre $\pm 0.54$                    | 55.3        | 57.8  | 57.6  | 56.9 |
| Percentage Eyespot in April                        | 54.7        | 53.8  | 46.0  | 51.5 |
| Transformed Percent. Eyespot at harvest $\pm 1.76$ | 59.3        | 46.0  | 47.5  | 50.9 |
| Percentage Eyespot at harvest                      | 74.0        | 51.8  | 54.3  | 60.2 |
| Percentage area lodged at harvest                  | 94.8        | 70.8  | 69.2  | 78.3 |



WHEAT

Little Knott, 1946-1948

The effects of depth and rate of sowing, of sulphate of ammonia, and of spraying, on yield and Eyespot infection.

Design; 3x3x3 in 6 blocks of 9 plots each, certain three-factor interactions and the effect of spraying being confounded with block differences.

Area of each plot; 0.0152 acre

Treatments

Rate of sowing;  $1\frac{1}{2}$ ,  $2\frac{1}{2}$  or  $3\frac{1}{2}$  (1946, and 1, 2, 3 (1947) bushels per acre (R<sub>0</sub>, R<sub>1</sub>, R<sub>2</sub>)

Depth of sowing; Approximately  $\frac{1}{2}$ ",  $1\frac{1}{2}$ ", 3" (1946) and  $\frac{3}{4}$ ",  $1\frac{1}{2}$ ",  $2\frac{1}{2}$ " (1947) (D<sub>0</sub>, D<sub>1</sub>, D<sub>2</sub>)

Sulphate of ammonia; None, 0.4, 0.8 (1946) and None, 0.3, 0.6 (1947) cwt. N per acre applied as top dressing in March.

Spraying; 3 blocks sprayed each year with sulphuric acid in autumn before germination and again in March, each time with 100 gals. per acre 12 $\frac{1}{2}$ % B.O.V.

Basal Manuring; None in 1946, 3 cwt. per acre superphosphate and 1 cwt. per acre muriate of potash in 1947.

Crop Notes

|      | Sown     | Harvested                      |
|------|----------|--------------------------------|
| 1946 | 15.10.45 | Aug. 24 (Previous crop, Wheat) |
| 1947 | 21.10.46 | Aug. 6                         |

Variety, Squareheads Master 13/4

See also 1948 Report of Field Experiments, 48/Ca/1

Standard errors per plot;

|                              | 1946         | 1947          |         |
|------------------------------|--------------|---------------|---------|
| Grain, cwt. per acre         | 1.95 or 7.2% | 2.09 or 8.0%  | All     |
| Straw, cwt. per acre         | 5.00 or 7.4% | 3.83 or 10.4% | with    |
| Transformed Percent. Eyespot | 8.15         | 6.18          | 24 d.f. |



K/22

Wheat - Little Knott 1946-48

1946

Grain: cwt. per acre

|   | ±0.79                |      |      |               |   |
|---|----------------------|------|------|---------------|---|
|   | R0                   | R1   | R2   | Mean<br>±0.46 | Effect of<br>spraying<br>±0.92 <sup>(1)</sup> |
| D0  | 27.4                 | 26.4 | 26.9 | 26.9          | 1.0   |
| D1  | 26.8                 | 27.1 | 26.4 | 26.8          | 2.3   |
| D2  | 26.5                 | 27.2 | 28.1 | 27.3          | 2.1   |
|   | NO                   | N1   | N2   |               |   |
| D0  | 27.1                 | 26.7 | 26.9 |               |   |
| D1  | 26.6                 | 27.2 | 26.6 |               |   |
| D2  | 26.0                 | 29.1 | 26.7 |               |   |
| R0  | 26.5                 | 27.4 | 26.7 | 26.9          | 1.5   |
| R1  | 26.9                 | 27.6 | 26.2 | 26.9          | 2.5   |
| R2  | 26.2                 | 28.0 | 27.3 | 27.1          | 1.5   |
| Mean ±0.46                                    | 26.5                 | 27.7 | 26.7 | 27.0          |   |
| Effect of<br>spraying<br>±0.92 <sup>(1)</sup> | 0.0                  | 2.3  | 3.1  |               |   |
|   | Straw: cwt. per acre |      |      |               |   |
|   | R0                   | R1   | R2   | Mean<br>±1.18 | Effect of<br>spraying<br>±2.36 <sup>(1)</sup> |
| D0  | 65.8                 | 68.3 | 67.5 | 67.2          | 1.3   |
| D1  | 69.7                 | 64.8 | 67.1 | 67.2          | 2.0   |
| D2  | 68.9                 | 68.2 | 67.4 | 68.2          | -0.3  |
|   | NO                   | N1   | N2   |               |   |
| D0  | 62.6                 | 68.4 | 70.7 |               |   |
| D1  | 62.1                 | 69.9 | 69.5 |               |   |
| D2  | 62.4                 | 69.6 | 72.4 |               |   |
| R0  | 66.3                 | 67.9 | 70.2 | 68.1          | 1.5   |
| R1  | 61.3                 | 69.8 | 70.1 | 67.1          | -4.1  |
| R2  | 79.6                 | 70.2 | 72.4 | 67.4          | 1.6   |
| Mean ±1.18                                    | 62.4                 | 69.3 | 70.9 | 67.5          |   |
| Effect of<br>spraying<br>±2.36 (1)            | 1.8                  | 1.0  | 0.2  |               |   |

(1) S.E. only for comparison between effects.

86



1946

Transformed Percent. Eyespot at harvest

|                                     | $\pm 3.33$ |       |       | Mean<br>$\pm 1.92$ | Effect of spraying<br>$\pm 3.85(1)$ |
|-------------------------------------|------------|-------|-------|--------------------|-------------------------------------|
|                                     | RO         | R1    | R2    |                    |                                     |
| D0                                  | 38.8       | 58.4  | 52.4  | 49.9               | -19.8                               |
| D1                                  | 48.4       | 49.2  | 51.0  | 49.5               | -22.7                               |
| D2                                  | 43.1       | 43.7  | 44.6  | 43.8               | -19.6                               |
|                                     | NO         | N1    | N2    |                    |                                     |
| D0                                  | 46.2       | 46.5  | 56.9  |                    |                                     |
| D1                                  | 46.4       | 51.1  | 51.2  |                    |                                     |
| D2                                  | 41.4       | 41.4  | 48.6  |                    |                                     |
| RO                                  | 41.3       | 37.5  | 51.7  | 43.5               | -12.6                               |
| R1                                  | 47.9       | 49.4  | 54.0  | 50.4               | -26.7                               |
| R2                                  | 44.8       | 52.2  | 51.0  | 49.3               | -22.8                               |
| Mean $\pm 1.92$                     | 44.7       | 46.3  | 52.2  | 47.7               |                                     |
| Effect of spraying<br>$\pm 3.85(1)$ | -18.7      | -20.6 | -22.8 |                    |                                     |

Percentage Eyespot at harvest

|                    | RO  | R1  | R2  | Mean | Effect of spraying |
|--------------------|-----|-----|-----|------|--------------------|
| D0                 | 39  | 73  | 63  | 59   | -34                |
| D1                 | 56  | 57  | 60  | 58   | -38                |
| D2                 | 47  | 48  | 49  | 48   | -34                |
|                    | NO  | N1  | N2  |      |                    |
| D0                 | 52  | 53  | 70  |      |                    |
| D1                 | 52  | 61  | 61  |      |                    |
| D2                 | 44  | 44  | 56  |      |                    |
| RO                 | 44  | 37  | 62  | 47   | -21                |
| R1                 | 55  | 58  | 65  | 59   | -45                |
| R2                 | 50  | 62  | 60  | 57   | -38                |
| Mean               | 49  | 52  | 62  | 55   |                    |
| Effect of spraying | -32 | -35 | -37 |      |                    |

(1) S.E. only for comparison between effects.



K/24  
Wheat - Little Knott 1946-48

1946

Percentage Area Lodged

|                    | R0  | R1  | R2  | Mean | Effect of spraying |
|--------------------|-----|-----|-----|------|--------------------|
| D0                 | 54  | 79  | 79  | 71   | -60                |
| D1                 | 56  | 61  | 80  | 66   | -70                |
| D2                 | 48  | 60  | 67  | 58   | -60                |
|                    | NO  | N1  | N2  |      |                    |
| D0                 | 66  | 69  | 79  |      |                    |
| D1                 | 57  | 68  | 73  |      |                    |
| D2                 | 42  | 55  | 77  |      |                    |
|                    |     |     |     |      |                    |
| R0                 | 55  | 37  | 66  | 53   | -74                |
| R1                 | 59  | 68  | 74  | 67   | -73                |
| R2                 | 52  | 84  | 87  | 76   | -42                |
| Mean               | 55  | 64  | 76  | 65   |                    |
| Effect of spraying | -79 | -68 | -45 |      |                    |

1947

Grain: cwt. per acre

|                                  | R0   | R1 $\pm 0.85$ | R2   | Mean $\pm 0.49$ | Effect of spraying $\pm 0.99(1)$ |
|----------------------------------|------|---------------|------|-----------------|----------------------------------|
| D0                               | 24.3 | 26.9          | 27.2 | 26.1            | 2.1                              |
| D1                               | 24.5 | 25.5          | 26.3 | 25.5            | 0.9                              |
| D2                               | 25.4 | 26.8          | 27.0 | 26.4            | 1.8                              |
|                                  | NO   | N1            | N2   |                 |                                  |
| D0                               | 23.3 | 26.9          | 28.3 |                 |                                  |
| D1                               | 22.0 | 26.0          | 28.3 |                 |                                  |
| D2                               | 24.0 | 26.7          | 28.4 |                 |                                  |
|                                  |      |               |      |                 |                                  |
| R0                               | 22.3 | 25.1          | 26.9 | 24.7            | 1.9                              |
| R1                               | 24.0 | 26.9          | 28.4 | 26.4            | 1.2                              |
| R2                               | 23.1 | 27.7          | 29.8 | 26.8            | 1.8                              |
| Mean $\pm 0.49$                  | 23.1 | 26.5          | 28.3 | 26.0            |                                  |
| Effect of spraying $\pm 0.99(1)$ | 0.5  | 2.8           | 1.5  |                 |                                  |

(1) S.E. only for comparison between effects.



1947

K/25

Straw: cwt. per acre

|  |      | $\pm 1.56$ |      | Mean       | Effect of spraying |
|--|------|------------|------|------------|--------------------|
|  | R0   | R1         | R2   | $\pm 0.90$ | $\pm 1.81^{(1)}$   |
| D0                                     | 35.1 | 38.0       | 37.5 | 36.9       | -0.1               |
| D1                                     | 36.8 | 35.0       | 37.2 | 36.3       | -1.3               |
| D2                                     | 35.6 | 36.7       | 38.0 | 36.8       | -1.6               |
|  | NO   | N1         | N2   |            |                    |
| D0                                     | 32.5 | 37.8       | 40.3 |            |                    |
| D1                                     | 30.7 | 37.6       | 40.7 |            |                    |
| D2                                     | 31.7 | 37.1       | 41.5 |            |                    |
| R0                                     | 31.8 | 35.9       | 39.7 | 35.8       | -1.6               |
| R1                                     | 32.3 | 37.5       | 40.0 | 36.6       | -1.9               |
| R2                                     | 30.7 | 39.2       | 42.8 | 37.6       | 0.6                |
| Mean $\pm 0.90$                        | 31.6 | 37.5       | 40.8 | 36.7       |                    |
| Effect of spraying<br>$\pm 1.81^{(1)}$ | -1.5 | 0.3        | -1.7 |            |                    |

Transformed Percent. Eyespot at harvest

|  |      | $\pm 2.52$ |      | Mean       | Effect of spraying |
|--|------|------------|------|------------|--------------------|
|  | R0   | R1         | R2   | $\pm 1.46$ | $\pm 2.91^{(1)}$   |
| D0                                     | 28.7 | 28.7       | 25.9 | 27.8       | -7.0               |
| D1                                     | 31.2 | 25.1       | 24.2 | 26.8       | -8.3               |
| D2                                     | 26.4 | 23.0       | 22.4 | 23.9       | -6.4               |
|  | NO   | N1         | N2   |            |                    |
| D0                                     | 24.9 | 28.6       | 29.8 |            |                    |
| D1                                     | 24.3 | 27.8       | 28.4 |            |                    |
| D2                                     | 22.0 | 21.8       | 27.9 |            |                    |
| R0                                     | 27.5 | 27.9       | 30.9 | 28.8       | -9.9               |
| R1                                     | 24.4 | 26.6       | 25.8 | 25.6       | -4.2               |
| R2                                     | 19.3 | 23.8       | 29.3 | 24.2       | -7.6               |
| Mean $\pm 1.46$                        | 23.7 | 26.1       | 28.7 | 26.2       |                    |
| Effect of spraying<br>$\pm 2.91^{(1)}$ | -7.5 | -6.6       | -7.5 |            |                    |

(1) S.E. only for comparison between effects.



K/26

Wheat - Little Knott 1946-48

1947

Percentage Eyespot at harvest

|                    | R0   | R1   | R2   | Mean | Effect of spraying |
|--------------------|------|------|------|------|--------------------|
| D0                 | 23.1 | 23.1 | 19.1 | 21.8 | -3.1               |
| D1                 | 26.8 | 18.0 | 16.8 | 20.3 | -4.0               |
| D2                 | 19.8 | 15.3 | 14.5 | 16.4 | -2.0               |
|                    | NO   | N1   | N2   |      |                    |
| D0                 | 17.7 | 22.9 | 24.7 |      |                    |
| D1                 | 16.9 | 21.8 | 22.6 |      |                    |
| D2                 | 14.0 | 13.8 | 21.9 |      |                    |
| R0                 | 21.3 | 21.9 | 26.4 | 23.2 | -6.3               |
| R1                 | 17.1 | 20.0 | 18.9 | 18.7 | -1.0               |
| R2                 | 10.9 | 16.3 | 23.9 | 16.8 | -2.8               |
| Mean               | 16.2 | 19.4 | 23.1 | 19.5 |                    |
| Effect of spraying | -2.8 | -2.5 | -3.8 |      |                    |

Percentage Area Covered by Weeds

|                    | R0    | R1    | R2    | Mean | Effect of spraying |
|--------------------|-------|-------|-------|------|--------------------|
| D0                 | 70.0  | 53.3  | 49.2  | 57.5 | -47.2              |
| D1                 | 78.3  | 41.7  | 40.8  | 53.6 | -38.3              |
| D2                 | 57.5  | 61.7  | 42.5  | 53.9 | -40.0              |
|                    | NO    | N1    | N2    |      |                    |
| D0                 | 45.0  | 65.8  | 61.7  |      |                    |
| D1                 | 45.8  | 55.0  | 60.0  |      |                    |
| D2                 | 37.5  | 62.5  | 61.7  |      |                    |
| R0                 | 56.7  | 74.2  | 75.0  | 68.6 | -31.7              |
| R1                 | 36.7  | 60.0  | 60.0  | 52.2 | -48.9              |
| R2                 | 35.0  | 49.2  | 48.3  | 44.2 | -45.0              |
| Mean               | 42.8  | 61.1  | 61.1  | 55.0 |                    |
| Effect of spraying | -30.0 | -44.4 | -51.1 |      |                    |

90



WINTER WHEAT AND BARLEY

Woburn Stackyard, Series C, 1944-46

Control of "Take-All" (*Ophiobolus*)

Design; 4 randomized blocks of 12 plots each, certain interactions being confounded with block differences.

Area of each plot: 0.02 acre

Crops; Winter wheat in 1944, barley in 1945 and 1946.

Treatments

Inoculations: None, inoculated with "Take-All" in December 1943.

Time of ploughing: Early (early autumn) and late - (February) with stubble cleaning during winter where trefoil was not grown.

Straw: None, 30 cwt. per acre ploughed in on plots which were ploughed early.

Trefoil: None, trefoil undersown in preceding crop on plots which were to be ploughed late.

Sulphate of ammonia: None, 0.4 cwt. N per acre applied either to trefoil soon after preceding corn crop was cut or to straw when ploughed in.

None, 0.4 cwt. N per acre applied to present crop at sowing (as top dressing in 1944 only).

Superphosphate and sulphate of potash: 0.4 cwt.  $P_2O_5$  per acre and 0.5 cwt.  $K_2O$  per acre, applied to blocks 1 and 3 at sowing time.

Of the above treatments the wheat crop in 1944 received only three: inoculation with "Take-All", late application of sulphate of ammonia (as a top dressing) and application of superphosphate and sulphate of potash (in seed-bed).

Basal manuring: 8 cwt. per acre carbonate of lime.

Crop Notes

|             | Sown    | Harvested | Variety        | Trefoil undersown |
|-------------|---------|-----------|----------------|-------------------|
| 1944 Wheat  | 24.9.43 | Aug.9     | Red Standard   | May 15            |
| 1945 Barley | Mar.2   | Aug.10    | Plumage Archer | Mar.2             |
| 1946 Barley | Mar.19  | Aug.23    | Plumage Archer |                   |

Previous year, Fallow (the experiment was begun in 1943 season but was ploughed up on account of weeds)

Standard errors per plot:

Wheat 1944: grain, 2.70 cwt. per acre or 15.2%, 36 d.f.  
 straw, 7.13 " " " " 16.1%, 36 d.f.

Barley 1945 grain, 1.88 cwt. per acre or 15.2%, 14 d.f.  
 straw, 2.51 " " " " 17.3%, 14 d.f.  
 Transformed % Take-All, 7.53, 14 d.f.

Barley 1946 grain, 1.40 cwt. per acre or 14.7%, 14 d.f.  
 Transformed % Take-All, 6.72, 14 d.f.



K/28

Winter Wheat and Barley, 1944-46

| Differential Responses                             |             |          |       |             |       |            |       |       |       |
|--|-------------|----------|-------|-------------|-------|------------|-------|-------|-------|
|  | Mean effect | Ploughed |       | Inoculation |       | N          |       | PK    |       |
|  |             | Early    | Late  | Abs.        | Pres. | Abs.       | Pres. | Abs.  | Pres. |
| 1944 Wheat Grain, cwt. per acre. Mean yield, 17.7  |             |          |       |             |       |            |       |       |       |
|  | $\pm 0.78$  |          |       |             |       | $\pm 1.10$ |       |       |       |
| Inoculation  | -0.3        |          |       | -           | -     | -1.9       | 1.4   | -0.8  | 0.2   |
| N top-dressing                                     | 2.3         |          |       | 0.6         | 3.9   | -          | -     | 3.3   | 1.3   |
| 1944 Wheat Straw, cwt. per acre. Mean yield, 44.3  |             |          |       |             |       |            |       |       |       |
|  | $\pm 2.06$  |          |       |             |       | $\pm 2.91$ |       |       |       |
| Inoculation  | 2.9         |          |       | -           | -     | 0.4        | 5.4   | 2.5   | 3.1   |
| N top-dressing                                     | 4.0         |          |       | 1.5         | 6.4   | -          | -     | 6.1   | 1.9   |
| 1945 Barley Grain, cwt. per acre. Mean yield, 12.3 |             |          |       |             |       |            |       |       |       |
|  | $\pm 0.54$  |          |       |             |       | $\pm 0.77$ |       |       |       |
| Late-early plough.                                 | 3.7         | -        |       | 2.6         | 4.8   | 4.6        | 2.7   | 3.0   | 4.3   |
| Inoculation  | 0.8         | -0.3     | 1.8   | -           | -     | 0.8        | 0.8   | 0.9   | 0.7   |
| N at sowing  | 5.1         | 6.1      | 4.2   | 5.1         | 5.1   | -          | -     | 4.9   | 5.2   |
| 1945 Barley Straw, cwt. per acre. Mean yield, 14.5 |             |          |       |             |       |            |       |       |       |
|  | $\pm 0.72$  |          |       |             |       | $\pm 1.03$ |       |       |       |
| Late-early plough.                                 | 2.2         | -        | -     | 1.8         | 2.5   | 3.4        | 0.8   | 2.0   | 2.3   |
| Inoculation  | 0.3         | 0.0      | 0.7   | -           | -     | 0.1        | 0.5   | -0.8  | 1.5   |
| N at sowing  | 4.9         | 6.2      | 3.6   | 4.7         | 5.1   | -          | -     | 5.0   | 4.8   |
| 1945 Barley. Transformed % Take-All. Mean, 31.7    |             |          |       |             |       |            |       |       |       |
|  | $\pm 2.17$  |          |       |             |       | $\pm 3.07$ |       |       |       |
| Late-early plough.                                 | -6.3        | -        | -     | -4.5        | -8.0  | -6.1       | -6.4  | -12.3 | -0.2  |
| Inoculation  | 3.4         | 5.1      | 1.6   | -           | -     | 1.9        | 4.9   | 3.7   | 3.1   |
| N at sowing  | -13.5       | -13.3    | -13.6 | -15.0       | -12.0 | -          | -     | -12.0 | -15.0 |
| 1945 Barley. Percentage Take-All. Mean, 28         |             |          |       |             |       |            |       |       |       |
| Late-early plough.                                 | -10         | -        | -     | 6           | -13   | -10        | -8    | -19   | 0     |
| Inoculation  | 5           | 9        | 2     | -           | -     | 3          | 6     | 6     | 5     |
| N at sowing  | -21         | -22      | -20   | -22         | -19   | -          | -     | -19   | -22   |
| 1946 Barley Grain, cwt. per acre. Mean yield, 9.5  |             |          |       |             |       |            |       |       |       |
|  | $\pm 0.40$  |          |       |             |       | $\pm 0.57$ |       |       |       |
| Late-early plough.                                 | 3.9         | -        | -     | 3.8         | 4.0   | 3.4        | 4.4   | 2.5   | 5.3   |
| Inoculation  | -0.5        | -0.6     | -0.5  | -           | -     | -1.2       | 0.1   | -0.9  | -0.2  |
| N at sowing  | 3.4         | 2.9      | 3.9   | 2.7         | 4.1   | -          | -     | 3.3   | 3.5   |
| 1946 Barley. Transformed % Take-All. Mean, 33.0    |             |          |       |             |       |            |       |       |       |
|  | $\pm 1.94$  |          |       |             |       | $\pm 2.74$ |       |       |       |
| Late-early plough.                                 | -0.2        | -        | -     | 1.8         | -2.4  | 3.6        | -4.0  | -2.8  | 2.4   |
| Inoculation  | -1.4        | 0.7      | -3.5  | -           | -     | -1.6       | -1.2  | -3.6  | 0.9   |
| N at sowing  | -7.2        | -3.4     | -11.0 | -7.4        | -7.0  | -          | -     | -7.6  | -6.7  |
| 1946 Barley. Percentage Take-All. Mean, 30         |             |          |       |             |       |            |       |       |       |
| Late-early plough.                                 | 0           | -        | -     | 3           | -3    | 6          | -6    | -5    | 4     |
| Inoculation  | -2          | 1        | -5    | -           | -     | -3         | -2    | -6    | 2     |
| N at sowing  | -12         | -6       | -18   | -12         | -11   | -          | -     | -13   | -11   |



Differential Responses

K/29

|                                     | Ploughed early     |                  |                  | Ploughed late        |                    |                    |
|-------------------------------------|--------------------|------------------|------------------|----------------------|--------------------|--------------------|
|                                     | No straw<br>or S/A | Straw<br>and S/A | Straw<br>and S/A | No trefoil<br>or S/A | Trefoil<br>and S/A | Trefoil<br>and S/A |
| 1945 Barley Grain, cwt. per acre    |                    |                  |                  |                      |                    |                    |
|                                     | $\pm 1.33$         |                  |                  | $\pm 1.33$           |                    |                    |
| Inoculation                         | -1.1               | -0.1             | 0.2              | 3.6                  | -0.2               | 2.0                |
| N at sowing                         | 6.6                | 4.9              | 6.7              | 3.6                  | 4.0                | 4.8                |
| PK                                  | -2.0               | -0.8             | 3.1              | -1.0                 | 2.0                | 3.2                |
| Mean $\pm 0.66$                     | 12.3               | 8.8              | 10.4             | 13.1                 | 14.2               | 15.3               |
| 1945 Barley Straw, cwt. per acre    |                    |                  |                  |                      |                    |                    |
|                                     | $\pm 1.77$         |                  |                  | $\pm 1.77$           |                    |                    |
| Inoculation                         | 0.4                | -0.4             | 0.0              | 1.3                  | -0.9               | 1.3                |
| N at sowing                         | 5.6                | 6.4              | 6.8              | 3.0                  | 3.9                | 3.7                |
| PK                                  | -1.3               | 0.0              | 2.7              | -1.2                 | 1.1                | 2.2                |
| Mean $\pm 0.89$                     | 14.4               | 12.6             | 13.2             | 15.1                 | 15.0               | 16.5               |
| 1945 Barley. Transformed % Take-All |                    |                  |                  |                      |                    |                    |
|                                     | $\pm 5.32$         |                  |                  | $\pm 5.32$           |                    |                    |
| Inoculation                         | 0.3                | 6.9              | 8.1              | -0.1                 | 4.5                | 0.5                |
| N at sowing                         | -11.5              | -11.9            | -16.5            | -9.3                 | -14.0              | -17.6              |
| PK                                  | -16.0              | -9.6             | -2.0             | 6.1                  | -6.9               | 9.4                |
| Mean $\pm 2.66$                     | 33.2               | 38.6             | 32.6             | 34.4                 | 24.4               | 26.8               |
| 1945 Barley. Percentage Take-All    |                    |                  |                  |                      |                    |                    |
| Inoculation                         | 0                  | 12               | 13               | 0                    | 6                  | 1                  |
| N at sowing                         | -19                | -20              | -26              | -15                  | -18                | -24                |
| PK                                  | -25                | -16              | -3               | 10                   | -9                 | 14                 |
| Mean                                | 30                 | 39               | 29               | 32                   | 17                 | 20                 |
| 1946 Barley Grain, cwt. per acre    |                    |                  |                  |                      |                    |                    |
|                                     | $\pm 0.99$         |                  |                  | $\pm 0.99$           |                    |                    |
| Inoculation                         | -1.0               | -1.0             | 0.1              | 0.5                  | -0.6               | -1.3               |
| N at sowing                         | 3.7                | 3.7              | 1.3              | 6.1                  | 3.2                | 2.3                |
| PK                                  | 1.1                | 0.4              | 0.9              | 2.4                  | 4.5                | 3.9                |
| Mean $\pm 0.49$                     | 6.5                | 6.3              | 10.0             | 7.6                  | 12.5               | 14.2               |
| 1946 Barley. Transformed % Take-All |                    |                  |                  |                      |                    |                    |
|                                     | $\pm 4.75$         |                  |                  | $\pm 4.75$           |                    |                    |
| Inoculation                         | 5.0                | 0.0              | -3.0             | -8.2                 | -1.0               | -1.3               |
| N at sowing                         | -3.0               | -7.2             | 0.0              | -9.9                 | -11.9              | -9.3               |
| PK                                  | -4.8               | -8.4             | -8.4             | -4.1                 | -4.3               | 2.5                |
| Mean $\pm 2.38$                     | 34.3               | 36.3             | 28.8             | 36.2                 | 30.5               | 32.0               |
| 1946 Barley. Percentage Take-All    |                    |                  |                  |                      |                    |                    |
| Inoculation                         | 8                  | 0                | -4               | -14                  | -1                 | -2                 |
| N at sowing                         | -5                 | -12              | 0                | -16                  | -18                | -17                |
| PK                                  | -8                 | -14              | -13              | -6                   | -7                 | 4                  |
| Mean                                | 32                 | 35               | 23               | 35                   | 26                 | 28                 |

The PK main effect was confounded with blocks. Standard errors quoted for PK effects are for use in comparisons only.



K/30

WHEAT

Delharding 1943 - 1944

Effects of basic slag and triple superphosphate, powdered or granular, broadcast or drilled.

Design; 4 randomized blocks of 12 plots each.

Area of each plot: 0.0250 acre.

Treatments:

Levels of phosphate: None, 0.3, 0.6 cwt. P<sub>2</sub>O<sub>5</sub> per acre

Types of phosphate: Basic slag, powdered or granular triple superphosphate.

Method of application: Drilled with seed or broadcast. In 1943 the powdered triple superphosphate was drilled at rates of 0.27 and 0.52 cwt. P<sub>2</sub>O<sub>5</sub> per acre, the balance of the dressings being broadcast, and basic slag was broadcast only.

Ground chalk; In 1943 only, 39 cwt. per acre applied to blocks I and III.

Basal Manuring; Sulphate of ammonia, 2 cwt. per acre as top dressing in spring.

Crop Notes

|      | Sown    | Harvested | Variety                    |
|------|---------|-----------|----------------------------|
| 1943 | Nov. 13 | Aug. 10   | Wilma. Previous crop, Oats |
| 1944 | Nov. 3  | Aug. 10   | Wilma.                     |

Standard errors per plot: 1943 Grain, 2.09 cwt. per acre or 9.9%, 24 d.f.  
 Straw, 3.29 cwt. per acre or 7.5%, 23 d.f.  
 1944 Grain, 2.01 cwt. per acre or 9.4%, 26 d.f.  
 Straw, 2.99 cwt. per acre or 7.6%, 26 d.f.

1943

|                             | Standard errors | Grain: cwt. per acre                        |          |                   | Mean | With-<br>out<br>Chalk | With<br>Chalk |
|-----------------------------|-----------------|---|----------|-------------------|------|-----------------------|---------------|
|                             |                 | Cwt. P <sub>2</sub> O <sub>5</sub> per acre |          |                   |      |                       |               |
|                             |                 | 0   | 0.3      | 0.6               |      |                       |               |
| Basic slag                  | ±1.04           | 21.1  | 20.3     | 20.7 <sup>a</sup> | 21.4 | 20.1                  |               |
| Triple super.<br>(powdered) | ±0.74           | 20.6  | 22.5     | 21.6 <sup>b</sup> | 22.0 | 21.1                  |               |
| Triple super.<br>(granular) | ±0.74           | 20.7  | 22.9     | 21.8 <sup>b</sup> | 22.5 | 21.1                  |               |
| Mean                        | ±0.47           | 19.8 <sup>a</sup>                           | 20.7     | 22.2              | 21.2 | -                     |               |
| Without chalk               | ±0.66           | 21.4 <sup>c</sup>                           | 21.0     | 23.2              | -    | -                     |               |
| With chalk                  |                 | 18.2 <sup>c</sup>                           | 20.5     | 21.3              | -    | -                     |               |
| Triple Super.               |                 | Cwt. P <sub>2</sub> O <sub>5</sub> per acre |          | Mean              |      |                       |               |
|                             |                 | Powdered                                    | Granular | 0.3               | 0.6  | ±0.52                 |               |
| Broadcast                   | ±0.74           | 22.3  | 22.0     | 21.3              | 23.0 | 22.2                  |               |
| Drilled                     |                 | 20.8  | 21.6     | 20.0              | 22.4 | 21.2                  |               |
| Mean                        | ±0.52           | 21.6  | 21.8     | 20.6              | 22.7 | 21.7                  |               |

Standard errors (a) 0.74 (b) 0.52 (c) 1.04

94



1943  
Straw: cwt. per acre

K/31

|                          |       | Cwt. P <sub>2</sub> O <sub>5</sub> per acre |      |                   | Mean | With-<br>out<br>Chalk | With<br>Chalk |
|--------------------------|-------|---|------|-------------------|------|-----------------------|---------------|
|                          |       | 0   | 0.3  | 0.6               |      |                       |               |
| Basic slag               | ±1.64 | 43.3  | 41.6 | 42.4 <sup>d</sup> | 43.0 | 41.9                  |               |
| Triple super. (powdered) | ±1.16 | 42.9  | 45.4 | 44.2 <sup>e</sup> | 45.7 | 42.6                  |               |
| Triple super (granular)  | ±1.16 | 44.3  | 47.6 | 46.0 <sup>e</sup> | 47.4 | 44.4                  |               |
| Mean                     | ±0.74 | 39.2 <sup>d</sup>                           | 43.5 | 45.5              | 43.7 | -                     |               |
| Without chalk            |       | 42.6 <sup>f</sup>                           | 45.9 | 45.8              | -    | -                     |               |
| With chalk               | ±1.04 | 35.9 <sup>f</sup>                           | 41.2 | 45.3              | -    | -                     |               |

| Triple Super. | Powdered | Granular | Cwt. P <sub>2</sub> O <sub>5</sub> per acre |      | Mean  |
|---------------|----------|----------|---|------|-------|
|               |          |          | 0.3   | 0.6  | ±0.82 |
| Broadcast     | 45.2     | 44.8     | 43.0  | 47.0 | 45.0  |
| Drilled       | 43.1     | 47.1     | 44.2  | 46.0 | 45.1  |
| Mean          | 44.2     | 46.0     | 43.6  | 46.5 | 45.0  |

Standard errors (d) 1.16 (e) 0.82 (f) 1.64

Note: Standard errors referring to "with and without chalk" apply to interactions only and not to main effects of chalk.

1944

|   | None            | Super.<br>Powd. | Gran. | Basic<br>Slag | Mean  |                   |
|---|-----------------|-----------------|-------|---------------|-------|-------------------|
| Grain: cwt. per acre                        |                 | ±0.71           |       |               | ±0.41 |                   |
| Broadcast                                   |                 | 20.8            | 20.9  | 20.4          | 20.7  |                   |
| Drilled                                     |                 | 23.4            | 22.8  | 22.1          | 22.7  |                   |
| Cwt. P <sub>2</sub> O <sub>5</sub> per acre |                 |                 |       |               |       | Broadcast drilled |
| 0.3   |                 | 21.4            | 21.8  | 20.1          | 21.1  | 19.8 ±0.58        |
| 0.6   |                 | 22.8            | 22.0  | 22.4          | 22.4  | 21.7              |
| Mean  | 19.4<br>(±0.71) | 22.1            | 21.9  | 21.2          | 21.4  |                   |
| Straw: cwt. per acre                        |                 | ±1.06           |       |               | ±0.61 |                   |
| Broadcast                                   |                 | 37.7            | 37.8  | 38.8          | 38.1  |                   |
| Drilled                                     |                 | 42.3            | 43.2  | 39.6          | 41.7  |                   |
| Cwt. P <sub>2</sub> O <sub>5</sub> per acre |                 |                 |       |               |       | Broadcast drilled |
| 0.3   |                 | 38.6            | 39.9  | 38.1          | 38.9  | 36.4 ±0.86        |
| 0.6   |                 | 41.4            | 41.2  | 40.4          | 41.0  | 39.8              |
| Mean  | 34.9<br>(±1.06) | 40.0            | 40.5  | 39.2          | 39.2  |                   |

A similar experiment was carried out on white turnips in 1942 on Deacon's Field, but the results are unreliable owing to the late sowing of the crop.



K/32

SPRING SOWN CEREALS

Long Hoos V, 1947

Comparison of barley, spring oats and two varieties of wheat, and of the effects on them of four levels of sulphate of ammonia, of superphosphate and of muriate of potash.

Similar experiments were made in 1948 and 1949.

Design; 4 randomized blocks of four plots each, each plot being split into 4, crop differences and certain first-order interactions of artificials being confounded with differences between whole plots.

Area of each sub-plot; 0.0150 acre.

Treatments

Crops: Oats (S.84), wheat (Atle and Bersee) and barley (Plumage Archer).

Sulphate of ammonia: None, 0.3, 0.6, 0.9 cwt. N per acre.

Superphosphate : None, 0.6 cwt. P<sub>2</sub>O<sub>5</sub> per acre.

Muriate of potash: None, 0.6 cwt. K<sub>2</sub>O per acre

Crop Notes

All seed drilled: April 12. Harvested: oats, Aug. 7;  
barley, Aug.12: Atle wheat, Aug.18; Bersee wheat, Aug.20.  
Previous crop: Beans.

Standard errors: Grain

per whole plot, 1.26 cwt. per acre or 4.8%, 6 d.f.

per sub-plot, 1.30 cwt. per acre or 5.0%, 24 d.f.



K/33

|                     | Grain: cwt. per acre |              |                |        | Straw: cwt. per acre |              |                |        |
|---------------------|----------------------|--------------|----------------|--------|----------------------|--------------|----------------|--------|
|                     | Oats                 | Wheat (Atle) | Wheat (Bersee) | Barley | Oats                 | Wheat (Atle) | Wheat (Bersee) | Barley |
| Mean                | 26.0                 | 22.5         | 27.2           | 29.2   | 37.7                 | 27.5         | 33.5           | 28.7   |
| Sulphate of ammonia |                      | (a) and (b)  |                |        |                      |              |                |        |
| None                | 20.5                 | 19.1         | 23.9           | 26.3   | 31.6                 | 21.9         | 25.3           | 24.8   |
| 0.3 cwt. N per acre | 25.2                 | 22.1         | 26.7           | 29.3   | 38.2                 | 26.6         | 32.0           | 28.1   |
| 0.6 cwt. N per acre | 28.3                 | 24.2         | 29.0           | 31.3   | 38.9                 | 30.4         | 36.4           | 30.7   |
| 0.9 cwt. N per acre | 29.9                 | 24.5         | 29.1           | 30.0   | 42.1                 | 20.9         | 40.3           | 31.3   |
| Response to F       | 1.8                  | -0.7         | 1.2            | 1.0    | 0.6                  | -0.7         | 0.3            | 0.6    |
| Response to K       | 0.3                  | -1.1         | 0.8            | 2.4    | -0.3                 | -0.6         | 0.2            | 1.7    |

Standard Errors (a)  $\pm 0.65$  for vertical comparisons only

(b)  $\pm 0.85$  for all other comparisons







BARLEY AND HAY

Roadpiece 1944-1945

Effects in the first year of sulphate of ammonia, superphosphate, compound fertilizer of equivalent composition and methods of fertilizer placement; and in the second year the residual effects of the previous year's cropping and manuring.

Design; 4 randomized blocks of 10 plots each.

Area of each plot; 1944, 0.0250 acre  
1945, 0.0274 acre

First Season 1944

Barley

Treatments

Sulphate of ammonia; None, 0.3 cwt. N per acre  
Superphosphate; None, 0.6 cwt P<sub>2</sub>O<sub>5</sub> per acre  
Compound fertilizer; None, 0.3 cwt. N and 0.6 cwt. P<sub>2</sub>O<sub>5</sub> per acre  
Method of fertilizer placement; Drilled or broadcast.

Crop Notes

Seed sown; March 16. Harvested; August 17  
Variety; Plumage Archer. Previous crop; Permanent Grass

Standard errors per plot:

Grain: 1.02 cwt. per acre or 4.4%, 28 d.f.  
Straw: 0.88 cwt. per acre or 3.4%, 28 d.f.

Second Season 1945

Hay

Basal manuring; Sulphate of ammonia, 0.4 cwt. N per acre

Seed sown in barley: April 27, 1944. Cut: June 27.

Standard error per plot:

Hay: 2.40 cwt. per acre or 3.3%, 28 d.f.



L/2

Barley and Hay - Roadpiece

|                             | Barley               |                |        |                            |                            | Mean             |
|-----------------------------|----------------------|----------------|--------|----------------------------|----------------------------|------------------|
|                             | None                 | Sulph.<br>amm. | Super. | Sulph.<br>amm. &<br>Super. | Equivalent<br>compd. fert. |                  |
|                             | Grain: cwt. per acre |                |        |                            |                            |                  |
|                             |                      |                |        |                            |                            | ±0.26            |
|                             |                      |                |        |                            |                            | ±0.51            |
| Broadcast                   |                      | 19.9           | 21.6   | 23.4                       | 24.8                       | 22.4             |
| Drilled                     |                      | 18.8           | 25.4   | 27.1                       | 28.0                       | 24.8             |
| Mean ±0.36                  | 20.5                 | 19.4           | 23.5   | 25.2                       | 26.4                       | 23.0             |
| Effect of<br>drilling ±0.72 |                      | -1.1           | 3.8    | 3.7                        | 3.2                        | 2.4 <sup>a</sup> |
|                             | Straw: cwt. per acre |                |        |                            |                            |                  |
|                             |                      |                |        |                            |                            | ±0.22            |
|                             |                      |                |        |                            |                            | ±0.44            |
| Broadcast                   |                      | 23.6           | 24.8   | 25.8                       | 27.4                       | 25.4             |
| Drilled                     |                      | 24.1           | 26.2   | 28.6                       | 29.3                       | 27.0             |
| Mean ±0.31                  | 23.5                 | 23.8           | 25.5   | 27.2                       | 28.4                       | 25.7             |
| Effect of<br>drilling ±0.62 |                      | 0.5            | 1.4    | 2.8                        | 1.9                        | 1.6 <sup>b</sup> |
|                             | Residual effects     |                |        |                            |                            |                  |
|                             | Hay: cwt. per acre   |                |        |                            |                            |                  |
|                             |                      |                |        |                            |                            | ±0.60            |
|                             |                      |                |        |                            |                            | ±1.20            |
| Broadcast                   |                      | 69.7           | 71.7   | 74.2                       | 74.1                       | 72.4             |
| Drilled                     |                      | 70.4           | 72.1   | 73.4                       | 74.0                       | 72.5             |
| Mean ±0.85                  | 72.8                 | 70.0           | 71.9   | 73.8                       | 74.0                       | 72.5             |
| Effect of<br>drilling ±1.70 |                      | 0.7            | 0.4    | -0.8                       | -0.1                       | 0.1 <sup>c</sup> |

Standard errors (a) 0.36 (b) 0.31 (c) 0.85



BARLEY

L/3

Long Hoos V, 1945

Effects of sulphate of ammonia, nitrate of soda, and ammonium nitrate at 4 levels, and method of placement of fertilizer.

Design; 3 randomized blocks of 12 plots each, plots split for method of placement.

Area of each sub-plot; 0.0154 acre.

Treatments

Nitrogenous fertilizers: None, sulphate of ammonia, nitrate of soda, ammonium nitrate.

Levels of fertilizer: 0.3, 0.6, 0.9 cwt. N per acre.

Methods of placement: Broadcast before sowing, drilled with seed.

Basal manuring: Superphosphate, 0.5 cwt. P<sub>2</sub>O<sub>5</sub> per acre drilled.

Crop Notes

Seed sown: March 24. Harvested: August 9.

Variety: Plumage Archer. Previous crop: Barley.

Standard errors:

Grain, per whole plot: 1.20 cwt. per acre or 3.9%, 24 d.f.

per sub plot: 1.56 cwt. per acre or 5.1%, 27 d.f.

Straw, per whole plot: 1.47 cwt. per acre or 4.4%, 24 d.f.

per sub plot: 1.79 cwt. per acre or 5.3%, 27 d.f.

|                     | Grain: cwt. per acre |                      |      |      | Mean  | Method of placement |           |
|---------------------|----------------------|----------------------|------|------|-------|---------------------|-----------|
|                     | None                 | 0.3                  | 0.6  | 0.9  |       | Drilled             | Broadcast |
|                     |                      | ±0.69                |      |      | ±0.40 | ±0.54               |           |
| Sulphate of ammonia |                      | 30.1                 | 34.6 | 36.0 | 33.6  | 33.3                | 33.8      |
| Nitrate of soda     | 22.9                 | 30.4                 | 32.6 | 33.6 | 32.2  | 31.5                | 33.0      |
| Ammonium nitrate    |                      | 31.4                 | 33.7 | 34.1 | 33.1  | 32.7                | 33.4      |
| Mean                | 22.9                 | 30.6                 | 33.6 | 34.6 | 30.4  | 32.5                | 33.4      |
|                     |                      | ±0.40                |      |      |       | ±0.31               |           |
| Drilled             |                      | 30.2                 | 33.7 | 33.6 | 32.5  |                     |           |
| Broadcast           |                      | 31.0                 | 33.6 | 35.5 | 33.4  |                     |           |
|                     |                      | ±0.54                |      |      | ±0.31 |                     |           |
|                     |                      | Straw: cwt. per acre |      |      |       |                     |           |
|                     |                      | ±0.85                |      |      | ±0.49 | ±0.65               |           |
| Sulphate of ammonia |                      | 31.5                 | 39.5 | 40.4 | 37.1  | 37.6                | 36.7      |
| Nitrate of soda     | 22.5                 | 33.6                 | 37.8 | 40.4 | 37.3  | 36.7                | 37.8      |
| Ammonium nitrate    |                      | 34.7                 | 38.4 | 40.8 | 38.0  | 38.7                | 37.2      |
| Mean                | 22.5                 | 33.3                 | 38.6 | 40.5 | 33.7  | 37.7                | 37.2      |
|                     |                      | ±0.49                |      |      |       | ±0.37               |           |
| Drilled             |                      | 33.3                 | 39.3 | 40.5 | 37.7  |                     |           |
| Broadcast           |                      | 33.3                 | 37.9 | 40.6 | 37.2  |                     |           |
|                     |                      | ±0.65                |      |      | ±0.37 |                     |           |



*[The text in this section is extremely faint and illegible, appearing to be a list or table of contents.]*



BEANS

M/1

For a discussion of all experiments on beans see  
D.A. Boyd, G.W. Cooke, H.V. Garner and J.R. Moffatt,  
Rothamsted Experiments on Field Beans, J.R.A.S.E. 113(1952), 55.

Long Hoos III 1939  
Long Hoos I and III 1945  
Deacon's Field 1946

Effects of dung, nitro-chalk (and its time of application in 1945 and 1946), superphosphate and muriate of potash (and their method of application in 1946) and in 1939 the effect of borax.

Designs;

- 1939: 8 x 8 Latin square. Certain interactions confounded with rows and columns.
- 1945: 4 randomized blocks of 8 plots each. The plots receiving nitro-chalk were split for time of application.
- 1946: 8 randomized blocks of 8 plots each. The plots receiving nitro-chalk were split for time of application. Certain high order interactions confounded with block differences.

Area of each whole plot; 1939 and 1946: 0.0200 acre  
1945: 0.0192 acre

Treatments

- All years: Dung: None, 10 tons per acre (D)  
Nitro-chalk: None, 0.4 cwt. N per acre (N)  
Superphosphate: None, 0.6 cwt. P<sub>2</sub>O<sub>5</sub> per acre (P)  
Muriate of potash: None, 1.0 cwt. K<sub>2</sub>O per acre (K)
- 1939: Borax: None (B<sub>0</sub>), 10 lb. (B<sub>1</sub>), 20 lb. (B<sub>2</sub>)  
40 lb. (B<sub>3</sub>) per acre.
- 1945: The nitro-chalk was applied to the split plots in autumn and spring.
- 1946: The nitro-chalk was applied to the sub-plots at the time of sowing and in the spring. The superphosphate and muriate of potash were drilled with the seed or broadcast at sowing.

Crop Notes

|                                 | 1939                   | 1945               | 1946                   |         |
|---------------------------------|------------------------|--------------------|------------------------|---------|
|                                 |                        |                    | Early                  | Late    |
| Seed sown                       | Nov. 17-18             | Sept. 29 - Oct. 10 | Oct. 10-11             | Mar. 27 |
| Harvested                       | Aug. 16                | July 31- Aug. 1    | Aug. 23                | Aug. 23 |
| Variety                         |                        | Garton's Winter    |                        | Giant   |
| Previous Crop                   | Wheat                  |                    |                        | Wheat   |
| Standard errors (cwt. per acre) | Per whole plot         |                    | sub-plot               |         |
| 1939 Grain                      | 1.70 or 6.6%, 25 d.f.  |                    |                        |         |
| 1945 Grain                      | 2.34 or 9.8%, 13 d.f.  |                    | 2.91 or 12.1%, 8 d.f.  |         |
| 1945 Straw                      | 3.74 or 11.6%, 13 d.f. |                    | 2.94 or 9.0%, 8 d.f.   |         |
| 1946 Grain                      | 2.52 or 17.1%, 31 d.f. |                    | 2.87 or 19.5%, 48 d.f. |         |



M/2  
Beans

Long Hoos, 1939

Mean yields: Grain, 26.0 cwt. per acre. Straw, 25.3 cwt. per acre

Differential responses

| Mean response | O                    | D    | O    | N    | O   | P   | O    | K    |
|---------------|----------------------|------|------|------|-----|-----|------|------|
|               | Grain: cwt. per acre |      |      |      |     |     |      |      |
| $\pm 0.42$    | $\pm 0.60$           |      |      |      |     |     |      |      |
| D 0.41        | -                    | -    | 3.3  | 5.0  | 4.0 | 4.4 | 4.7  | 3.6  |
| N 0.7         | -0.2                 | 1.6  | -    | -    | 1.4 | 0.0 | 0.3  | 1.0  |
| P -1.1        | -1.3                 | -1.0 | -0.4 | -1.8 | -   | -   | -1.0 | -1.2 |
| K 1.8         | 2.4                  | 1.3  | 1.5  | 2.2  | 2.0 | 1.8 | -    | -    |

Straw: cwt. per acre

|       |     |     |     |     |     |     |     |      |
|-------|-----|-----|-----|-----|-----|-----|-----|------|
| D 2.8 | -   | -   | 3.2 | 2.4 | 3.0 | 2.6 | 2.8 | 2.8  |
| N 1.4 | 1.8 | 1.0 | -   | -   | 1.8 | 1.0 | 1.6 | 1.2  |
| P 0.4 | 0.6 | 0.2 | 0.8 | 0.0 | -   | -   | 0.8 | -0.1 |
| K 1.2 | 1.2 | 1.2 | 1.4 | 1.0 | 1.7 | 0.8 | -   | -    |

Response to borax

|                | Mean yield           | Response to |     |      |      |
|----------------|----------------------|-------------|-----|------|------|
|                |                      | D           | N   | F*   | K    |
|                | Grain: cwt. per acre |             |     |      |      |
|                | $\pm 0.42$           | $\pm 0.85$  |     |      |      |
| B <sub>0</sub> | 25.5                 | 3.4         | 1.2 | -1.0 | 2.9  |
| B <sub>1</sub> | 26.9                 | 5.4         | 1.3 | -1.4 | 2.7  |
| B <sub>2</sub> | 25.8                 | 4.5         | 0.3 | -1.1 | 1.9  |
| B <sub>3</sub> | 25.6                 | 3.5         | 0.0 | -0.8 | -0.1 |

Straw: cwt. per acre

|                |      |     |     |     |     |
|----------------|------|-----|-----|-----|-----|
| B <sub>0</sub> | 25.0 | 3.7 | 1.6 | 0.2 | 0.8 |
| B <sub>1</sub> | 25.3 | 3.0 | 1.0 | 0.7 | 2.1 |
| B <sub>2</sub> | 25.3 | 2.0 | 1.5 | 0.6 | 0.7 |
| B <sub>3</sub> | 25.6 | 2.4 | 1.2 | 0.1 | 1.3 |

\* The (B<sub>0</sub> - B<sub>1</sub> + B<sub>2</sub> - B<sub>3</sub>) x F interaction was confounded with columns. The figures shown have been adjusted so as to make this interaction zero.



M/3

Long Hoos, 1945

|  | Mean<br>Resp. | Differential responses |  |                          |  |                          |  |                        |  |
|--|---------------|------------------------|--|--------------------------|--|--------------------------|--|------------------------|--|
|  |               | Dung<br>Abs. Pres.     |  | Nitrochalk<br>Abs. Pres. |  | Superphos.<br>Abs. Pres. |  | Mur.pot.<br>Abs. Pres. |  |

Grain: Mean yield, 23.9 cwt. per acre

|            | ±0.83 |     |      | ±1.17 |      |     |     |     |      |
|------------|-------|-----|------|-------|------|-----|-----|-----|------|
| Dung       | 3.5   | -   | -    | 3.3   | 3.7  | 4.2 | 2.8 | 3.8 | 3.2  |
| Nitrochalk | 0.4   | 0.2 | 0.6  | -     | -    | 0.2 | 0.6 | 1.7 | -0.9 |
| Super.     | 0.4   | 1.1 | -0.3 | 0.2   | 0.6  | -   | -   | 0.5 | 0.3  |
| Mur.pot.   | 1.0   | 1.3 | 0.7  | 2.3   | -0.3 | 1.1 | 0.9 | -   | -    |

Straw: Mean yield, 32.4 cwt. per acre

|            | ±1.32 |     |      | ±1.87 |      |      |      |     |     |
|------------|-------|-----|------|-------|------|------|------|-----|-----|
| Dung       | 2.9   | -   | -    | 2.8   | 3.0  | 3.0  | 2.8  | 3.9 | 1.9 |
| Nitrochalk | 0.6   | 0.3 | 0.7  | -     | -    | 1.5  | -0.3 | 1.1 | 0.1 |
| Super.     | 1.6   | 1.7 | 1.5  | 2.5   | 0.7  | -    | -    | 1.4 | 1.8 |
| Mur.pot.   | 0.1   | 1.1 | -0.9 | 0.6   | -0.4 | -0.1 | 0.3  | -   | -   |

Responses, Spring minus Autumn application of Nitrochalk

|  | Mean<br>Resp. | Dung<br>Abs. Pres. |  | Superphos.<br>Abs. Pres. |  | Mur.pot.<br>Abs. Pres. |  |
|--|---------------|--------------------|--|--------------------------|--|------------------------|--|
|--|---------------|--------------------|--|--------------------------|--|------------------------|--|

Grain: Mean effect, -0.9 cwt. per acre

|          | ±2.06 |      |      | ±2.91 |      |      |      |
|----------|-------|------|------|-------|------|------|------|
| Dung     | -2.3  | -    | -    | -4.4  | -0.2 | -1.1 | -3.5 |
| Super    | 1.6   | -0.5 | 3.7  | -     | -    | 0.9  | 2.3  |
| Mur.pot. | 0.7   | 1.9  | -0.5 | 0.0   | 1.4  | -    | -    |

Straw: Mean effect, 0.5 cwt. per acre

|          | ±2.08 |      |      | ±2.94 |      |      |      |
|----------|-------|------|------|-------|------|------|------|
| Dung     | -3.2  | -    | -    | -3.8  | -2.6 | -3.9 | -2.5 |
| Super    | -3.7  | -4.3 | -3.1 | -     | -    | -3.1 | -4.3 |
| Mur.pot. | 2.4   | 1.7  | 3.1  | 3.0   | 1.8  | -    | -    |



M/4  
Beans

Deacon's Field, 1946

Grain: cwt. per acre

Mean yield, 14.7

Differential Responses

| Mean response | Dung       |      | Nitrochalk |      | Superphos. |     | Muriate of Potash |     | Time of Sowing |        |
|---------------|------------|------|------------|------|------------|-----|-------------------|-----|----------------|--------|
|               | Abs. Fres. |      | Abs. Fres. |      | Abs. Fres. |     | Abs. Fres.        |     | Spring         | Autumn |
| $\pm 0.63$    | -          |      | 2.6        | 1.2  | $\pm 0.89$ |     | 2.4               | 1.4 | 0.7            | 3.1    |
| 1.9           | 2.0        | 0.6  | -          | -    | 2.6        | 1.2 | 0.0               | 2.6 | 1.6            | 1.0    |
| 1.3           | 0.1        | -1.3 | 0.2        | -1.4 | 2.1        | 0.5 | -1.3              | 0.1 | -0.7           | -0.5   |
| -0.6          | 1.1        | 0.1  | -0.7       | 1.9  | -          | -   | -                 | -   | 0.3            | 0.9    |
| 0.6           | 1.2        | 3.6  | 2.7        | 2.1  | -0.1       | 1.3 | 2.1               | 2.7 | -              | -      |
| 2.4           |            |      |            |      | 2.3        | 2.5 |                   |     |                |        |
| 2.0           | 0.2        | 3.8  | -          | -    | 0.3        | 3.7 | 1.6               | 2.4 | 6.4            | -2.4   |
| $\pm 0.72$    |            |      |            |      | $\pm 1.03$ |     |                   |     |                |        |

Phosphate alone      Potash alone      Phosphate and Potash

Winter beans:

Drilled - Broadcast ( $\pm 2.52$ )      2.6      0.4      3.2

Dung  
Nitrochalk  
Superphosphate  
Muriate of potash  
Autumn-Spring sowing  
Time of application  
of Nitrochalk:  
Autumn - Spring



BEANS

Great Harpenden 1944

Effects of spacing, time of sowing, method of sowing and nitrate of soda on two varieties.

Design; 4 randomized blocks of 12 plots each, with certain treatment interactions confounded between blocks.

Area of each plot: 0.0250 acre.

Treatments

Varieties: Garton's Giant Winter and N.I.A.B. No.7 Winter.

Spacing: 9 inch and 18 inch, or broadcast at equivalent rates.

Method of sowing: Drilled, broadcast and covered in by ploughing ('broadcast'), sown in the furrows and covered in by ploughing ('ploughed in').

Time of sowing: Oct. 26 ('early'), Nov. 19 ('late')

Nitrate of soda: None,  $2\frac{1}{2}$  cwt. per acre as spring top dressing.

The 16 drilled plots failed and were re-sown with spring beans, for which the treatments tested were spacing, method of sowing and nitrate of soda. The results for winter and spring sowing have been treated as separate experiments.

Basal manuring: Superphosphate: 5 cwt per acre

Muriate of potash: 1.5 cwt per acre

Crop Notes

Harvested: Aug 2-3.

Previous Crop, Wheat and beans

Standard errors per plot:

Winter beans: Grain: 1.61 cwt. per acre or 14.0%, 14 d.f.

Straw: 1.21 cwt. per acre or 11.2%, 12 d.f.

Spring beans: Grain: 0.65 cwt. per acre or 12.7%, 6 d.f.

Straw: 1.40 cwt. per acre or 13.2%, 6 d.f.



M/6

Beans - Great Harpenden 1944

Differential Responses

Winter Beans

|                                       | Mean  | Garton | N.I.A.B. | Early | Late | Spacing<br>18" 9"  | Ploughing | Broad-<br>cast | Nitrate<br>of soda<br>Abs. Pres. |
|---------------------------------------|-------|--------|----------|-------|------|--------------------|-----------|----------------|----------------------------------|
| Grain: Mean yield, 11.5 cwt. per acre |       |        |          |       |      |                    |           |                |                                  |
|                                       | ±0.57 | -      | -        | -5.1  | -3.5 | ±0.80<br>-3.4 -5.2 | -4.6      | -4.0           | (-2.9 -5.7)                      |
| N.I.A.B. - Garton                     | -4.3  | -3.6   | -        | -     | -    | -3.7 -1.9          | -3.8      | -1.8           | -2.8 -2.8                        |
| Late - Early                          | -2.8  | 4.3    | 2.5      | 2.5   | 4.3  | -                  | 3.7       | 3.1            | 3.5 3.3                          |
| 9" - 18" spacing                      | 3.4   | -1.2   | -0.6     | -1.9  | 0.1  | -0.6 -1.2          | -         | -              | 0.0 -1.8                         |
| Broadcast-Ploughing                   | -0.9  | (2.2)  | -0.6     | 0.8   | 0.8  | 0.9 0.7            | 1.7       | -0.1           | -                                |
| Nitrate of Soda                       | 0.8   |        |          |       |      |                    |           |                |                                  |
| Straw: Mean yield, 10.8 cwt. per acre |       |        |          |       |      |                    |           |                |                                  |
|                                       | ±0.43 | -      | -        | -3.7  | -3.1 | ±0.60<br>-2.4 -4.4 | -3.4      | -3.4           | (-2.2 -4.6)                      |
| N.I.A.B. - Garton                     | -3.4  | -3.0   | -2.4     | -     | -    | -2.6 -2.8          | -3.4      | -2.0           | -3.2 -2.2                        |
| Late - Early                          | -2.7  | 3.8    | 1.8      | 2.9   | 2.7  | -                  | 3.4       | 2.2            | 2.4 3.2                          |
| 9" - 18" spacing                      | 2.8   | -0.3   | -0.3     | -1.0  | 0.4  | 0.3 -0.9           | -         | -              | 0.5 -1.1                         |
| Broadcast-Ploughing                   | -0.3  | (1.9)  | -0.5     | 0.2   | 1.2  | 0.3 1.1            | 1.5       | -0.1           | -                                |
| Nitrate of Soda                       | 0.7   |        |          |       |      |                    |           |                |                                  |

The interaction shown in ( ) is a block difference



Differential Responses  
Spring Beans

|                                       | Mean  | Spacing<br>18" 9" | Ploughing Broadcast | Nitrate of Soda<br>Absent Present |
|---------------------------------------|-------|-------------------|---------------------|-----------------------------------|
| Grain: Mean yield, 5.1 cwt. per acre  |       |                   |                     |                                   |
|                                       | ±0.32 |                   | ±0.46               |                                   |
| 9" - 18" spacing                      | 2.2   | -                 | 2.5                 | 1.9                               |
| Broadcast-Ploughing                   | -1.3  | -1.0              | -1.6                | -                                 |
| Nitrate of Soda                       | 0.2   | 0.6               | -0.2                | 0.6                               |
|                                       |       |                   |                     | -0.2                              |
|                                       |       |                   |                     | 2.6                               |
|                                       |       |                   |                     | -0.9                              |
|                                       |       |                   |                     | -                                 |
|                                       |       |                   |                     | 1.8                               |
|                                       |       |                   |                     | -1.7                              |
|                                       |       |                   |                     | -                                 |
| Straw: Mean yield, 10.6 cwt. per acre |       |                   |                     |                                   |
|                                       | ±0.70 |                   | ±0.99               |                                   |
| 9" - 18" spacing                      | 3.3   | -                 | 4.6                 | 2.0                               |
| Broadcast-Ploughing                   | -0.8  | 0.5               | -2.1                | -                                 |
| Nitrate of Soda                       | 1.2   | 1.6               | 0.8                 | 1.5                               |
|                                       |       |                   |                     | 0.9                               |
|                                       |       |                   |                     | 3.7                               |
|                                       |       |                   |                     | -0.5                              |
|                                       |       |                   |                     | -                                 |
|                                       |       |                   |                     | 2.9                               |
|                                       |       |                   |                     | -1.1                              |
|                                       |       |                   |                     | -                                 |



M/8

BEANS

Long Hoos I and III 1945

Effect of time of sowing, of three seeding rates, of spacing and of method of sowing on two varieties.

Design; 8 randomized blocks of 8 plots each.  
Certain interactions confounded with block differences.

Area of each plot: 0.0200 acre

Treatments

Applied to blocks:

Varieties: Garton's Giant Winter and N.I.A.B. No. 7 Winter.

Time of sowing: Sept. 22-29 (early) and Oct. 20 - Nov. 1 (late)

Applied to plots:

Rates and methods of sowing: Broadcast before ploughing, 3 cwt. and  $4\frac{1}{2}$  cwt. per acre. Seed dropped in furrow during ploughing at 1.5 cwt. per acre, rows 9 and 18 inches apart, and at 3 cwt. per acre, rows 9 and 18 inches apart.

Basal manuring: Nitro-chalk: 2.5 cwt. per acre  
Superphosphate: 3.5 cwt. per acre  
Muriate of potash: 2.0 cwt. per acre

Crop Notes

Harvested: Aug. 4

Previous crop, Wheat

Standard errors per plot: Garton's: Grain 2.05 cwt. per acre  
or 9.7%, 18 d.f.  
N.I.A.B.: Grain 2.11 cwt. per acre  
or 15.4%, 8 d.f.

Result of germination test: N.I.A.B. 60%; Garton's 94%  
Purity of sample: N.I.A.B. 91%; Garton's 99%  
Thousand corn weights: N.I.A.B. 582 grm; Garton's 595 grm.



| Method    | Seed rate<br>cwt./acre | Row<br>Spacing | Grain: cwt. per acre |                   | N.I.A.B.          |                   |                   |        |
|-----------|------------------------|----------------|----------------------|-------------------|-------------------|-------------------|-------------------|--------|
|           |                        |                | Early<br>Sown        | Late<br>Sown      | Mean              | Early<br>Sown     | Late<br>Sown      |        |
| Furrows   | 1½                     | 9"             | ±1.45                | 17.5              | 15.0              | ±1.02             | ±1.50             |        |
| "         | 1½ (hoed)              | 18"            | 17.5                 | 18.2 <sup>a</sup> | 15.8 <sup>a</sup> | 16.2              | 8.2               |        |
| "         | 3                      | 9"             | 22.4                 | 23.1              | 22.8              | 17.0 <sup>b</sup> | 9.0 <sup>c</sup>  |        |
| "         | 3 (hoed)               | 18"            | 26.3 <sup>a</sup>    | 21.6 <sup>a</sup> | 24.0 <sup>b</sup> | 22.8              | 15.6 <sup>c</sup> | Failed |
| Broadcast | 3                      | -              | 26.2                 | 20.3              | 23.2              | 24.0 <sup>b</sup> | 16.5 <sup>c</sup> |        |
| "         | 4½                     | -              | 23.9                 | 24.7              | 24.3              | 23.2              | 14.2              |        |
|           | Mean                   |                | 22.4                 | 19.7              | 21.1              | 24.3              | 20.9              |        |
|           |                        |                |                      |                   |                   |                   |                   | 13.7   |

| Seed rate per<br>acre in furrow | Garton's                              |       | N.I.A.B.                          |       |
|---------------------------------|---------------------------------------|-------|-----------------------------------|-------|
|                                 | (Early and Late)<br>Spacing<br>9" 18" | Mean  | (Early only)<br>Spacing<br>9" 18" | Mean  |
| cwt.                            | ±1.02                                 | ±0.59 | ±1.50                             | ±0.86 |
| 1½                              | 16.2                                  | 16.8  | 8.2                               | 8.7   |
| 3                               | 22.8                                  | 23.6  | 15.6                              | 16.0  |
| Mean                            | 19.5 <sup>b</sup>                     | 20.2  | 11.9 <sup>c</sup>                 | 12.3  |

Standard errors (a) 1.02 (b) 0.72 (c) 1.06 (d) 0.51 (e) 0.75



M/10

Beans - Long Hoos 1945

Grain: cwt. per acre (continued)

| Seed rate<br>per acre | Gartons              |                      | Mean     | N. I. A. B.          |                      |
|-----------------------|----------------------|----------------------|----------|----------------------|----------------------|
|                       | Early                | Late                 |          | Early                | Late                 |
| cwt.                  |                      |                      |          |                      |                      |
| 1½                    | 18.0f                | 15.5f                | 16.8g    | 8.7h                 |                      |
| 3                     | 25.3b                | 21.6b                | 23.5d    | 15.7e                | Failed               |
| 4½                    | 23.9j                | 24.7j                | 24.3a    | 20.9k                |                      |
| Standard errors       | (a) 1.02<br>(f) 0.84 | (b) 0.72<br>(g) 0.59 | (h) 0.86 | (d) 0.51<br>(j) 1.45 | (e) 0.75<br>(k) 1.49 |



M/11

BEANS

Long Hoos V 1946

Effects of time of sowing, two seed rates and method of sowing on four varieties.

Design; 4 randomized blocks of 8 plots each, certain interactions being confounded with block differences.

Area of each plot: 0.0286 acre.

Treatments

Applied to blocks:

Time of sowing: Oct. 5-9 (early), Nov. 5-8 (late)

Applied to plots:

Varieties: Giant (once grown), Essex strain, Lincolnshire strain, Fa7 (twice grown from N.I.A.B.)

Method of sowing: Seed broadcast before ploughing or dropped in furrows during ploughing with 18" spacing between rows.

Seed rate: 2 cwt. per acre, 3 cwt. per acre.

Basal manuring: Dung: 10 tons per acre

Superphosphate: 2 cwt. per acre

Muriate of potash: 1 cwt. per acre.

Crop Notes

Harvested: Aug. 9

Previous crop, Barley

Standard errors per plot: Grain: 1.61 cwt. per acre or 7.8%,  
10 d.f.

Straw: 2.23 cwt. per acre or 5.3%,  
10 d.f.



M/12

Beans - Long Hoos 1946

|                          |  | Differential Responses |                      |        |       |       |  |
|--------------------------|--|------------------------|----------------------|--------|-------|-------|--|
|                          |  | Variety                | Seed rate            | Sowing |       | Mean  |  |
|                          |  | Giant Essex Lincs. Fa7 | 2<br>cwt.            | Late   | Early |       |  |
|                          |  |                        | ±0.81                | ±0.81  |       | ±0.57 |  |
|                          |  |                        | Grain, cwt. per acre |        |       |       |  |
| Broadcast - ploughed in  |  | -1.5                   | 0.0                  | -1.2   | 0.7   | -0.2  |  |
| Seed rate, 3 cwt.-2 cwt. |  | -0.9                   | -                    | 1.7    | 1.8   | 1.8   |  |
| Early - late sowing      |  | 4.6                    | 1.4                  | -      | -     | 1.5   |  |
| Mean ±0.57               |  | 21.3                   | 19.7                 | 21.8   | 20.3  | 20.8  |  |
|                          |  |                        | Straw, cwt. per acre |        |       |       |  |
|                          |  |                        | ±1.12                | ±1.12  |       | ±0.79 |  |
|                          |  |                        | Grain, cwt. per acre |        |       |       |  |
| Broadcast - ploughed in  |  | 0.3                    | 1.2                  | 2.7    | 1.7   | 2.0   |  |
| Seed rate, 3 cwt.-2 cwt. |  | 2.5                    | -                    | -      | 3.6   | 3.7   |  |
| Early - late sowing      |  | 9.2                    | 7.2                  | 7.4    | -     | 7.3   |  |
| Mean ±0.79               |  | 42.2                   | 41.0                 | 44.6   | 40.4  | 42.0  |  |



N/1

## POTATOES

From 1940 onwards, regular observations were made on aphid populations on potato experiments by the Plant Pathology Department.

### POTATOES AND BARLEY

#### Long Hoos II, 1939-40

Effect in the first year of fresh and stored dungs made with normal and with additional litter, of sulphate of ammonia, superphosphate and sulphate of potash on potatoes, and in the second year the residual effects on barley of the previous year's manuring.

Design: 4 randomized blocks of 12 plots each, plots split into 3 for sulphate of ammonia. In 1940 the sub-plots were not harvested separately.

#### 1939 - Potatoes

Area of each sub-plot, neglecting edge rows: 0.0125 acre.

#### Treatments

Dung: None,

4 kinds of dung, each derived from an equal weight of feeding stuffs, but with differences in the quantity of litter and time of storage.

Fresh dung, normal litter (6 lb. per head per day) 15.0 tons per acre

Fresh dung, double litter 14.5 " " "

Stored dung (4 months), normal litter 9.3 " " "

Stored dung (4 months), double litter 12.0 " " "

Sulphate of ammonia: None, 0.4 cwt., 0.8 cwt. N per acre

Superphosphate: None, 0.8 cwt.  $P_2O_5$  per acre

Sulphate of potash: None, 1.6 cwt.  $K_2O$  per acre.

#### Crop Notes

Planted: May 18. Lifted: Sept. 22. Variety: Ally. Previous crop: Wheat.

Standard errors, total tubers:

Per whole plot, 0.942 tons per acre or 9.7%, 29 d.f.

Per sub-plot, 0.899 tons per acre or 9.3%, 56 d.f.

#### 1940 - Barley

Area of each plot: 0.0482 acre.

Residual effects of dungs, superphosphate and muriate of potash applied to previous crop of potatoes.

Sown: April 8. Harvested: Aug. 20. Variety: Plumage Archer.

Standard error per plot, grain, 2.71 cwt. per acre or 8.7%, 29 d.f.



N/2

Potatoes and Barley - Long Hoos

Potatoes, 1939

|                                       | Super-phosphate     |         | Sulphate of potash  |         | Sulphate of ammonia |       |       | Mean   |
|---------------------------------------|---------------------|---------|---------------------|---------|---------------------|-------|-------|--------|
|                                       | Absent              | Present | Absent              | Present | 0                   | 0.4   | 0.8   |        |
| Total Tubers, tons per acre           |                     |         |                     |         |                     |       |       |        |
| Yields                                | ±0.192              |         | ±0.192              |         | ±0.130              |       |       |        |
| Mean                                  | 9.28                | 10.07   | 9.46                | 9.89    | 8.45                | 10.08 | 10.50 | 9.68   |
| Sulphate of ammonia (cwt. N per acre) | ±0.183 <sup>a</sup> |         | ±0.183 <sup>a</sup> |         |                     |       |       |        |
| 0                                     | 8.31                | 8.59    | 8.56                | 8.35    |                     |       |       |        |
| 0.4                                   | 9.74                | 10.41   | 9.72                | 10.43   |                     |       |       |        |
| 0.8                                   | 9.78                | 11.22   | 10.10               | 10.89   |                     |       |       |        |
| Responses to:                         | ±0.408              |         | ±0.408              |         | ±0.275 <sup>a</sup> |       |       | ±0.288 |
| Presence of dung                      | 4.48                | 2.86    | 4.59                | 2.75    | 3.75                | 3.22  | 4.03  | 3.67   |
|                                       | ±0.471              |         | ±0.471              |         | ±0.318 <sup>a</sup> |       |       | ±0.333 |
| Fresh-stored dung                     | 0.24                | 0.22    | 0.36                | 0.09    | 0.90                | -0.11 | -0.11 | 0.23   |
| Double-single litter                  | 0.12                | -0.03   | -0.50               | 0.60    | 0.65                | -0.30 | -0.19 | 0.05   |
| Percentage Ware                       |                     |         |                     |         |                     |       |       |        |
| Mean                                  | 88.5                | 89.5    | 88.7                | 89.3    | 87.4                | 89.6  | 90.0  | 89.0   |
| Sulphate of ammonia (cwt. N per acre) |                     |         |                     |         |                     |       |       |        |
| 0                                     | 87.3                | 87.6    | 87.4                | 87.4    |                     |       |       |        |
| 0.4                                   | 89.4                | 89.9    | 89.3                | 89.9    |                     |       |       |        |
| 0.8                                   | 89.0                | 91.0    | 89.5                | 90.5    |                     |       |       |        |
| Responses to                          |                     |         |                     |         |                     |       |       |        |
| Presence of dung                      | 4.2                 | 2.9     | 5.1                 | 2.0     | 4.2                 | 2.9   | 3.6   | 3.5    |
| Fresh-stored dung                     | -0.2                | 0.5     | -0.3                | 0.5     | 0.3                 | 0.1   | 0.0   | 0.2    |
| Double-single litter                  | -0.2                | 0.1     | -0.3                | 0.1     | 0.3                 | 0.0   | -0.4  | 0.0    |

(a) For use in comparisons involving differences between levels of nitrogen.



N/3

Barley, 1940

Residual effects

|                      | Superphosphate |         | Sulph. potash |         | Litter with dung |       | Mean  |
|----------------------|----------------|---------|---------------|---------|------------------|-------|-------|
|                      | Absent         | Present | Absent        | Present | Normal           | Add'l |       |
| Grain; cwt. per acre |                |         |               |         |                  |       |       |
|                      | ±0.55          |         | ±0.55         |         |                  |       |       |
| Mean                 | 32.3           | 30.1    | 31.4          | 30.9    |                  |       | 31.2  |
|                      | ±1.17          |         | ±1.17         |         |                  |       | ±0.83 |
| Response to dung     | 3.0            | 3.2     | 4.1           | 2.2     |                  |       | 3.1   |
| Dung:                | ±0.96          |         | ±0.96         |         | ±0.96            |       | ±0.68 |
| Fresh                | 34.3           | 32.1    | 33.9          | 32.5    | 33.2             | 33.2  | 33.2  |
| Stored               | 32.2           | 30.2    | 31.6          | 30.8    | 31.0             | 31.5  | 31.2  |
| Litter with dung:    |                |         |               |         |                  |       |       |
| Normal               | 33.3           | 30.8    | 33.1          | 31.1    |                  |       | 32.1  |
| Additional           | 33.2           | 31.5    | 32.5          | 32.2    |                  |       | 32.4  |
| Straw; cwt. per acre |                |         |               |         |                  |       |       |
| Mean                 | 38.5           | 37.3    | 38.1          | 37.6    |                  |       | 37.9  |
| Response to dung     | 4.2            | 4.6     | 5.4           | 3.3     |                  |       | 4.4   |
| Dung:                |                |         |               |         |                  |       |       |
| Fresh                | 40.3           | 40.7    | 41.6          | 39.4    | 40.4             | 40.6  | 40.5  |
| Stored               | 39.4           | 36.8    | 38.3          | 38.0    | 38.0             | 38.2  | 38.1  |
| Litter with dung:    |                |         |               |         |                  |       |       |
| Normal               | 40.4           | 38.1    | 40.0          | 38.5    |                  |       | 39.2  |
| Additional           | 39.4           | 39.4    | 39.8          | 39.0    |                  |       | 39.4  |



N/4

## POTATOES

### Great Harpenden 1940

Effects of normal, intensive cultivation before and after planting, intensive hoeing and grubbing, of low level and high level manuring, and of applying artificials in the bouts or broadcast before bouting.

Design: 6 randomized blocks of 8 plots each, certain interactions partially confounded with block differences.

Area of each plot: 0.0200 acre

#### Treatments

Cultivations: Normal, intensive cultivation before and after planting, intensive hoeing and grubbing.

Levels of Manuring: Low - 0.3 cwt. N per acre as sulphate of ammonia  
0.3 cwt.  $P_2O_5$  per acre as superphosphate  
0.5 cwt.  $K_2O$  per acre as muriate of potash  
High - 15 tons per acre dung, and artificials as for the low level but at twice the rate.

The artificials were applied with seed in the bouts or broadcast before bouting.

#### Crop Notes

Potatoes planted: May 2. Lifted: Sept 25. Variety: Arran Banner.  
Previous crop: Wheat.

Standard error per plot: Total tubers: 0.731 tons per acre or 8.6%, 27 d.f.



N/5

| Cultivation                      | Artificially applied |           | Level of manuring |       | Mean        |
|----------------------------------|----------------------|-----------|-------------------|-------|-------------|
|                                  | With seed            | Broadcast | Low               | High  |             |
| Total tubers: tons per acre      |                      |           |                   |       |             |
|                                  | $\pm 0.298$          |           |                   |       | $\pm 0.211$ |
| Normal                           | 8.82                 | 9.08      | 7.66              | 10.23 | 8.95        |
| Intensive cultivation            | 8.32                 | 7.72      | 7.19              | 8.86  | 8.02        |
| Intensive hoeing                 | 8.68                 | 8.56      | 7.62              | 9.62  | 8.62        |
| Intensive cultivation and hoeing | 8.52                 | 7.88      | 6.92              | 9.48  | 8.20        |
|                                  | $\pm 0.211$          |           |                   |       |             |
| Low manuring                     | 7.54                 | 7.16      |                   |       |             |
| High manuring                    | 9.63                 | 9.46      |                   |       |             |
| Mean $\pm 0.149$                 | 8.58                 | 8.31      | 7.35              | 9.55  | 8.45        |
| Percentage Ware                  |                      |           |                   |       |             |
| Normal                           | 94.0                 | 94.4      | 93.6              | 94.8  | 94.2        |
| Intensive cultivation            | 94.2                 | 94.6      | 93.8              | 95.0  | 94.4        |
| Intensive hoeing                 | 93.6                 | 94.3      | 93.9              | 94.0  | 94.0        |
| Intensive cultivation and hoeing | 94.0                 | 93.6      | 93.5              | 94.2  | 93.8        |
| Low manuring                     | 93.5                 | 93.9      |                   |       |             |
| High manuring                    | 94.4                 | 94.6      |                   |       |             |
| Mean                             | 94.0                 | 94.2      | 93.7              | 94.5  | 94.1        |



N/6

POTATOES

Great Harpenden, 1940

Design: Variety Trial. 4 x 4 Latin square.

Area of each plot (only 3 rows out of 10 harvested): 0.0075 acre.

Varieties: Ally, Arran Banner, Dunbar Rover, Gladstone.

Basal Manuring: 16 tons dung per acre, 0.6 cwt. N per acre as sulphate of ammonia, 0.6 cwt.  $P_2O_5$  per acre as superphosphate and 1.0 cwt.  $K_2O$  per acre as muriate of potash.

Crop Notes

Planted: May 1. Lifted: Oct. 2. Previous crop: Wheat.

Potatoes were passed through a  $1\frac{3}{4}$  inch riddle to determine percentage ware.

Standard Error per plot: Total tubers, 0.907 tons per acre or 9.7%, 6 d.f.

| Variety      | Total tubers, tons per acre | Percentage ware |
|--------------|-----------------------------|-----------------|
|              | $\pm 0.454$                 |                 |
| Ally         | 9.73                        | 92.0            |
| Arran Banner | 10.51                       | 95.1            |
| Dunbar Rover | 8.27                        | 92.8            |
| Gladstone    | 9.06                        | 91.9            |
| Mean         | 9.39                        | 93.0            |



N/7

## POTATOES

### Foster's 1942 and Sawyer's 1943

Effects of autumn and spring ploughing, of intensity of cultivation, of dung, of sulphate of ammonia and of muriate of potash and in 1943 of superphosphate.

Design: 4 randomized blocks of 12 plots each. Three interactions were confounded with block differences.

Area of each plot: 1942 0.0167 acre  
1943 0.0150 acre

### Treatments

Time of ploughing: Autumn, spring.

Cultivations: Shallow (6") ploughing followed by minimum grubbing and ridges appropriate to 6" ploughing depth, deep (9") ploughing followed by minimum grubbing and ridges appropriate to 6" ploughing depth, and deep (9") ploughing followed by intensive grubbing and ridges appropriate to 9" ploughing depth.

Dung: None, 16 tons per acre.

Sulphate of ammonia: None, 0.6 cwt. N per acre.

Muriate of potash: None, 1.0 cwt.  $K_2O$  per acre. In 1943 only, 0.6 cwt.  $P_2O_5$  per acre as superphosphate was applied to the plots which received this potash, and the combined treatment is referred to as "minerals".

Basal Manuring: 0.6 cwt.  $P_2O_5$  per acre as superphosphate in 1942 only.

### Crop Notes

|                  | 1942         | 1943      |
|------------------|--------------|-----------|
| Potatoes planted | April 24     | April 16  |
| Lifted           | Oct. 10      | Sept. 22. |
| Variety          | Arran Banner | Majestic. |

### Standard errors per plot:

Total tubers, tons per acre.

1942, 0.712 or 4.6%, 11 d.f.

1943, 0.712 or 8.6%, 11 d.f.



N/8

Potatoes - Foster's and Sawyer's

Total tubers, tons per acre

1942 - Foster's

| Ploughing          | 6"<br>deep  | 9"<br>deep | 9" + deep<br>intensive<br>grubbing | Mean                |
|--------------------|-------------|------------|------------------------------------|---------------------|
| Mean yields:       | $\pm 0.252$ |            |                                    |                     |
| Autumn             | 15.77       | 16.16      | 15.03                              | 15.66               |
| Spring             | 15.24       | 15.16      | 14.76                              | 15.05               |
| Mean $\pm 0.178$   | 15.50       | 15.66      | 14.90                              | 15.35               |
| Resp. to nitrogen: | $\pm 0.503$ |            |                                    |                     |
| Autumn             | 2.99        | 2.24       | 2.28                               | 2.50                |
| Spring             | 4.34        | 2.10       | 1.55                               | 2.66                |
| Mean $\pm 0.356$   | 3.66        | 2.17       | 1.92                               | 2.58<br>$\pm 0.206$ |
| Resp. to potash:   | $\pm 0.503$ |            |                                    |                     |
| Autumn             | 1.47        | 1.78       | 1.01                               | 1.42                |
| Spring             | 0.83        | -0.18      | 1.38                               | 0.68                |
| Mean $\pm 0.356$   | 1.15        | 0.80       | 1.20                               | 1.05<br>$\pm 0.206$ |
| Resp. to dung:     | $\pm 0.503$ |            |                                    |                     |
| Autumn             | 2.55        | 2.68       | 3.22                               | 2.82                |
| Spring             | 1.10        | 1.84       | 2.13                               | 1.69                |
| Mean $\pm 0.356$   | 1.82        | 2.26       | 2.68                               | 2.25<br>$\pm 0.206$ |

|         | No nitrogen | Nitrogen | No potash | Potash |
|---------|-------------|----------|-----------|--------|
| No dung | 12.93       | 15.53    | 13.37     | 15.10  |
| Dung    | 15.19       | 17.77    | 16.30     | 16.67  |



Total tubers, tons per acre  
1943 - Sawyer's

N/9

| Floughing          | 6"<br>deep  | 9"<br>deep | 9" + deep<br>intensive<br>grubbing | Mean                |
|--------------------|-------------|------------|------------------------------------|---------------------|
| Mean Yields:       |             |            | $\pm 0.252$                        |                     |
| Autumn             | 8.02        | 8.56       | 7.85                               | 8.14                |
| Spring             | 8.53        | 8.20       | 8.43                               | 8.39                |
| Mean $\pm 0.178$   | 8.28        | 8.38       | 8.14                               | 8.26                |
| Resp. to nitrogen: |             |            | $\pm 0.504$                        |                     |
| Autumn             | 0.94        | 2.82       | 1.30                               | 1.69                |
| Spring             | 0.64        | 1.78       | 1.72                               | 1.38                |
| Mean $\pm 0.356$   | 0.79        | 2.30       | 1.51                               | 1.53<br>$\pm 0.206$ |
| Resp. to minerals  |             |            | $\pm 0.504$                        |                     |
| Autumn             | 3.25        | 1.88       | 1.95                               | 2.36                |
| Spring             | 1.41        | 1.48       | 1.09                               | 1.33                |
| Mean $\pm 0.356$   | 2.33        | 1.68       | 1.52                               | 1.84<br>$\pm 0.206$ |
| Resp. to dung:     |             |            | $\pm 0.504$                        |                     |
| Autumn             | 2.74        | 3.98       | 3.89                               | 3.54                |
| Spring             | 3.88        | 3.18       | 3.21                               | 3.42                |
| Mean $\pm 0.356$   | 3.31        | 3.58       | 3.55                               | 3.48<br>$\pm 0.206$ |
|                    | No nitrogen | Nitrogen   | No dung                            | Dung                |
| No minerals        | 6.75        | 7.94       | 5.04                               | 9.65                |
| Minerals           | 8.25        | 10.12      | 8.01                               | 10.36               |



N/10

## POTATOES

### Sawyers III 1945

Effect of time of planting, chitted seed, dung and sulphate of ammonia.

Design: 4 randomized blocks of 8 plots each, certain interactions being confounded with block differences.

Area of each plot: 0.0188 acre.

#### Treatments

Times of planting: March 30, April 20, May 11, June 1.

Seed: Not chitted, chitted.

Dung: None, 15 tons per acre at first planting, adjusted for change in weight of dung at subsequent plantings.

Sulphate of ammonia: None, 0.6 cwt. N per acre.

Actual rates of application of dung per acre were 15 tons March 30, 12.5 tons April 20, 9.5 tons May 11, 7.0 tons June 1.

In spite of the basal dressing of 2 cwt. per acre of muriate of potash the 4 plots of the 1st planting where no dung was applied showed severe symptoms of potash deficiency at the end of July. This led to the early death of the haulm and may partially account for the lower yield of these plots. Corresponding plots of the second planting showed similar though less severe symptoms later in the season.

One tuber infected with severe Mosaic virus was planted in the Southern half of each plot, and one tuber infected with Leaf Roll virus in the Northern half. Samples of tubers from plants near these infected tubers were taken on two occasions to measure the rate of spread of this virus infection.

This and the next two experiments, and similar ones in later years, are discussed by Broadbent, Gregory and Tinsley, "The influence of Planting Date and Manuring on Virus Diseases," *Ann. Appl. Biol.* 39 (1952), 509.

Basal manuring 0.6 cwt.  $P_2O_5$  per acre as superphosphate  
1.0 cwt.  $K_2O$  per acre as muriate of potash.

#### Crop Notes

Lifted: Oct 2. Variety: Majestic. Previous crop: Barley.

Standard error per plot: Total tubers, 0.670 tons per acre or 7.1%, 11 d.f.



N/11

Total tubers, tons per acre

Differential responses

|             | Mean        | Chitting    |         | Dung   |         | Sulph. amm. |         |
|-------------|-------------|-------------|---------|--------|---------|-------------|---------|
|             |             | Absent      | Present | Absent | Present | Absent      | Present |
|             | $\pm 0.237$ | $\pm 0.335$ |         |        |         |             |         |
| Chitting    | 0.70        | -           | -       | 0.42   | 0.98    | 0.86        | 0.54    |
| Dung        | 4.16        | 3.88        | 4.44    | -      | -       | 4.45        | 3.87    |
| Sulph. amm. | 1.50        | 1.66        | 1.34    | 1.79   | 1.21    | -           | -       |

| Time of planting | 30 March    | 20 April | 11 May | 1 June | Mean        |      |
|------------------|-------------|----------|--------|--------|-------------|------|
|                  | $\pm 0.335$ |          |        |        | $\pm 0.168$ |      |
| Not chitted      | 10.02       | 10.85    | 8.96   | 6.63   | 9.12        |      |
| Chitted          | 10.27       | 10.90    | 10.11  | 7.99   | 9.82        |      |
| No dung          | 7.24        | 8.64     | 7.54   | 6.13   | 7.40        |      |
| Dung             | 13.05       | 13.11    | 11.53  | 8.49   | 11.54       |      |
| No sulph. amm.   | 9.08        | 9.80     | 8.84   | 7.15   | 8.72        |      |
| Sulph. amm.      | 11.21       | 11.95    | 10.23  | 7.47   | 10.22       |      |
| Mean             | $\pm 0.237$ | 10.15    | 10.87  | 9.54   | 7.31        | 9.47 |



N/12

POTATOES

Great Knott II. 1946

Effects of dung, sulphate of ammonia, superphosphate and muriate of potash, and of time of planting.

Design: 8 randomized blocks of 8 plots each, certain high order interactions being confounded with block differences.

Area of each plot: 0.0133 acre.

Treatments

Times of planting: April 10, April 30, May 20, June 7.

Dung: None, 15 tons per acre at first planting and reduced amounts for the later plantings to allow for wastage on storage.

Sulphate of ammonia: None, 0.6 cwt. N per acre.

Superphosphate: None, 0.6 cwt.  $P_2O_5$  per acre.

Muriate of potash: None, 1.0 cwt.  $K_2O$  per acre.

One tuber infected with Severe Mosaic virus was planted in the northern half of each plot, and one tuber infected with Leaf Roll virus in the southern half. Samples of tubers from plants near these infected tubers were taken to measure the rate of spread of the virus infection (see previous experiment for reference).

Crop Notes

Lifted: Oct. 12-14. Variety: Majestic. Previous crop: Linseed.

Standard error per plot: Total tubers, 1.03 tons per acre or 9.8%, 32 d.f.

| Time of planting | Mean       | Dung                        |       | Sulphate of ammonia |       | Super-phosphate |       | Muriate of potash |       |
|------------------|------------|-----------------------------|-------|---------------------|-------|-----------------|-------|-------------------|-------|
|                  |            | Abs.                        | Pres. | Abs.                | Pres. | Abs.            | Pres. | Abs.              | Pres. |
|                  |            | Total tubers: tons per acre |       |                     |       |                 |       |                   |       |
|                  | $\pm 0.26$ | $\pm 0.37$                  |       |                     |       |                 |       |                   |       |
| 1                | 11.56      | 9.62                        | 13.49 | 10.62               | 12.50 | 11.47           | 11.64 | 10.79             | 12.32 |
| 2                | 10.64      | 8.84                        | 12.44 | 10.03               | 11.26 | 10.36           | 10.91 | 10.25             | 11.04 |
| 3                | 10.35      | 8.94                        | 11.76 | 9.60                | 11.11 | 10.12           | 10.59 | 9.89              | 10.81 |
| 4                | 9.43       | 7.87                        | 10.98 | 9.19                | 9.67  | 9.15            | 9.71  | 9.24              | 9.60  |
|                  |            | $\pm 0.18$                  |       |                     |       |                 |       |                   |       |
| Mean             | 10.49      | 8.81                        | 12.46 | 9.85                | 11.13 | 10.27           | 10.70 | 10.04             | 10.93 |



N/13

POTATOES

Great Harpenden II, 1947

Effects of dung, sulphate of ammonia, muriate of potash and time of planting.

Design: 4 randomized blocks of 8 plots each, the third order interaction being confounded with block differences.

Area of each plot: 0.0133 acre.

Treatments

Times of planting: May 5, May 27.

Dung: None, 15 tons per acre.

Sulphate of ammonia: None, 0.6 cwt. N per acre.

Muriate of potash: None, 1.0 cwt. K<sub>2</sub>O per acre.

One tuber infected with Severe Mosaic virus and one tuber infected with Leaf Roll virus were planted in different halves of each plot. Samples of tubers from plants near these infected tubers were taken to measure the rate of spread of infection (see previous experiment but one, for reference).

Basal manuring: 0.6 cwt. P<sub>2</sub>O<sub>5</sub> per acre as superphosphate.

Crop notes.

Lifted: Oct 8. Variety: Majestic. Previous crop: Barley.

Standard error per plot: Total tubers, 0.490 tons per acre or 6.6%, 18 d.f.

Total tubers, tons per acre. Mean yield, 7.44

Differential Responses.

|                               | Mean   | Dung  |       | Sulphate of ammonia |       | Muriate of potash |       | Time of planting |       |
|-------------------------------|--------|-------|-------|---------------------|-------|-------------------|-------|------------------|-------|
|                               |        | Abs.  | Pres. | Abs.                | Pres. | Abs.              | Pres. | Early            | Late  |
|                               | ±0.173 |       |       |                     |       |                   |       |                  |       |
| Dung                          | 0.75   | -     | -     | 1.07                | 0.43  | 1.58              | -0.08 | +1.57            | -0.07 |
| Sulphate of ammonia           | 0.61   | 0.93  | 0.29  | -                   | -     | 0.35              | 0.87  | 0.74             | 0.48  |
| Muriate of potash             | -0.03  | 0.80  | -0.86 | -0.29               | 0.23  | -                 | -     | -0.04            | -0.02 |
| Time of planting (Early-Late) | 0.36   | -0.46 | 1.18  | 0.23                | 0.49  | 0.35              | 0.37  | -                | -     |



N/14

POTATOES

Great Knott II 1946

Effects of deep and shallow tillage between rows, of earthing up and of mulching with straw. Notes on the development of the crop and its condition at harvest were made by the Physics Dept.

Design: 4 randomized blocks of 5 plots each.

Area of each plot: 0.0111 acre.

Treatments.

All four combinations of deep (4-6 inches) and shallow tillage between rows, with and without earthing up; also shallow cultivation until the crop was well through ground, then mulching with 3 tons per acre of chaffed straw between the rows.

Basal manuring: 5 cwt. superphosphate, 2 cwt. muriate of potash and 4 cwt. sulphate of ammonia per acre.

Crop Notes.

Planted: April 15. Lifted: Oct. 15. Variety, Majestic. Previous crop: Linseed.

Standard errors per plot:

Total tubers, tons per acre 0.692 or 5.6%, 12 d.f.  
 % ware 2.518 12 d.f.

|                             |             | Shallow intertillage |                |            | Deep intertillage |            | Mean  |
|-----------------------------|-------------|----------------------|----------------|------------|-------------------|------------|-------|
|                             |             | Mulched              | Not earthed up | Earthed up | Not earthed       | Earthed up |       |
| Total tubers, tons per acre | $\pm 0.346$ | 12.45                | 11.66          | 12.96      | 12.44             | 12.40      | 12.38 |
| % Ware,                     | $\pm 1.26$  | 83.4                 | 79.7           | 82.1       | 82.0              | 80.4       | 81.5  |

The following figures are % of Ware.

|        |      |      |      |      |      |      |
|--------|------|------|------|------|------|------|
| Green  | 26.7 | 39.3 | 15.5 | 24.0 | 19.0 | 24.9 |
| Blight | 3.5  | 5.0  | 8.6  | 12.8 | 6.3  | 7.0  |
| Scurf  | 3.2  | 6.2  | 7.8  | 4.4  | 13.3 | 7.0  |
| Scab   | 44.6 | 42.9 | 36.2 | 34.9 | 34.2 | 38.6 |



N/15

POTATOES

Great Harpenden I, 1947

Effects of deep and shallow intertillage between rows, of earthing up, of mulching with straw and of applying artificials before and after ridging.

Design: 4 randomized blocks of 10 plots each.

Area of each plot: 0.0098 acre.

Treatments.

Cultivations: All four combinations of deep (4-6 inches) and shallow intertillage between rows, with and without earthing up; also shallow cultivation until crop was well through ground, then mulching with 3 tons per acre of chaffed straw between the rows.

Application of fertilizers: Broadcast before ridging, applied in the bouts.

It was intended to treat two of the four blocks with sulphuric acid spray before lifting to kill haulm, but since no blight was present this year this treatment comparison was not made.

Planted: May 6.      Lifted: October 7.      Variety: Majestic.      Previous crop: Barley.

Crop Notes

Standard errors per plot:  
Total tubers, 0.607 tons per acre or 7.2%, 27 d.f.  
Percentage ware, 0.372, 27 d.f.



N/16

Potatoes - Gt. Harpenden 1947

|                             | Shallow intertillage |                | Deep intertillage |            | Mean |             |
|-----------------------------|----------------------|----------------|-------------------|------------|------|-------------|
|                             | Mulched              | Not earthed up | Not earthed up    | Earthed up |      |             |
| Total tubers, tons per acre |                      |                |                   |            |      |             |
| Artificials applied:        | $\pm 0.304$          |                |                   |            |      | $\pm 0.136$ |
| before ridging              | 8.63                 | 8.64           | 8.15              | 7.10       | 8.71 | 8.24        |
| after ridging               | 8.03                 | 8.82           | 9.11              | 8.63       | 8.15 | 8.55        |
| Mean $\pm 0.215$            | 8.33                 | 8.73           | 8.63              | 7.86       | 8.43 | 8.39        |
| Percentage Ware             |                      |                |                   |            |      |             |
| Artificials applied:        | $\pm 0.19$           |                |                   |            |      | $\pm 0.08$  |
| before ridging              | 98.0                 | 97.4           | 98.0              | 97.5       | 98.2 | 97.8        |
| after ridging               | 97.9                 | 97.4           | 98.2              | 97.6       | 98.0 | 97.8        |
| Mean $\pm 0.13$             | 98.0                 | 97.4           | 98.1              | 97.6       | 98.1 | 97.8        |
| Light greening, % of ware   |                      |                |                   |            |      |             |
| Artificials applied:        |                      |                |                   |            |      |             |
| before ridging              | 20.5                 | 16.0           | 19.0              | 24.0       | 20.2 | 20.0        |
| after ridging               | 16.2                 | 24.2           | 17.5              | 22.8       | 16.2 | 19.4        |
| Mean                        | 18.4                 | 20.1           | 18.2              | 23.4       | 18.2 | 19.7        |
| Severe greening, % of ware  |                      |                |                   |            |      |             |
| Artificials applied:        |                      |                |                   |            |      |             |
| before ridging              | 12.5                 | 15.5           | 5.2               | 20.8       | 10.2 | 12.8        |
| after ridging               | 9.8                  | 19.2           | 13.2              | 13.5       | 17.5 | 14.6        |
| Mean                        | 11.1                 | 17.4           | 9.2               | 17.1       | 13.9 | 13.8        |



N/17

POTATOES

Sawyers III, 1945

Fertilizer Placement. One of a country-wide series of about 60 similar experiments. A report on the whole series has been published by G.W.Cooke, Placement of Fertilizer for potatoes and row crops, *J.Agric.Sci.* 39 (1950), 96 and 359.

Design: 6 randomized blocks of 8 plots each, certain high order interactions being partially confounded with block differences.

Area of each plot: 0.0143 acres.

Treatments

Levels of fertilizer: None, 4.26, 8.36, 11.68 cwt per acre of National Compound No.1.

Methods of placement: Broadcast over ridges, applied in band in contact with seeds, in band 2 inches below seed, in bands 2 inches on either side of seed.

Crop Notes

Potatoes planted: May 12. Lifted: Oct. 3. Variety: Majestic.  
Previous crop: Barley.

Standard error per plot: Total tubers, 1.15 tons per acre of 12.9%, 39 d.f.

Total tubers: tons per acre

| Compound fertilizer<br>cwt. per acre | Broadcast  | Band contact<br>with seed | Band 2"<br>below seed | Bands 2"<br>either side<br>of seed | Mean       |
|--------------------------------------|------------|---------------------------|-----------------------|------------------------------------|------------|
|                                      | $\pm 0.67$ |                           |                       |                                    | $\pm 0.33$ |
| None                                 |            |                           |                       |                                    | 4.93       |
| 4.26                                 | 8.73       | 8.95                      | 7.80                  | 8.14                               | 8.41       |
| 8.36                                 | 10.95      | 11.44                     | 9.67                  | 11.46                              | 10.88      |
| 11.68                                | 12.22      | 10.50                     | 11.76                 | 11.17                              | 11.41      |
| Mean $\pm 0.38$                      | 10.64      | 10.30                     | 9.75                  | 10.26                              | 8.91       |



N/18

POTATOES

Great Knott II. 1946

Fertilizer Placement Series.

Design: 6 randomized blocks of 8 plots each, certain high order interactions being partially confounded with block differences.

Area of each plot: 0.0133 acre.

Treatments.

Levels of fertilizer: None, 4.60, 9.96, 13.84 cwt. per acre of National Compound No.1. (7% N; 7% P<sub>2</sub>O<sub>5</sub>; 9% K<sub>2</sub>O).

Methods of placement: Broadcast before bouting, broadcast after bouting, drilled in band in contact with seed, drilled in two bands, 2 inches on either side of, and 2 inches below, seed.

The plots receiving no fertilizer but due for drilling in two bands received one stroke with cultivator tines.

Crop Notes

Potatoes planted: April 15. Lifted: Oct. 12-14. Variety: Majestic. Previous crop; Linseed.

Standard error per plot: Total tubers, 0.77 tons per acre or 7.0%, 29 d.f.

Total tubers: tons per acre

| Compound fertilizer cwt. per acre. | Broadcast before ridging | Broadcast after ridging | Band contact with seed | Side bands         | Mean  |
|------------------------------------|--------------------------|-------------------------|------------------------|--------------------|-------|
|                                    |                          |                         |                        |                    | ±0.44 |
| None                               |                          | 7.02 <sup>a</sup>       |                        | 7.93               | 7.25  |
| 4.60                               | 9.52                     | 10.28                   | 10.05                  | 10.36              | 10.05 |
| 9.96                               | 11.91                    | 12.40                   | 13.30                  | 13.04              | 12.66 |
| 13.84                              | 12.74                    | 14.84                   | 14.11                  | 14.45              | 14.04 |
| Mean ±0.26                         | 11.39 <sup>‡</sup>       | 12.51 <sup>‡</sup>      | 12.49 <sup>‡</sup>     | 12.62 <sup>‡</sup> | 11.00 |

Standard error (a) 0.26

<sup>‡</sup>Mean excluding yield at zero level of fertilizer.



N/19

POTATOES

Great Harpenden II, 1947

Fertilizer Placement Series.

Design: 3 randomized blocks of 16 plots each.

Area of each plot: 0.0123 acre.

Treatments

Levels of fertilizer: None, 5, 10, 15 cwt. per acre of National Compound No.1 (7% N, 7% P<sub>2</sub>O<sub>5</sub>, 10.5% K<sub>2</sub>O).

Methods of placement: Broadcast before ridging, broadcast after ridging, drilled in band in contact with seed, drilled in 2 bands 2 inches either side of, and 2 inches below, seed.

Crop Notes.

Potatoes planted: May 12. Lifted: Oct.10. Variety: Majestic.  
Previous crop: Barley.

Standard error per plot: Total tubers, 0.635 tons per acre or 7.4%, 33 d.f.

Total tubers: tons per acre

| Compound fertilizer cwt. per acre | Broadcast      |               | Band in contact with seed | Side bands | Mean   |
|-----------------------------------|----------------|---------------|---------------------------|------------|--------|
|                                   | before ridging | after ridging |                           |            |        |
|                                   |                |               | ±0.367                    |            | ±0.183 |
| None                              |                |               |                           |            | 6.88   |
| 5                                 | 8.06           | 9.00          | 8.54                      | 9.29       | 8.72   |
| 10                                | 8.88           | 9.50          | 8.00                      | 10.07      | 9.11   |
| 15                                | 9.98           | 9.41          | 9.03                      | 9.78       | 9.55   |
| Mean ±0.212                       | 8.97           | 9.30          | 8.52                      | 9.71       | 8.57   |

The mean percentage ware was 97.3%.



TABLE I

Summary of the results of the analysis of the data from the 1960-1961 season

(continued from page 133)

| Area     | Number of birds | Number of eggs | Number of chicks | Number of fledglings | Number of birds that died |
|----------|-----------------|----------------|------------------|----------------------|---------------------------|
| Area 1   | 10              | 10             | 10               | 10                   | 10                        |
| Area 2   | 10              | 10             | 10               | 10                   | 10                        |
| Area 3   | 10              | 10             | 10               | 10                   | 10                        |
| Area 4   | 10              | 10             | 10               | 10                   | 10                        |
| Area 5   | 10              | 10             | 10               | 10                   | 10                        |
| Area 6   | 10              | 10             | 10               | 10                   | 10                        |
| Area 7   | 10              | 10             | 10               | 10                   | 10                        |
| Area 8   | 10              | 10             | 10               | 10                   | 10                        |
| Area 9   | 10              | 10             | 10               | 10                   | 10                        |
| Area 10  | 10              | 10             | 10               | 10                   | 10                        |
| Area 11  | 10              | 10             | 10               | 10                   | 10                        |
| Area 12  | 10              | 10             | 10               | 10                   | 10                        |
| Area 13  | 10              | 10             | 10               | 10                   | 10                        |
| Area 14  | 10              | 10             | 10               | 10                   | 10                        |
| Area 15  | 10              | 10             | 10               | 10                   | 10                        |
| Area 16  | 10              | 10             | 10               | 10                   | 10                        |
| Area 17  | 10              | 10             | 10               | 10                   | 10                        |
| Area 18  | 10              | 10             | 10               | 10                   | 10                        |
| Area 19  | 10              | 10             | 10               | 10                   | 10                        |
| Area 20  | 10              | 10             | 10               | 10                   | 10                        |
| Area 21  | 10              | 10             | 10               | 10                   | 10                        |
| Area 22  | 10              | 10             | 10               | 10                   | 10                        |
| Area 23  | 10              | 10             | 10               | 10                   | 10                        |
| Area 24  | 10              | 10             | 10               | 10                   | 10                        |
| Area 25  | 10              | 10             | 10               | 10                   | 10                        |
| Area 26  | 10              | 10             | 10               | 10                   | 10                        |
| Area 27  | 10              | 10             | 10               | 10                   | 10                        |
| Area 28  | 10              | 10             | 10               | 10                   | 10                        |
| Area 29  | 10              | 10             | 10               | 10                   | 10                        |
| Area 30  | 10              | 10             | 10               | 10                   | 10                        |
| Area 31  | 10              | 10             | 10               | 10                   | 10                        |
| Area 32  | 10              | 10             | 10               | 10                   | 10                        |
| Area 33  | 10              | 10             | 10               | 10                   | 10                        |
| Area 34  | 10              | 10             | 10               | 10                   | 10                        |
| Area 35  | 10              | 10             | 10               | 10                   | 10                        |
| Area 36  | 10              | 10             | 10               | 10                   | 10                        |
| Area 37  | 10              | 10             | 10               | 10                   | 10                        |
| Area 38  | 10              | 10             | 10               | 10                   | 10                        |
| Area 39  | 10              | 10             | 10               | 10                   | 10                        |
| Area 40  | 10              | 10             | 10               | 10                   | 10                        |
| Area 41  | 10              | 10             | 10               | 10                   | 10                        |
| Area 42  | 10              | 10             | 10               | 10                   | 10                        |
| Area 43  | 10              | 10             | 10               | 10                   | 10                        |
| Area 44  | 10              | 10             | 10               | 10                   | 10                        |
| Area 45  | 10              | 10             | 10               | 10                   | 10                        |
| Area 46  | 10              | 10             | 10               | 10                   | 10                        |
| Area 47  | 10              | 10             | 10               | 10                   | 10                        |
| Area 48  | 10              | 10             | 10               | 10                   | 10                        |
| Area 49  | 10              | 10             | 10               | 10                   | 10                        |
| Area 50  | 10              | 10             | 10               | 10                   | 10                        |
| Area 51  | 10              | 10             | 10               | 10                   | 10                        |
| Area 52  | 10              | 10             | 10               | 10                   | 10                        |
| Area 53  | 10              | 10             | 10               | 10                   | 10                        |
| Area 54  | 10              | 10             | 10               | 10                   | 10                        |
| Area 55  | 10              | 10             | 10               | 10                   | 10                        |
| Area 56  | 10              | 10             | 10               | 10                   | 10                        |
| Area 57  | 10              | 10             | 10               | 10                   | 10                        |
| Area 58  | 10              | 10             | 10               | 10                   | 10                        |
| Area 59  | 10              | 10             | 10               | 10                   | 10                        |
| Area 60  | 10              | 10             | 10               | 10                   | 10                        |
| Area 61  | 10              | 10             | 10               | 10                   | 10                        |
| Area 62  | 10              | 10             | 10               | 10                   | 10                        |
| Area 63  | 10              | 10             | 10               | 10                   | 10                        |
| Area 64  | 10              | 10             | 10               | 10                   | 10                        |
| Area 65  | 10              | 10             | 10               | 10                   | 10                        |
| Area 66  | 10              | 10             | 10               | 10                   | 10                        |
| Area 67  | 10              | 10             | 10               | 10                   | 10                        |
| Area 68  | 10              | 10             | 10               | 10                   | 10                        |
| Area 69  | 10              | 10             | 10               | 10                   | 10                        |
| Area 70  | 10              | 10             | 10               | 10                   | 10                        |
| Area 71  | 10              | 10             | 10               | 10                   | 10                        |
| Area 72  | 10              | 10             | 10               | 10                   | 10                        |
| Area 73  | 10              | 10             | 10               | 10                   | 10                        |
| Area 74  | 10              | 10             | 10               | 10                   | 10                        |
| Area 75  | 10              | 10             | 10               | 10                   | 10                        |
| Area 76  | 10              | 10             | 10               | 10                   | 10                        |
| Area 77  | 10              | 10             | 10               | 10                   | 10                        |
| Area 78  | 10              | 10             | 10               | 10                   | 10                        |
| Area 79  | 10              | 10             | 10               | 10                   | 10                        |
| Area 80  | 10              | 10             | 10               | 10                   | 10                        |
| Area 81  | 10              | 10             | 10               | 10                   | 10                        |
| Area 82  | 10              | 10             | 10               | 10                   | 10                        |
| Area 83  | 10              | 10             | 10               | 10                   | 10                        |
| Area 84  | 10              | 10             | 10               | 10                   | 10                        |
| Area 85  | 10              | 10             | 10               | 10                   | 10                        |
| Area 86  | 10              | 10             | 10               | 10                   | 10                        |
| Area 87  | 10              | 10             | 10               | 10                   | 10                        |
| Area 88  | 10              | 10             | 10               | 10                   | 10                        |
| Area 89  | 10              | 10             | 10               | 10                   | 10                        |
| Area 90  | 10              | 10             | 10               | 10                   | 10                        |
| Area 91  | 10              | 10             | 10               | 10                   | 10                        |
| Area 92  | 10              | 10             | 10               | 10                   | 10                        |
| Area 93  | 10              | 10             | 10               | 10                   | 10                        |
| Area 94  | 10              | 10             | 10               | 10                   | 10                        |
| Area 95  | 10              | 10             | 10               | 10                   | 10                        |
| Area 96  | 10              | 10             | 10               | 10                   | 10                        |
| Area 97  | 10              | 10             | 10               | 10                   | 10                        |
| Area 98  | 10              | 10             | 10               | 10                   | 10                        |
| Area 99  | 10              | 10             | 10               | 10                   | 10                        |
| Area 100 | 10              | 10             | 10               | 10                   | 10                        |



SUGAR BEET

Great Harpenden II, 1947

Design; Fertilizer Placement Series. 3 randomized blocks of 16 plots each.

Area of each plot; 0.00808 acre.

Treatments

Levels of fertilizer: None,  $4\frac{1}{2}$ , 9 cwt. per acre of National Granular Compound No. 2 (9% N, 7.5% P<sub>2</sub>O<sub>5</sub>, 4.5% K<sub>2</sub>O).

Methods of placement: Broadcast on flat and harrowed in, drilled in band in contact with seed, drilled in band 2 inches below seed, drilled in 2 bands 1 inch either side of and 1 inch below seed, drilled in 2 bands 2 inches either side of and 2 inches below seed.

Crop Notes

Seed drilled: May 10. Lifted: Nov. 11. Variety: Klein E. Previous crop: Barley.

Standard errors per plot:

Roots (washed), 1.21 tons per acre or 15.7%, 45 d.f.

Tops, 0.894 tons per acre or 14.9%, 45 d.f.

Sugar percentage, 0.565, 45 d.f.

Total sugar, 5.02 cwt. per acre or 17.2%, 45 d.f.

Plant number, 2.10 thousand per acre or 10.9%, 45 d.f.



P/2  
Sugar Beet - Gt. Harpenden 1947

| Fertilizer<br>cwt/acre                    | Broadcast          | Contact<br>with<br>seed | Band 2"<br>below<br>seed | 1" below<br>and 1"<br>of either side<br>of seed | 2" below<br>and 2"<br>of either side<br>of seed | Mean                         |
|---|--------------------|-------------------------|--------------------------|---|---|------------------------------|
| Roots (washed): tons per acre<br>±0.698   |                    |                         |                          |   |   |                              |
| None                                      |                    |                         |                          |   |   | ±0.285<br>6.51 <sup>a</sup>  |
| 4½  | 6.76 <sup>b</sup>  | 7.57                    | 8.82                     | 8.58  | 8.67  | 8.03                         |
| 9   | 7.95 <sup>b</sup>  | 7.51                    | 8.71                     | 8.62  | 8.53  | 8.21                         |
| Mean ±0.494                               | 7.35 <sup>a</sup>  | 7.54                    | 8.77                     | 9.10  | 8.60  | 7.71                         |
| Standard errors (a) 0.349 (b) 0.494       |                    |                         |                          |   |   |                              |
| Sugar Percentage<br>±0.326                |                    |                         |                          |   |   |                              |
| None                                      |                    |                         |                          |   |   | ±0.133<br>19.02 <sup>c</sup> |
| 4½  | 18.70 <sup>d</sup> | 18.87                   | 19.35                    | 19.14   | 19.00   | 18.96                        |
| 9   | 18.55 <sup>d</sup> | 18.63                   | 18.88                    | 19.27   | 18.68   | 18.76                        |
| Mean ±0.231                               | 18.62 <sup>c</sup> | 18.75                   | 19.11                    | 19.21   | 18.84   | 18.90                        |
| Standard errors (c) 0.163 (d) 0.231       |                    |                         |                          |   |   |                              |
| Total sugar: cwt. per acre<br>±2.90       |                    |                         |                          |   |   |                              |
| None                                      |                    |                         |                          |   |   | ±1.18<br>24.8 <sup>e</sup>   |
| 4½  | 25.3 <sup>f</sup>  | 28.8                    | 34.1                     | 36.7  | 33.1  | 30.6                         |
| 9   | 29.5 <sup>f</sup>  | 28.0                    | 32.9                     | 33.2  | 31.9  | 30.8                         |
| Mean ±2.05                                | 27.4 <sup>e</sup>  | 28.4                    | 33.5                     | 35.0  | 32.5  | 29.2                         |
| Standard errors (e) 1.45 (f) 2.05         |                    |                         |                          |   |   |                              |
| Tops: tons per acre<br>±0.516             |                    |                         |                          |   |   |                              |
| None                                      |                    |                         |                          |   |   | ±0.211<br>4.30 <sup>g</sup>  |
| 4½  | 5.25 <sup>h</sup>  | 5.56                    | 6.76                     | 6.67  | 6.50  | 6.00                         |
| 9   | 6.17 <sup>h</sup>  | 6.70                    | 7.74                     | 7.70  | 8.16  | 7.11                         |
| Mean 0.365                                | 5.71 <sup>g</sup>  | 6.13                    | 7.25                     | 7.18  | 7.33  | 5.99                         |
| Standard errors (g) 0.258 (h) 0.365       |                    |                         |                          |   |   |                              |
| Plant number: thousands per acre<br>±1.21 |                    |                         |                          |   |   |                              |
| None                                      |                    |                         |                          |   |   | ±0.496<br>18.3 <sup>j</sup>  |
| 4½  | 22.2 <sup>k</sup>  | 18.6                    | 19.1                     | 21.0  | 18.7  | 20.3                         |
| 9   | 21.3 <sup>k</sup>  | 15.2                    | 15.4                     | 17.2  | 21.6  | 18.7                         |
| Mean ±0.858                               | 21.7 <sup>j</sup>  | 16.9                    | 17.3                     | 19.1  | 20.2  | 19.2                         |
| Standard errors (j) 0.607 (k) 0.858       |                    |                         |                          |   |   |                              |



## SUGAR BEET

Long Hoos and Woburn Lansome, 1939

Effects of nitrogenous and mineral fertilizers.

Design; 5 x 5 lattice square design with 6 replicates at Rothamsted and 3 replicates at Woburn.

Area of each plot:

Rothamsted; 0.0111 acre

Woburn; 0.0133 acre

### Treatments

Nitrogenous fertilizers: None, nitrate of soda, nitrate of lime, sulphate of ammonia and muriate of ammonia (0.6 cwt. N per acre).

Mineral fertilizers: None, high grade muriate of potash, high grade sulphate of potash (both at 2.0 cwt. K<sub>2</sub>O per acre), salt (2.5 cwt. per acre) and sulphate of soda (6.9 cwt. per acre).

Basal manuring: Superphosphate; 0.5 cwt. P<sub>2</sub>O<sub>5</sub> per acre.

### Crop Notes

|               | Rothamsted     | Woburn         |
|---------------|----------------|----------------|
| Seed sown     | May 8          | May 10         |
| Harvested     | Nov 11         | Oct. 30-Nov. 9 |
| Variety       | Kleinwanzleben | Kleinwanzleben |
| Previous crop | Wheat          | Barley         |

Standard errors per plot

Sugar percentage: Rothamsted 0.390, 120 d.f.

Woburn 0.329, 120 d.f.

Total sugar: Rothamsted 3.24 cwt. per acre or 7.1%, 72 d.f.

Woburn 3.13 cwt. per acre or 7.2%, 72 d.f.



P/4

Sugar Beet - Long Hoos & Lansome, 1939

| <u>Rothamsted</u>                |       |               |               |                |              |        |
|----------------------------------|-------|---------------|---------------|----------------|--------------|--------|
|                                  | None  | Nitr.<br>sod. | Nitr.<br>lime | Sulph.<br>amm. | Mur.<br>amm. | Mean   |
| Roots (washed): tons per acre    |       |               |               |                |              |        |
| None                             | 11.80 | 13.83         | 13.88         | 13.19          | 14.09        | 13.35  |
| Mur. pot.                        | 11.42 | 14.03         | 14.22         | 13.03          | 13.55        | 13.25  |
| Salt                             | 11.51 | 14.10         | 14.28         | 13.12          | 14.08        | 13.42  |
| Sulph. pot.                      | 12.12 | 14.50         | 13.34         | 13.41          | 12.96        | 13.27  |
| Sulph. sod.                      | 11.26 | 14.44         | 14.36         | 14.03          | 14.08        | 13.63  |
| Mean                             | 11.62 | 14.18         | 14.01         | 13.36          | 13.75        | 13.38  |
| Sugar percentage                 |       |               |               |                |              |        |
|                                  |       |               | ±0.159        |                |              | ±0.071 |
| None                             | 16.88 | 16.58         | 16.97         | 16.79          | 17.02        | 16.85  |
| Mur. pot.                        | 16.99 | 17.01         | 17.07         | 17.11          | 17.06        | 17.05  |
| Salt                             | 17.04 | 17.30         | 17.19         | 17.10          | 16.84        | 17.09  |
| Sulph. pot.                      | 17.07 | 16.79         | 17.00         | 17.02          | 17.10        | 17.00  |
| Sulph. sod.                      | 16.88 | 17.17         | 16.73         | 16.68          | 17.02        | 16.90  |
| Mean                             | 16.97 | 16.97         | 16.99         | 16.94          | 17.01        | 16.98  |
| Total sugar: cwt. per acre       |       |               |               |                |              |        |
|                                  |       |               | ±1.32         |                |              | ±0.59  |
| None                             | 39.4  | 46.0          | 46.9          | 44.6           | 46.8         | 44.7   |
| Mur. pot.                        | 39.2  | 47.7          | 47.1          | 44.4           | 47.3         | 45.1   |
| Salt                             | 38.3  | 48.4          | 48.1          | 46.8           | 47.6         | 45.8   |
| Sulph. pot.                      | 40.0  | 48.9          | 45.7          | 45.7           | 45.0         | 45.1   |
| Sulph. sod.                      | 38.7  | 49.3          | 48.1          | 47.3           | 48.4         | 46.4   |
| Mean                             | 39.1  | 48.1          | 47.2          | 45.8           | 47.0         | 45.4   |
| Tops: tons per acre              |       |               |               |                |              |        |
| None                             | 12.79 | 17.48         | 17.83         | 17.06          | 18.56        | 16.74  |
| Mur. pot.                        | 12.19 | 19.27         | 20.33         | 17.44          | 17.03        | 17.25  |
| Salt                             | 11.82 | 18.13         | 18.05         | 16.59          | 18.51        | 16.62  |
| Sulph. pot.                      | 11.89 | 18.63         | 16.43         | 16.32          | 17.40        | 16.13  |
| Sulph. sod.                      | 11.67 | 16.60         | 17.90         | 17.30          | 18.99        | 16.49  |
| Mean                             | 12.07 | 18.02         | 18.11         | 16.94          | 18.10        | 16.65  |
| Plant number: thousands per acre |       |               |               |                |              |        |
| None                             | 29.3  | 30.3          | 29.0          | 29.5           | 29.7         | 29.6   |
| Mur. pot.                        | 29.9  | 30.4          | 30.6          | 30.9           | 29.6         | 30.3   |
| Salt                             | 30.6  | 30.3          | 29.4          | 30.1           | 30.3         | 30.1   |
| Sulph. pot.                      | 30.0  | 30.4          | 29.2          | 29.9           | 30.1         | 29.9   |
| Sulph. sod.                      | 29.5  | 30.0          | 30.2          | 29.4           | 30.3         | 29.9   |
| Mean                             | 29.9  | 30.3          | 29.7          | 30.0           | 30.0         | 30.0   |



|                                  | None  | Nitr. sod. | Woburn<br>Nitr. lime | Sulph. amm. | Mur. amm. | Mean   |
|----------------------------------|-------|------------|----------------------|-------------|-----------|--------|
| Roots (washed): tons per acre    |       |            |                      |             |           |        |
| None                             | 9.32  | 13.83      | 13.56                | 12.33       | 12.50     | 12.31  |
| Mur. pot.                        | 8.44  | 13.66      | 13.12                | 13.53       | 13.66     | 12.48  |
| Salt                             | 9.61  | 13.50      | 14.50                | 13.29       | 12.99     | 12.78  |
| Sulph. pot.                      | 8.27  | 13.39      | 14.42                | 11.61       | 13.96     | 12.33  |
| Sulph. sod.                      | 9.43  | 14.34      | 13.95                | 12.70       | 13.74     | 12.83  |
| Mean                             | 9.01  | 13.75      | 13.91                | 12.69       | 13.37     | 12.55  |
| Sugar percentage                 |       |            |                      |             |           |        |
|                                  |       |            | ±0.190               |             |           | ±0.085 |
| None                             | 16.84 | 17.16      | 17.06                | 17.15       | 17.39     | 17.12  |
| Mur. pot.                        | 17.48 | 17.88      | 17.02                | 17.51       | 17.44     | 17.47  |
| Salt                             | 17.60 | 17.29      | 17.29                | 17.26       | 17.51     | 17.39  |
| Sulph. pot.                      | 17.11 | 17.33      | 17.18                | 17.09       | 17.56     | 17.25  |
| Sulph. sod.                      | 17.25 | 16.96      | 17.05                | 17.22       | 17.58     | 17.21  |
| Mean                             | 17.26 | 17.32      | 17.12                | 17.25       | 17.50     | 17.29  |
| Total sugar: cwt. per acre       |       |            |                      |             |           |        |
|                                  |       |            | ±1.80                |             |           | ±0.80  |
| None                             | 31.1  | 48.1       | 45.2                 | 42.5        | 44.6      | 42.3   |
| Mur. pot.                        | 27.5  | 51.0       | 43.2                 | 46.8        | 46.5      | 43.0   |
| Salt                             | 33.1  | 48.7       | 47.1                 | 46.3        | 47.5      | 44.6   |
| Sulph. pot.                      | 27.1  | 47.3       | 48.3                 | 43.2        | 48.4      | 42.8   |
| Sulph. sod.                      | 32.0  | 49.7       | 46.8                 | 44.1        | 47.9      | 44.1   |
| Mean                             | 30.2  | 49.0       | 46.1                 | 44.6        | 47.0      | 43.4   |
| Tops: tons per acre              |       |            |                      |             |           |        |
| None                             | 8.36  | 12.91      | 13.67                | 11.79       | 12.06     | 11.76  |
| Mur. pot.                        | 7.15  | 13.07      | 15.00                | 12.43       | 11.87     | 11.90  |
| Salt                             | 8.47  | 12.13      | 14.16                | 12.41       | 12.13     | 11.86  |
| Sulph. pot.                      | 6.51  | 12.23      | 12.12                | 9.99        | 12.37     | 10.64  |
| Sulph. sod.                      | 7.15  | 13.27      | 12.30                | 10.87       | 12.89     | 11.30  |
| Mean                             | 7.53  | 12.72      | 13.45                | 11.50       | 12.26     | 11.49  |
| Plant number: thousands per acre |       |            |                      |             |           |        |
| None                             | 37.0  | 35.5       | 37.0                 | 37.3        | 36.7      | 36.7   |
| Mur. pot.                        | 37.0  | 36.9       | 36.7                 | 36.2        | 37.0      | 36.8   |
| Salt                             | 37.5  | 36.2       | 36.2                 | 38.0        | 37.6      | 37.1   |
| Sulph. pot.                      | 37.8  | 37.4       | 36.8                 | 35.7        | 37.6      | 37.1   |
| Sulph. sod.                      | 37.8  | 37.2       | 36.7                 | 36.4        | 37.9      | 37.2   |
| Mean                             | 37.4  | 36.6       | 36.7                 | 36.7        | 37.4      | 37.0   |



P/6

SUGAR BEET

Long Hoos and Woburn Lansome, 1939

Effects of powdered and granulated fertilizer, of placing the fertilizer above the seed, below the seed or broadcast and of normal and intensive cultivation on seed bed. These and the next four experiments are discussed by E.W.Russell, B.A.Keen and H.H.Mann, "Studies in Soil Cultivation", J.Agric.Sci., 32, (1942), 330.

Design; 7 x 7 Latin square. Columns split for normal and intensive cultivation.

Area of each sub-plot;  
 Rothamsted; 0.00172 acre  
 Woburn; 0.00198 acre

Treatments

Fertilizer: Powdered, granular.  
 Placed: Above seed, below seed, broadcast on seed bed.  
 Cultivation: Intensive, normal hoeing between rows.  
 Complete fertilizer contained 6.2% nitrogen, 6.4% water soluble phosphoric acid and 7.5% potash, and was applied at the rate of 10 cwt. per acre.

Crop Notes

|            | Seed sown | Harvested | Variety        | Previous crop |
|------------|-----------|-----------|----------------|---------------|
| Rothamsted | May 23    | Nov. 28   | Kühn           | Wheat         |
| Woburn     | May 12    | Nov. 17   | Kleinwanzleben | Barley        |

Standard errors:

Rothamsted, Total sugar, per whole plot; 2.61 cwt. per acre or 7.35%, 30 d.f.  
 per half column; 1.21 cwt. per acre or 3.42%, 6 d.f.  
 Woburn, Total sugar, per whole plot; 3.61 cwt. per acre or 8.39%, 30 d.f.  
 per half column; 1.48 cwt. per acre or 3.44%, 6 d.f.

| Cultivation       | Roots (washed)<br>tons per acre | Sugar<br>Percentage | Total sugar<br>cwt. per acre | Tops<br>tons per acre |
|-------------------|---------------------------------|---------------------|------------------------------|-----------------------|
| <u>Rothamsted</u> |                                 |                     |                              |                       |
| Normal            | 10.48                           | 17.02               | $\pm 0.457$<br>35.6          | 14.67                 |
| Intensive         | 10.36                           | 17.07               | 35.4                         | 14.52                 |
| <u>Woburn</u>     |                                 |                     |                              |                       |
| Normal            | 11.29                           | 17.81               | $\pm 0.559$<br>40.2          | 9.51                  |
| Intensive         | 12.95                           | 17.68               | 45.8                         | 11.56                 |



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| Fertilizer                          | Placed                        |            |            | Mean  | Placed                     |                   |                   | Mean                            |
|-------------------------------------|-------------------------------|------------|------------|-------|----------------------------|-------------------|-------------------|---------------------------------|
|                                     | Broad-cast                    | Above seed | Under seed |       | Broad-cast                 | Above seed        | Under seed        |                                 |
| <u>Rothamsted</u>                   |                               |            |            |       |                            |                   |                   |                                 |
|                                     | Roots (washed): tons per acre |            |            |       | Total sugar: cwt. per acre |                   |                   |                                 |
| None                                |                               |            |            | 9.32  |                            |                   |                   | $\pm 0.986$<br>31.6a            |
| Powdered                            | 11.00                         | 11.06      | 10.08      | 10.71 | 37.9                       | 38.1              | 34.2              | 36.7                            |
| Granular                            | 10.84                         | 10.71      | 9.93       | 10.49 | 37.4                       | 36.1              | 33.4              | 35.6                            |
| Mean                                | 10.92                         | 10.88      | 10.00      | 10.42 | 37.6 <sup>b</sup>          | 37.1 <sup>b</sup> | 33.8 <sup>b</sup> | 35.5                            |
| Standard error (a) 0.986. (b) 0.697 |                               |            |            |       |                            |                   |                   |                                 |
|                                     | Sugar percentage              |            |            |       | Tops: tons per acre        |                   |                   |                                 |
| None                                |                               |            |            | 16.91 |                            |                   |                   | 11.76                           |
| Powdered                            | 17.25                         | 17.23      | 16.97      | 17.15 | 14.60                      | 15.51             | 15.15             | 15.09                           |
| Granular                            | 17.28                         | 16.86      | 16.82      | 16.99 | 15.12                      | 14.95             | 15.08             | 15.05                           |
| Mean                                | 17.26                         | 17.04      | 16.90      | 17.05 | 14.86                      | 15.23             | 15.12             | 14.60                           |
| <u>Woburn</u>                       |                               |            |            |       |                            |                   |                   |                                 |
|                                     | Roots (washed): tons per acre |            |            |       | Total sugar: cwt. per acre |                   |                   |                                 |
| None                                |                               |            |            | 8.64  |                            |                   |                   | $\pm 1.36$<br>30.3 <sup>o</sup> |
| Powdered                            | 11.58                         | 12.56      | 13.19      | 12.44 | 40.6                       | 44.5              | 47.6              | 44.2                            |
| Granular                            | 11.57                         | 13.75      | 13.56      | 12.96 | 41.0                       | 49.0              | 48.1              | 46.0                            |
| Mean                                | 11.58                         | 13.16      | 13.38      | 12.12 | 40.8 <sup>d</sup>          | 46.8 <sup>d</sup> | 47.8 <sup>d</sup> | 43.0                            |
| Standard error (c) 1.36 (d) 0.962   |                               |            |            |       |                            |                   |                   |                                 |
|                                     | Sugar percentage              |            |            |       | Tops: tons per acre        |                   |                   |                                 |
| None                                |                               |            |            | 17.62 |                            |                   |                   | 7.63                            |
| Powdered                            | 17.55                         | 17.71      | 18.06      | 17.77 | 10.23                      | 11.46             | 10.95             | 10.88                           |
| Granular                            | 17.72                         | 17.84      | 17.72      | 17.76 | 10.70                      | 11.34             | 11.44             | 11.16                           |
| Mean                                | 17.64                         | 17.78      | 17.89      | 17.75 | 10.46                      | 11.40             | 11.20             | 10.54                           |



P/8

## SUGAR BEET

Great Harpenden, 1940

Woburn Butt Furlong, 1940

Little Hoos, 1941

Effects of sulphate of ammonia, superphosphate, muriate of potash and agricultural salt in all experiments, and of intensive cultivation at Woburn and Rothamsted in 1940, and of "gapping" at Rothamsted in 1940 and 1941, and of early and late cultivation at Rothamsted in 1941. These experiments form part of the countrywide Factory Sugar Beet Series of about 280 similar experiments. A report on the whole series is in preparation.

Designs; Woburn and Rothamsted 1940: 4 randomized blocks of 8 plots each, certain interactions being confounded between blocks. At Rothamsted, one quarter replicate of all treatment combinations.

Rothamsted 1941: 8 randomized blocks of 8 plots each, certain interactions being confounded between blocks. One quarter replicate of all treatment combinations.

Area of each plot;

Woburn 1940: 0.00463 acre.

Rothamsted 1940: 0.0152 acre.

Rothamsted 1941: 0.00952 acre.

### Treatments

All experiments:

Sulphate of ammonia: None, 0.8 cwt. N per acre.

Superphosphate: None, 1.0 cwt. P<sub>2</sub>O<sub>5</sub> per acre (P)

Muriate of potash: None, 1.2 cwt. K<sub>2</sub>O per acre (K)

Agricultural salt: None, 5 cwt. per acre.

Woburn and Rothamsted 1940:

Cultivation: Normal and intensive (C).

Rothamsted 1940 and 1941:

Gapping: One third of each plot had applied to them one of four levels of artificial "gappiness". Of the plants remaining after singling a proportion was removed at random, the four levels being: None, 1/6, 1/3, 1/2.

Rothamsted 1941:

Early cultivation: Normal, additional cultivation before singling.

Late cultivation: Normal, additional cultivation after singling.



Crop Notes

|                  | Seed sown | Harvested  | Variety              | Previous crop |
|------------------|-----------|------------|----------------------|---------------|
| Woburn, 1940     | April 25  | October 31 | Kleinwanzleben       | Barley        |
| Rothamsted, 1940 | May 20    | December 9 | Kleinwanzleben       | Wheat         |
| Rothamsted, 1941 | May 6     | Dec. 4-16  | Kleinwanzleben<br>E. | Wheat         |

Standard errors per plot:

|                  | d. f. | Roots<br>(washed)   |      | Sugar<br>Percent-<br>age | Total<br>Sugar      |      | Tops                |      | Plant no.<br>thous.<br>per<br>acre |     |
|------------------|-------|---------------------|------|--------------------------|---------------------|------|---------------------|------|------------------------------------|-----|
|                  |       | tons<br>per<br>acre | %    |                          | cwt.<br>per<br>acre | %    | tons<br>per<br>acre | %    | per<br>acre                        | %   |
| Woburn 1940      | 13    | 1.47                | 9.0  | 0.554                    | 5.11                | 8.5  | 1.53                | 15.5 | 1.70                               | 4.9 |
| Rothamsted 1940: |       |                     |      |                          |                     |      |                     |      |                                    |     |
| "ungapped"       | 13    | 2.18                | 18.2 | 0.308                    | 7.71                | 18.1 | 1.93                | 19.0 | 1.83                               | 6.3 |
| "gapped"         | 13    | 1.26                |      | 0.471                    | 4.38                |      | 1.35                |      |                                    |     |
| Rothamsted 1941: |       |                     |      |                          |                     |      |                     |      |                                    |     |
| "ungapped"       | 26    | 0.595               | 6.3  | 0.198                    | 2.12                | 6.3  | 0.973               | 11.6 | 1.43                               | 4.6 |
| "gapped"         | 22    | 0.864               |      | 0.223                    | 3.06                |      | 1.02                |      |                                    |     |



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Sugar Beet - Factory Series

| Mean Resp. | Rothamsted 1940<br>Differential Responses |            |            |       |           |              |           |       |                   |      |
|------------|---|------------|------------|-------|-----------|--------------|-----------|-------|-------------------|------|
|            | Sulph. Abs.                               | amm. Pres. | Super Abs. | Pres. | Mur. Abs. | Potash Pres. | Salt Abs. | Pres. | Cultivation Norm. | Int. |

| Roots (washed), tons per acre. Mean yield, 11.94 |        |       |       |       |       |       |       |       |       |       |       |
|--|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|  | ±0.769 |       |       |       |       | ±1.09 |       |       |       |       |       |
| Sulph. amm.                                      | 2.83   | -     | -     | 2.89  | 2.77  | 2.03  | 3.63  | 1.91  | 3.75  | 3.90  | 1.76  |
| Super.   | -0.29  | -0.23 | -0.35 | -     | -     | -0.51 | -0.07 | 0.15  | -0.73 | 0.93  | -1.51 |
| Mur. Pot.  | -0.48  | -1.28 | 0.32  | -0.70 | -0.26 | -     | -     | -0.39 | -0.57 | -1.56 | 0.60  |
| Salt   | -0.97  | -1.89 | -0.05 | -0.53 | -1.41 | -0.88 | -1.06 | -     | -     | -1.86 | -0.08 |
| Int. Cultn.                                      | 0.47   | 1.54  | -0.60 | 1.69  | -0.75 | -0.61 | 1.55  | -0.42 | 1.36  | -     | -     |

| Sugar Percentage. Mean, 17.82 |        |      |      |       |       |        |       |       |       |       |       |
|-------------------------------|--------|------|------|-------|-------|--------|-------|-------|-------|-------|-------|
|                               | ±0.109 |      |      |       |       | ±0.154 |       |       |       |       |       |
| Sulph. amm.                   | -0.10  | -    | -    | -0.17 | -0.03 | -0.11  | -0.09 | -0.11 | -0.09 | -0.09 | -0.11 |
| Super.                        | 0.17   | 0.10 | 0.24 | -     | -     | 0.03   | 0.31  | 0.22  | 0.12  | 0.17  | 0.17  |
| Mur. Pot.                     | 0.11   | 0.10 | 0.12 | -0.03 | 0.25  | -      | -     | 0.10  | 0.12  | 0.34  | -0.12 |
| Salt                          | 0.19   | 0.18 | 0.20 | 0.24  | 0.14  | 0.18   | 0.20  | -     | -     | 0.22  | 0.16  |
| Int. Cultn.                   | 0.06   | 0.07 | 0.05 | 0.06  | 0.06  | 0.29   | -0.17 | 0.09  | 0.03  | -     | -     |

| Total Sugar, cwt. per acre. Mean yield, 42.5 |       |      |      |      |      |       |      |      |      |      |      |
|--|-------|------|------|------|------|-------|------|------|------|------|------|
|  | ±2.72 |      |      |      |      | ±3.85 |      |      |      |      |      |
| Sulph. amm.                                  | 9.9   | -    | -    | 9.9  | 9.9  | 6.9   | 12.9 | 6.5  | 13.3 | 13.7 | 6.1  |
| Super.                                       | -0.6  | -0.6 | -0.6 | -    | -    | -1.7  | 0.5  | 1.1  | -2.3 | 3.7  | -4.9 |
| Mur. Pot.                                    | -1.5  | -4.5 | 1.5  | -2.6 | -0.4 | -     | -    | -1.1 | -1.9 | -4.8 | 1.8  |
| Salt   | -3.0  | -6.4 | 0.4  | -1.3 | -4.7 | -2.6  | -3.4 | -    | -    | -6.2 | 0.2  |
| Int. Cultn.                                  | 1.9   | 5.7  | -1.9 | 6.2  | -2.4 | -1.4  | 5.2  | -1.3 | 5.1  | -    | -    |

| Tops, tons per acre. Mean yield, 10.15 |        |       |       |       |       |        |       |       |       |       |       |
|--|--------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|
|  | ±0.684 |       |       |       |       | ±0.967 |       |       |       |       |       |
| Sulph. amm.                            | 5.02   | -     | -     | 4.78  | 5.26  | 4.54   | 5.50  | 4.52  | 5.52  | 5.17  | 4.87  |
| Super.                                 | -0.38  | -0.62 | -0.14 | -     | -     | 0.09   | -0.85 | -0.39 | -0.37 | 0.27  | -1.03 |
| Mur. Pot.                              | -0.16  | -0.64 | 0.32  | 0.31  | -0.63 | -      | -     | 0.44  | -0.76 | -0.96 | 0.64  |
| Salt                                   | -0.38  | -0.88 | 0.12  | -0.39 | -0.37 | 0.22   | -0.98 | -     | -     | -1.09 | 0.33  |
| Int. Cultn.                            | 1.05   | 1.20  | 0.90  | 1.70  | 0.40  | 0.25   | 1.85  | 0.34  | 1.76  | -     | -     |

| Plant number, thousands per acre. Mean, 40.2 |       |      |      |      |      |       |      |      |      |      |      |
|--|-------|------|------|------|------|-------|------|------|------|------|------|
|  | ±0.65 |      |      |      |      | ±0.91 |      |      |      |      |      |
| Sulph. amm.                                  | -0.2  | -    | -    | 0.5  | -0.9 | -1.0  | 0.6  | 0.7  | -1.1 | 1.0  | -1.4 |
| Super.                                       | -0.3  | 0.4  | -1.0 | -    | -    | -4.7  | 4.1  | -0.2 | -0.4 | 0.1  | -0.7 |
| Mur. Pot.                                    | -0.3  | -1.1 | 0.5  | -4.7 | 4.1  | -     | -    | 0.6  | -1.2 | -2.9 | 2.3  |
| Salt   | -0.3  | 0.6  | -1.2 | -0.2 | -0.4 | 0.6   | -1.2 | -    | -    | 0.0  | -0.6 |
| Int. Cultn.                                  | 1.1   | 2.3  | -0.1 | 1.5  | 0.7  | -1.5  | 3.7  | 1.4  | 0.8  | -    | -    |

The above figures derive from the "ungapped" portions of plots.



Effects of Artificial Gapping

| Proportion of plants removed | Roots (washed), tons/acre | Sugar percentage | Total Sugar, cwt./acre | Tops, tons/acre | Plant number, thous./acre |
|------------------------------|---------------------------|------------------|------------------------|-----------------|---------------------------|
| None                         | 12.19                     | 17.82            | 43.4                   | 10.39           | 28.5                      |
| 1/6                          | 12.46                     | 17.75            | 44.2                   | 10.29           | 24.7                      |
| 1/3                          | 12.02                     | 17.53            | 42.2                   | 10.42           | 20.6                      |
| 1/2                          | 8.81                      | 17.49            | 30.7                   | 8.57            | 16.3                      |
|                              | ±0.444                    | ±0.166           | ±1.55                  | ±0.478          |                           |

The  $(0 + 1/6 - 1/3 - 1/2)$ ,  $(0 - 1/6 - 1/3 + 1/2)$  and  $(0 - 1/6 + 1/3 - 1/2)$  gapping effects were confounded with the treatment interactions FK, FC, KC respectively in the "gapped" portion of the experiment.



P/12

Sugar Beet - Factory Series

Woburn 1940

Differential Responses

|  | Mean Resp. | Sulph. amm. |       | Super |       | Mur. Potash |       | Salt |       | Cultivation |      |
|--|------------|-------------|-------|-------|-------|-------------|-------|------|-------|-------------|------|
|  |            | Abs.        | Pres. | Abs.  | Pres. | Abs.        | Pres. | Abs. | Pres. | Norm.       | Int. |

Roots (washed), tons per acre. Mean yield 16.37

|             | ±0.529 | ±0.735 |       |       |       |       |      |       |       |       |       |
|-------------|--------|--------|-------|-------|-------|-------|------|-------|-------|-------|-------|
| Sulph. amm. | 5.56   | -      | -     | 4.82  | 6.30  | 5.56  | 5.56 | 5.34  | 5.78  | 7.10  | 4.02  |
| Super.      | -0.31  | -1.05  | 0.43  | -     | -     | -0.97 | 0.35 | -0.01 | -0.61 | 0.45  | -1.07 |
| Mur. Pot.   | -0.81  | -0.81  | -0.81 | -1.47 | -0.15 | -     | -    | -1.12 | -0.50 | -1.56 | -0.06 |
| Salt        | 0.11   | -0.11  | 0.33  | 0.41  | -0.19 | -0.20 | 0.42 | -     | -     | -0.18 | 0.40  |
| Int. Cultn. | 0.76   | 2.30   | -0.78 | 1.52  | 0.00  | 0.01  | 1.51 | 0.47  | 1.05  | -     | -     |

Sugar Percentage. Mean 18.29

|             | ±0.196 | ±0.277 |      |       |       |       |       |       |       |       |       |
|-------------|--------|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| Sulph. amm. | -0.23  | -      | -    | -0.15 | -0.31 | -0.25 | -0.21 | -0.24 | -0.22 | -0.62 | 0.16  |
| Super.      | 0.38   | 0.46   | 0.30 | -     | -     | 0.47  | 0.29  | 0.45  | 0.31  | 0.33  | 0.43  |
| Mur. Pot.   | 0.45   | 0.43   | 0.47 | 0.54  | 0.36  | -     | -     | 0.49  | 0.41  | 0.24  | 0.66  |
| Salt        | 0.02   | 0.01   | 0.03 | 0.09  | -0.05 | 0.06  | -0.02 | -     | -     | 0.08  | -0.04 |
| Int. Cultn. | -0.02  | -0.41  | 0.37 | -0.07 | 0.03  | -0.23 | 0.19  | 0.04  | -0.08 | -     | -     |

Total Sugar, cwt. per acre. Mean yield 59.8

|             | ±1.81 | ±2.56 |      |      |      |      |      |      |      |      |      |
|-------------|-------|-------|------|------|------|------|------|------|------|------|------|
| Sulph. amm. | 19.6  | -     | -    | 17.1 | 22.1 | 19.4 | 19.8 | 18.8 | 20.4 | 24.1 | 15.1 |
| Super.      | -0.1  | -2.6  | 2.4  | -    | -    | -2.0 | 1.8  | 1.4  | -1.6 | 2.3  | -2.5 |
| Mur. Pot.   | -1.5  | -1.7  | -1.3 | -3.4 | 0.4  | -    | -    | -2.5 | -0.5 | -5.1 | 2.1  |
| Salt        | 0.5   | -0.3  | 1.3  | 2.0  | -1.0 | -0.5 | 1.5  | -    | -    | -0.4 | 1.4  |
| Int. Cultn. | 3.0   | 7.5   | -1.5 | 5.4  | 0.6  | -0.6 | 6.6  | 2.1  | 3.9  | -    | -    |

Tops, tons per acre. Mean yield 9.84

|             | ±0.541 | ±0.765 |       |       |       |       |      |       |       |       |       |
|-------------|--------|--------|-------|-------|-------|-------|------|-------|-------|-------|-------|
| Sulph. amm. | 4.76   | -      | -     | 4.16  | 5.36  | 4.56  | 4.96 | 3.64  | 5.88  | 5.69  | 3.83  |
| Super.      | -0.29  | -0.89  | 0.31  | -     | -     | -0.92 | 0.34 | 0.00  | -0.58 | 0.39  | -0.97 |
| Mur. Pot.   | -0.83  | -1.03  | -0.63 | -1.46 | -0.20 | -     | -    | -0.84 | -0.82 | -1.44 | -0.22 |
| Salt        | 0.83   | -0.29  | 1.95  | 1.12  | 0.54  | 0.82  | 0.84 | -     | -     | 0.36  | 1.30  |
| Int. Cultn. | 0.81   | 1.74   | -0.12 | 1.49  | 0.13  | 0.20  | 1.42 | 0.34  | 1.28  | -     | -     |

Plant number, thousands per acre. Mean 34.5

|             | ±0.60 | ±0.85 |      |      |      |      |      |      |      |      |      |
|-------------|-------|-------|------|------|------|------|------|------|------|------|------|
| Sulph. amm. | -2.2  | -     | -    | -2.3 | -2.1 | -1.5 | -2.9 | -2.6 | -1.8 | -1.3 | -3.1 |
| Super.      | 1.0   | 0.9   | 1.1  | -    | -    | 1.1  | 0.9  | 1.3  | 0.7  | 0.6  | 1.4  |
| Mur. Pot.   | -0.5  | 0.2   | -1.2 | -0.4 | -0.6 | -    | -    | -0.7 | -0.3 | 0.2  | -1.2 |
| Salt        | -0.6  | -1.0  | -0.2 | -0.3 | -0.9 | -0.8 | -0.4 | -    | -    | -1.2 | 0.0  |
| Int. Cultn. | -1.6  | -0.7  | -2.5 | -2.0 | -1.2 | -0.9 | -2.3 | -2.2 | -1.0 | -    | -    |



| Rothamsted 1941                                |             |       |       |       |             |       |       |       |             |       |                  |       |
|--|-------------|-------|-------|-------|-------------|-------|-------|-------|-------------|-------|------------------|-------|
| Differential Responses                         |             |       |       |       |             |       |       |       |             |       |                  |       |
| Mean Resp.                                     | Sulph. amm. |       | Super |       | Mur. Potash |       | Salt  |       | Cultivation |       | Cultivation Late |       |
|  | Abs.        | Pres. | Abs.  | Pres. | Abs.        | Pres. | Abs.  | Pres. | None        | Early |                  |       |
| Roots (washed), tons per acre. Mean yield 9.38 |             |       |       |       |             |       |       |       |             |       |                  |       |
| ±0.149   |             |       |       |       |             |       |       |       |             |       |                  |       |
| Sulph. amm.                                    | -           | -     | 3.58  | 4.18  | 3.77        | 3.99  | 3.45  | 4.32  | 4.10        | 3.67  | 3.50             | 4.27  |
| Super.   | -0.08       | 0.52  | -     | -     | 0.21        | 0.23  | 0.06  | 0.38  | -0.19       | 0.64  | -0.05            | 0.50  |
| Mur. Pot.                                      | 0.31        | 0.53  | 0.41  | 0.43  | -           | -     | 0.84  | 0.00  | 0.59        | 0.25  | 0.60             | 0.24  |
| Salt   | 0.03        | 0.90  | 0.30  | 0.62  | 0.89        | 0.04  | -     | -     | 0.52        | 0.41  | 0.46             | 0.47  |
| Cult. Early                                    | 0.70        | 0.49  | 0.29  | 1.12  | 0.87        | 0.53  | 0.76  | 0.65  | -           | -     | 0.73             | 0.67  |
| Cult. Late                                     | -0.30       | 0.08  | -0.58 | -0.03 | -0.12       | -0.48 | -0.31 | -0.29 | -0.27       | -0.33 | -                | -     |
| Sugar percentage. Mean, 17.77                  |             |       |       |       |             |       |       |       |             |       |                  |       |
| ±0.049   |             |       |       |       |             |       |       |       |             |       |                  |       |
| Sulph. amm.                                    | -           | -     | 0.05  | -0.04 | 0.05        | -0.04 | -0.04 | 0.06  | 0.06        | -0.05 | 0.08             | -0.07 |
| Super.   | 0.06        | -0.03 | -     | -     | 0.05        | -0.02 | 0.09  | -0.06 | 0.06        | -0.02 | 0.13             | -0.10 |
| Mur. Pot.                                      | 0.10        | 0.05  | 0.13  | 0.07  | -           | -     | 0.21  | -0.02 | 0.18        | 0.02  | 0.08             | 0.11  |
| Salt   | 0.19        | 0.14  | 0.27  | 0.12  | 0.31        | 0.08  | -     | -     | 0.16        | 0.23  | 0.31             | 0.08  |
| Cult. Early                                    | -0.03       | 0.08  | 0.01  | -0.07 | 0.05        | -0.11 | -0.06 | 0.00  | -           | -     | -0.07            | 0.01  |
| Cult. Late                                     | 0.05        | 0.13  | 0.17  | -0.06 | 0.04        | 0.07  | 0.17  | -0.06 | 0.02        | 0.09  | -                | -     |
| Total Sugar, cwt. per acre. Mean yield, 33.3   |             |       |       |       |             |       |       |       |             |       |                  |       |
| ±0.53  |             |       |       |       |             |       |       |       |             |       |                  |       |
| Sulph. amm.                                    | -           | -     | 12.8  | 14.8  | 13.5        | 14.2  | 12.1  | 15.5  | 14.7        | 12.9  | 12.6             | 15.1  |
| Super.   | -0.2        | 1.8   | -     | -     | 0.8         | 0.8   | 0.3   | 1.2   | -0.7        | 2.3   | 0.1              | 1.5   |
| Mur. Pot.                                      | 1.3         | 2.0   | 1.7   | 1.6   | -           | -     | 3.3   | -0.1  | 2.3         | 0.9   | 2.2              | 1.0   |
| Salt   | 0.3         | 3.8   | 1.6   | 2.5   | 3.7         | 0.3   | -     | -     | 2.1         | 1.9   | 2.2              | 1.8   |
| Cult. Early                                    | 2.4         | 1.6   | 0.9   | 3.9   | 3.2         | 1.7   | 2.5   | 2.3   | -           | -     | 2.4              | 2.4   |
| Cult. Late                                     | -1.0        | 0.3   | -1.7  | -0.3  | -0.4        | -1.6  | -0.8  | -1.2  | -1.0        | -1.0  | -                | -     |

The above figures derive from the "ungapped" portions of plots.



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Sugar Beet - Factory Series

| Rothamsted 1941  |  |       |                  |       |                            |       |               |       |                               |       |                  |       |
|--|--|-------|------------------|-------|----------------------------|-------|---------------|-------|-------------------------------|-------|------------------|-------|
| Differential Responses   |  |       |                  |       |                            |       |               |       |                               |       |                  |       |
| Mean Resp.   | Sulph. amm.                                  |       | Super            |       | Mur. Potash                |       | Salt          |       | Cultivation                   |       | Cultivation Late |       |
|  | Abs.   | Pres. | Abs.             | Pres. | Abs.                       | Pres. | Abs.          | Pres. | None                          | Early |                  |       |
|  | Tops, tons per acre. Mean yield, 8.39        |       |                  |       |                            |       |               |       |                               |       |                  |       |
|  | ±0.243                                       |       |                  |       |                            |       |               |       |                               |       |                  |       |
| Sulph. amm.  | 5.44   |       | 5.58             | 5.30  | 5.47                       | 5.42  | 5.30          | 5.59  | 5.35                          | 5.54  | 5.19             | 5.70  |
| Super.   | -0.36  | -0.22 | -                | -     | -0.37                      | -0.35 | -0.46         | -0.25 | -0.45                         | -0.26 | -0.83            | 0.11  |
| Mur. Pot.  | 0.52   | 0.54  | 0.51             | 0.53  | -                          | -     | 0.80          | 0.25  | 0.69                          | 0.35  | 0.49             | 0.55  |
| Salt   | 0.26   | 0.11  | 0.16             | 0.36  | 0.54                       | -0.01 | -             | -     | 0.20                          | 0.33  | 0.34             | 0.18  |
| Cult. Early  | 0.78   | 0.69  | 0.69             | 0.87  | 0.95                       | 0.61  | 0.72          | 0.84  | -                             | -     | 0.80             | 0.76  |
| Cult. Late   | -0.20  | -0.46 | -0.68            | 0.27  | -0.24                      | -0.17 | -0.13         | -0.28 | -0.18                         | -0.23 | -                | -     |
|  | ±0.344                                       |       |                  |       |                            |       |               |       |                               |       |                  |       |
|  | Plant number, thousands per acre. Mean, 31.0 |       |                  |       |                            |       |               |       |                               |       |                  |       |
|  | ±0.50  |       |                  |       |                            |       |               |       |                               |       |                  |       |
| Sulph. amm.  | -0.4   | -     | -0.4             | -0.4  | -0.3                       | -0.5  | -0.8          | 0.0   | 0.2                           | -0.9  | 0.0              | -0.7  |
| Super.   | 0.4  | 0.4   | -                | -     | 0.7                        | 0.1   | 0.7           | 0.0   | -0.1                          | 0.8   | -0.1             | 0.8   |
| Mur. Pot.  | 0.2  | 0.3   | 0.5              | -0.1  | -                          | -     | 0.0           | 0.4   | 0.3                           | 0.2   | -0.1             | 0.5   |
| Salt   | -0.5   | -0.9  | -0.2             | -0.8  | -0.7                       | -0.3  | -             | -     | -0.6                          | -0.4  | -1.0             | 0.0   |
| Cult. Early  | -1.1   | -0.5  | -1.5             | -0.8  | -1.0                       | -1.1  | -1.2          | -1.0  | -                             | -     | -0.8             | -1.4  |
| Cult. Late   | 0.3  | 0.7   | -0.1             | 0.8   | 0.0                        | 0.6   | -0.2          | 0.8   | 0.6                           | 0.0   | -                | -     |
| The above figures derive from the "ungapped" portions of plots |  |       |                  |       |                            |       |               |       |                               |       |                  |       |
| Effects of Artificial Gapping                                  |  |       |                  |       |                            |       |               |       |                               |       |                  |       |
| Proportion of plants removed                                   | Roots (washed), tons per acre                |       | Sugar percentage |       | Total Sugar, cwt. per acre |       | Tops per acre |       | Plant number, thous. per acre |       |                  |       |
|  | Abs.   | Pres. | Abs.             | Pres. | Abs.                       | Pres. | Abs.          | Pres. | Abs.                          | Pres. | Abs.             | Pres. |
| None   | 10.42  |       | 17.83            |       | 37.1                       |       | 9.42          |       | 31.3                          |       |                  |       |
| 1/6  | 9.45   |       | 17.81            |       | 33.6                       |       | 9.22          |       | 26.7                          |       |                  |       |
| 1/3  | 8.82   |       | 17.68            |       | 31.2                       |       | 8.78          |       | 23.1                          |       |                  |       |
| 1/2  | 7.99   |       | 17.60            |       | 28.1                       |       | 8.45          |       | 19.0                          |       |                  |       |
|  | ±0.216                                       |       | ±0.056           |       | ±0.77                      |       | ±0.254        |       |                               |       |                  |       |

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SUGAR BEET

Woburn Butt Close 1941

Effects of early and late weeding, hoeing and pulling weeds and of sulphate of ammonia.

Design; 6 randomized blocks of 6 plots each. Certain interactions confounded between blocks.

Area of each plot; 0.00333 acre.

Treatments

Weeding: Early (before singling), late (after singling), early and late.  
Method: pulled, hoed.

Sulphate of ammonia: None, 0.8 cwt.N per acre.

Basal manuring: 1.0 cwt. P<sub>2</sub>O<sub>5</sub> per acre as superphosphate,  
1.2 cwt. K<sub>2</sub>O per acre as sulphate of potash and 5 cwt. salt per acre.

Crop Notes

Sown, May 9. Lifted, Nov. 12. Variety, Kleinwanzleben E. Previous crop, Barley.

Standard errors per plot:

Roots (washed): 0.869 tons per acre or 7.4%, 19 d.f.

Sugar percentage: 0.493, 19 d.f.

Total sugar: 3.95 cwt. per acre or 8.5%, 19 d.f.

Tops: 1.08 tons per acre or 9.2%, 19 d.f.



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Sugar Beet - Butt Close 1941

| Time of weeding               | Early | Late        | Early and Late | Mean        | No nitrogen | Nitrogen |
|-------------------------------|-------|-------------|----------------|-------------|-------------|----------|
| Roots (washed): tons per acre |       |             |                |             |             |          |
|                               |       | $\pm 0.355$ |                | $\pm 0.205$ | $\pm 0.290$ |          |
| Pulled                        | 11.45 | 10.90       | 11.96          | 11.44       | 9.02        | 13.86    |
| Hoed                          | 12.09 | 11.52       | 12.32          | 11.98       | 10.17       | 13.79    |
| No nitrogen                   | 9.66  | 8.37        | 10.74          | 9.59        |             |          |
| Nitrogen                      | 13.88 | 14.05       | 13.54          | 13.83       |             |          |
| Mean $\pm 0.251$              | 11.77 | 11.21       | 12.14          | 11.71       |             |          |
| Sugar percentage              |       |             |                |             |             |          |
|                               |       | $\pm 0.201$ |                | $\pm 0.116$ | $\pm 0.164$ |          |
| Pulled                        | 19.99 | 20.13       | 19.92          | 20.01       | 20.10       | 19.94    |
| Hoed                          | 19.83 | 19.85       | 19.54          | 19.74       | 19.70       | 19.78    |
| No nitrogen                   | 20.03 | 19.87       | 19.80          | 19.90       |             |          |
| Nitrogen                      | 19.79 | 20.11       | 19.66          | 19.86       |             |          |
| Mean $\pm 0.142$              | 19.91 | 19.99       | 19.73          | 19.88       |             |          |
| Total sugar: cwt. per acre    |       |             |                |             |             |          |
|                               |       | $\pm 1.61$  |                | $\pm 0.931$ | $\pm 1.32$  |          |
| Pulled                        | 45.7  | 43.9        | 47.7           | 45.8        | 36.2        | 55.3     |
| Hoed                          | 47.9  | 45.7        | 48.2           | 47.2        | 40.0        | 54.5     |
| No nitrogen                   | 38.6  | 33.2        | 42.5           | 38.1        |             |          |
| Nitrogen                      | 55.0  | 56.4        | 53.3           | 54.9        |             |          |
| Mean $\pm 1.14$               | 46.8  | 44.8        | 47.9           | 46.5        |             |          |
| Tops: tons per acre           |       |             |                |             |             |          |
|                               |       | $\pm 0.441$ |                | $\pm 0.255$ | $\pm 0.360$ |          |
| Pulled                        | 9.80  | 11.10       | 11.99          | 10.96       | 7.69        | 14.23    |
| Hoed                          | 11.96 | 12.54       | 12.63          | 12.38       | 8.93        | 15.83    |
| No nitrogen                   | 7.72  | 7.97        | 9.24           | 8.31        |             |          |
| Nitrogen                      | 14.04 | 15.67       | 15.38          | 15.03       |             |          |
| Mean $\pm 0.312$              | 10.88 | 11.82       | 12.31          | 11.67       |             |          |



P/17

SUGAR BEET SEED

Woburn Butt Close 1942

Woburn Lansome 1943

Effects of dung, sulphate of ammonia, superphosphate, muriate of potash and salt, and of time of application of sulphate of ammonia.

Design: 4 randomized blocks of 8 plots each, certain interactions being confounded between blocks. One half replicate of all treatment combinations.

Area of each plot 1942: 0.0118 acre  
1943: 0.0103 acre.

Treatments

Dung: None, 10 tons per acre.  
Sulphate of ammonia: None, 0.4 cwt. N per acre.  
Superphosphate: None, 0.6 cwt.  $P_2O_5$  per acre.  
Muriate of potash: None, 0.75 cwt.  $K_2O$  per acre.  
Agricultural salt: None, 3.0 cwt. per acre.  
Time of application of sulphate of ammonia: Early (applied at transplanting), Late (top dressing; June 3 in 1942, May 17 in 1943).

Crop Notes

1942: Seed sown in seed bed: 21/7/41. Stocklings planted out: March 19. Cut: Sept 14. Variety: Mother seed of Klein E.  
1943: Stocklings planted: Feb. 26. Harvested Sept. 3. Variety: Kleinwanzleben E.

Standard errors per plot:

Dressed seed: 1942: 2.68 cwt. per acre or 19.7%, 13 d.f.  
1943: 2.18 cwt. per acre or 19.7%, 13 d.f.  
Percentage germination in 6 days, 1942: 5.88, 13 d.f.  
1943: 6.66, 13 d.f.  
Percentage final germination, 1942: 5.44, 13 d.f.  
1943: 5.80, 13 d.f.



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Sugar Beet Seed.

1942, Differential responses

| Resp. to   | Mean  | Dung        |         | Sulph. amm.   |         | Super     |         | Mur. pot. |         | Salt   |         |
|--|-------|-------------|---------|---------------|---------|-----------|---------|-----------|---------|--------|---------|
|  |       | Absent      | Present | Absent        | Present | Absent    | Present | Absent    | Present | Absent | Present |
| Dressed Seed, cwt. per acre, Mean yield, 13.6                    |       |             |         |               |         |           |         |           |         |        |         |
|  | ±0.95 |             |         |               |         |           |         |           |         |        |         |
| Dung   | 3.8   | -           | -       | 3.8           | 3.8     | 2.9       | 4.7     | 4.9       | 2.7     | 3.9    | 3.7     |
| Sulph. amm.  | 2.4   | 2.4         | -       | -             | -       | 0.7       | 4.1     | 1.9       | 2.9     | 1.2    | 3.6     |
| Super.   | 0.4   | -0.5        | 1.3     | 2.1           | -       | -         | -       | 1.3       | -0.5    | 1.0    | -0.2    |
| Mur. pot.  | 0.7   | 1.8         | -0.4    | 1.2           | 1.6     | -0.2      | -       | -         | -       | 1.0    | 0.4     |
| Salt   | 1.6   | 1.7         | 1.5     | 2.8           | 2.2     | 1.0       | 1.9     | 1.3       | -       | -      | -       |
| Percentage germination in 6 days: Mean 74.5                      |       |             |         |               |         |           |         |           |         |        |         |
|  | ±2.08 |             |         |               |         |           |         |           |         |        |         |
| Dung   | 2.9   | -           | -       | 5.7           | 0.1     | 1.3       | 4.5     | 3.1       | 2.7     | 2.3    | 3.5     |
| Sulph. amm.  | -3.1  | -0.3        | -5.9    | -             | -       | -2.9      | -3.3    | -6.9      | 0.7     | -4.9   | -1.3    |
| Super.   | -0.7  | -2.3        | 0.9     | -0.5          | -0.9    | -         | -       | -1.6      | 0.2     | -1.4   | 0.0     |
| Mur. pot.  | 0.1   | 0.3         | -0.1    | -3.7          | 3.9     | -0.8      | 1.0     | -         | -       | -2.3   | 2.5     |
| Salt   | 1.1   | 0.5         | 1.7     | -0.7          | 2.9     | 0.4       | 1.8     | -1.3      | 3.5     | -      | -       |
| Final percentage germination: Mean 79.0                          |       |             |         |               |         |           |         |           |         |        |         |
|  | ±1.92 |             |         |               |         |           |         |           |         |        |         |
| Dung   | 3.1   | -           | -       | 5.3           | 0.9     | 1.8       | 4.4     | 2.5       | 3.7     | 1.3    | 4.9     |
| Sulph. amm.  | -1.9  | 0.3         | -4.1    | -             | -       | -1.0      | -2.8    | -5.2      | 1.4     | -3.7   | -0.1    |
| Super.   | -0.7  | -2.0        | 0.6     | 0.2           | -1.6    | -         | -       | -0.8      | -0.6    | -2.0   | 0.6     |
| Mur. pot.  | 0.1   | -0.5        | 0.7     | -3.2          | 3.4     | 0.0       | 0.2     | -         | -       | -2.2   | 2.4     |
| Salt   | 1.1   | -0.7        | 2.9     | -0.7          | 2.9     | -0.2      | 2.4     | -1.2      | 3.4     | -      | -       |
| Application of sulph. amm.      Seed      Percentage germination |       |             |         |               |         |           |         |           |         |        |         |
|  |       | sulph. amm. |         | cwt. per acre |         | in 6 days |         | final     |         |        |         |
|  |       | ±0.95       |         | ±2.08         |         | ±1.92     |         |           |         |        |         |
| Early  |       | 14.7        |         | 70.8          |         | 75.6      |         |           |         |        |         |
| Late   |       | 14.9        |         | 75.1          |         | 80.5      |         |           |         |        |         |



1943 Differential responses

| Resp. to | Mean | Dung   |         | Sulph. amm. |         | Super  |         | Mur. pot. |         | Salt   |         |
|----------|------|--------|---------|-------------|---------|--------|---------|-----------|---------|--------|---------|
|          |      | Absent | Present | Absent      | Present | Absent | Present | Absent    | Present | Absent | Present |

Dressed Seed, cwt. per acre Mean yield, 11.1

|             |       |     |      |      |      |      |      |      |      |      |  |
|-------------|-------|-----|------|------|------|------|------|------|------|------|--|
|             | ±0.77 |     |      |      |      |      |      |      |      |      |  |
| Dung        | -1.0  | -   | -0.4 | -1.6 | -0.1 | -1.9 | -0.9 | -1.1 | -1.2 | -0.8 |  |
| Sulph. amm. | 1.9   | 2.5 | -    | -    | 1.9  | 1.9  | 2.0  | 1.8  | 1.0  | 2.8  |  |
| Super.      | -0.1  | 0.8 | -0.1 | -0.1 | -    | -    | -0.9 | 0.7  | -0.3 | 0.1  |  |
| Mur. pot.   | 0.5   | 0.6 | 0.6  | 0.4  | -0.3 | 1.3  | -    | -    | 0.8  | 0.2  |  |
| Salt        | 1.5   | 1.3 | 0.6  | 2.4  | 1.3  | 1.7  | 1.8  | 1.2  | -    | -    |  |

Germination Percentage in Six Days: Mean 75.4

|             |       |      |     |      |     |      |     |      |      |      |  |
|-------------|-------|------|-----|------|-----|------|-----|------|------|------|--|
|             | ±2.36 |      |     |      |     |      |     |      |      |      |  |
| Dung        | 1.8   | -    | 4.6 | -1.0 | 3.4 | 0.2  | 2.7 | 0.9  | 2.2  | 1.4  |  |
| Sulph. amm. | -0.6  | -3.4 | -   | -    | 2.2 | -3.4 | 0.2 | -1.4 | -0.1 | -1.1 |  |
| Super.      | 1.0   | 2.6  | 3.8 | -1.8 | -   | -    | 1.4 | 0.6  | 2.9  | -0.9 |  |
| Mur. pot.   | -0.2  | 0.7  | 0.6 | -1.0 | 0.2 | -0.6 | -   | -    | 0.9  | -1.3 |  |
| Salt        | 0.0   | 0.4  | 0.5 | -0.5 | 1.9 | -1.9 | 1.1 | -1.1 | -    | -    |  |

Germination Percentage Final: Mean 79.3

|             |       |     |     |      |      |      |      |      |      |      |  |
|-------------|-------|-----|-----|------|------|------|------|------|------|------|--|
|             | ±2.05 |     |     |      |      |      |      |      |      |      |  |
| Dung        | 1.3   | -   | 4.0 | -1.4 | 2.5  | 0.1  | 2.1  | 0.5  | 2.1  | 0.5  |  |
| Sulph. amm. | -1.7  | 1.0 | -   | -    | 0.7  | -4.1 | -1.1 | -2.3 | -0.6 | -2.8 |  |
| Super.      | 1.1   | 2.3 | 3.5 | -1.3 | -    | -    | 0.7  | 1.5  | 2.2  | 0.0  |  |
| Mur. pot.   | 0.2   | 1.0 | 0.8 | -0.4 | -0.2 | 0.6  | -    | -    | 1.9  | -1.5 |  |
| Salt        | -0.1  | 0.7 | 1.0 | -1.2 | 1.0  | -1.2 | 1.6  | -1.8 | -    | -    |  |

Application of sulph. amm. Seed cwt. per acre Percentage germination six days final

|       |       |       |       |
|-------|-------|-------|-------|
|       | ±0.77 | ±2.36 | ±2.05 |
| Early | 13.0  | 77.2  | 80.5  |
| Late  | 11.0  | 73.0  | 76.4  |



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## SUGAR BEET

Woburn Butt Furlong 1943

Effects of weeding and levels of nitrogen.

Design: 6 randomized blocks of 6 plots each, certain interactions being confounded with block differences. Notes on the development of the crop were made by the Physics Dept.

Area of each plot: 0.0033 acre.

### Treatments

Weeding: Minimum, early intensive (up to 2 or 3 weeks after singling), continuous intensive (throughout season).

Weeds removed by: Pulling, hoeing.

Sulphate of ammonia: None, 0.4, 0.8 cwt. N per acre.

Basal manuring: 3 cwt. agricultural salt per acre.

### Crop Notes

Sown: April 13. Lifted: Nov. 23. Variety: Kleinwanzleben E.  
previous crop: Barley.

Standard errors per plot: Roots (washed) 0.973 tons per acre or 2.0%, 13 d.f.  
Tops, 0.964 tons per acre or 15.9%, 13 d.f.



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| Weeding                       | Sulph. amm. cwt.<br>N per acre |       |       | Weeds       |       | Mean        |
|-------------------------------|--------------------------------|-------|-------|-------------|-------|-------------|
|                               | 0                              | 0.4   | 0.8   | Pulled      | Hoed  |             |
| Roots (washed): tons per acre |                                |       |       |             |       |             |
|                               | $\pm 0.520$                    |       |       | $\pm 0.397$ |       | $\pm 0.281$ |
| Minimum                       | 6.26                           | 8.89  | 12.87 | 9.89        | 8.79  | 9.34        |
| Early intensive               | 8.72                           | 12.18 | 13.38 | 11.25       | 11.61 | 11.43       |
| Continuous intensive          | 9.56                           | 11.77 | 14.03 | 11.96       | 11.61 | 11.79       |
| Mean                          | 8.18                           | 10.95 | 13.43 | 11.03       | 10.67 | 10.85       |
|                               | $\pm 0.281$                    |       |       | $\pm 0.230$ |       |             |
| Pulled                        | 8.55                           | 10.87 | 13.68 |             |       |             |
| Hoed $\pm 0.397$              | 7.81                           | 11.03 | 13.17 |             |       |             |
| Tops: tons per acre           |                                |       |       |             |       |             |
|                               | $\pm 0.515$                    |       |       | $\pm 0.394$ |       | $\pm 0.279$ |
| Minimum                       | 3.82                           | 5.15  | 7.77  | 5.96        | 5.20  | 5.58        |
| Early intensive               | 4.53                           | 6.36  | 7.52  | 6.00        | 6.27  | 6.14        |
| Continuous intensive          | 4.88                           | 6.67  | 8.01  | 6.14        | 6.90  | 6.52        |
| Mean                          | 4.41                           | 6.06  | 7.77  | 6.03        | 6.12  | 6.08        |
|                               | $\pm 0.279$                    |       |       | $\pm 0.228$ |       |             |
| Pulled $\pm 0.394$            | 4.78                           | 5.89  | 7.43  |             |       |             |
| Hoed                          | 4.04                           | 6.23  | 8.10  |             |       |             |
| Sugar Percentage              |                                |       |       |             |       |             |
| Minimum                       | 18.97                          | 19.14 | 19.32 | 19.10       | 19.18 | 19.14       |
| Early intensive               | 18.69                          | 19.24 | 18.50 | 18.84       | 18.79 | 18.81       |
| Continuous intensive          | 19.20                          | 19.06 | 18.91 | 18.89       | 19.22 | 19.06       |
| Mean                          | 18.95                          | 19.15 | 18.91 | 18.94       | 19.06 | 19.00       |
| Pulled                        | 18.98                          | 19.12 | 18.73 |             |       |             |
| Hoed                          | 18.93                          | 19.17 | 19.10 |             |       |             |
| Total Sugar: cwt. per acre    |                                |       |       |             |       |             |
| Minimum                       | 23.8                           | 34.0  | 49.7  | 37.8        | 33.7  | 35.8        |
| Early intensive               | 32.6                           | 46.9  | 49.5  | 42.4        | 43.6  | 43.0        |
| Continuous intensive          | 36.7                           | 44.9  | 53.1  | 45.2        | 44.6  | 44.9        |
| Mean                          | 31.0                           | 41.9  | 50.8  | 41.8        | 40.6  | 41.2        |
| Pulled                        | 32.5                           | 41.6  | 51.2  |             |       |             |
| Hoed                          | 29.6                           | 42.3  | 50.3  |             |       |             |



P/22

SUGAR BEET

Woburn - Butt Close 1944

Effects of intensive hoeing and of sulphate of ammonia. Notes on the development of the crop were made by the Physics Dept.

Design: 2 randomized blocks of 9 plots each.

Area of each plot (after rejecting edge rows): 0.0033 acre.

Treatments

Hoeing: Till singling, till 2 weeks after singling, throughout the season.  
Sulphate of ammonia: None, 0.4 and 0.8 cwt. per acre.

Basal Manuring: 3 cwt. agricultural salt per acre

Crop Notes

Sown: April 29. Lifted: Dec. 4. Variety: Klein. Previous crop: Barley.

Standard errors per plot: Roots (washed), 1.41 tons per acre or 9.0%, 8 d.f.  
Sugar percentage, 0.550, 8 d.f.  
Total sugar, 5.20 cwt. per acre or 9.6%, 8 d.f.  
Tops, 1.46 tons per acre or 10.0%, 8 d.f.



P/23

| Hoeing                        | Sulph. amm. cwt.<br>N per acre |            |       | Mean       |
|-------------------------------|--------------------------------|------------|-------|------------|
|                               | 0                              | 0.4        | 0.8   |            |
| Roots (washed): tons per acre |                                |            |       |            |
|                               |                                | $\pm 1.03$ |       | $\pm 0.58$ |
| Till singling                 | 14.00                          | 15.54      | 16.27 | 15.27      |
| Till 2 weeks after singling   | 14.73                          | 15.80      | 17.34 | 15.96      |
| Throughout season             | 14.60                          | 16.67      | 16.00 | 15.76      |
| Mean $\pm 0.58$               | 14.44                          | 16.00      | 16.54 | 15.66      |
| Sugar Percentage              |                                |            |       |            |
|                               |                                | $\pm 0.39$ |       | $\pm 0.22$ |
| Till singling                 | 16.68                          | 17.48      | 17.22 | 17.13      |
| Till 2 weeks after singling   | 17.16                          | 17.52      | 16.85 | 17.18      |
| Throughout season             | 17.05                          | 17.84      | 17.24 | 17.38      |
| Mean $\pm 0.22$               | 16.96                          | 17.61      | 17.10 | 17.22      |
| Total sugar: cwt. per acre    |                                |            |       |            |
|                               |                                | $\pm 3.7$  |       | $\pm 2.1$  |
| Till singling                 | 47.0                           | 54.2       | 56.1  | 52.4       |
| Till 2 weeks after singling   | 50.6                           | 55.4       | 58.3  | 54.8       |
| Throughout season             | 49.7                           | 59.5       | 55.2  | 54.8       |
| Mean $\pm 2.1$                | 49.1                           | 56.4       | 56.5  | 54.0       |
| Tops: tons per acre           |                                |            |       |            |
|                               |                                | $\pm 1.0$  |       | $\pm 0.60$ |
| Till singling                 | 11.32                          | 12.39      | 14.40 | 12.70      |
| Till 2 weeks after singling   | 14.60                          | 16.00      | 16.81 | 15.80      |
| Throughout season             | 15.33                          | 14.60      | 16.21 | 15.39      |
| Mean $\pm 0.60$               | 13.75                          | 14.33      | 15.81 | 14.63      |



P/24

SUGAR BEET

Sawyers 1944

Effect of virus infection and manuring of seed crop on the subsequent crop of beet.

Design: 8 randomized blocks of 8 plots, certain second and third order interactions being confounded with block differences.

Area of each plot: 0.0033 acre.

Treatments.

- (a) Applied to the seed crop from which the seed for this experiment was grown in 1943
- Sulphate of ammonia: None, 0.8 cwt. N per acre
  - Superphosphate: None, 1.0 cwt.  $P_2O_5$  per acre
  - Muriate of potash: None, 1.2 cwt.  $\frac{5}{2}K_2O$  per acre
  - Agricultural Salt: None, 5 cwt. per acre
  - Virus: Not infected and infected
- (b) Applied in the seed bed in 1944
- Complete fertilizer: None, 17 cwt. per acre containing:-
    - Sulphate of ammonia: 0.8 cwt. N per acre
    - Superphosphate: 1.0 cwt.  $P_2O_5$  per acre
    - Muriate of potash: 1.2 cwt.  $\frac{5}{2}K_2O$  per acre
    - Agricultural Salt: 5 cwt. per acre.

Crop Notes

Sown: May 9. Lifted: Nov. 23. Variety: Kleinwanzleben E. Previous Crop: Wheat.

Standard errors per plot: Roots (washed) (adjusted for plant number)  
0.89 tons per acre or 14.9%, 18 d.f.  
Sugar Percentage, 0.477, 19 d.f.  
Total sugar (adjusted for plant number)  
2.61 cwt. per acre or 15.3%, 18 d.f.  
Tops (adjusted for plant number) 1.60 tons per  
acre or 9.6%, 18 d.f.  
Plant number, 2.65 thousands per acre or 10.4%,  
19 d.f.

The effects of the (a) treatments have been adjusted for variations in the plant numbers on the assumption that, since the seed-rate for the beet crop was constant, these variations are not caused by the treatments. The effects of the (b) treatment are not so adjusted.



| Response to   | Differential Responses to Fertilizers and Infection |                           |                           |                         |                 |                            |                        |                           |                           |                         |                 |                            |
|---|---|---------------------------|---------------------------|-------------------------|-----------------|----------------------------|------------------------|---------------------------|---------------------------|-------------------------|-----------------|----------------------------|
|   | Mean  | Sulph. of amm. Abs. Pres. | Superphosphate Abs. Pres. | Mur. of pot. Abs. Pres. | Salt Abs. Pres. | Virus infection Abs. Pres. | Comp. fert. Abs. Pres. | Sulph. of amm. Abs. Pres. | Superphosphate Abs. Pres. | Mur. of pot. Abs. Pres. | Salt Abs. Pres. | Virus infection Abs. Pres. |
| Roots (washed) tons per acre Mean yield 5.97<br>±0.32 |   |                           |                           |                         |                 |                            |                        |                           |                           |                         |                 |                            |
| Sulph. of amm.  | 0.32  | -                         | 0.84                      | -0.20                   | 0.55            | 0.09                       | -0.43                  | 1.07                      | 0.35                      | 0.29                    | 0.40            | 0.24                       |
| Superphosphate  | -0.12   | 0.40                      | -                         | -                       | -0.23           | -0.01                      | -0.30                  | 0.06                      | 0.19                      | -0.43                   | -0.05           | -0.19                      |
| Mur. of pot.  | 0.18  | 0.41                      | 0.07                      | 0.29                    | -               | -                          | -0.10                  | 0.46                      | 0.13                      | 0.23                    | 0.05            | 0.31                       |
| Salt  | -0.11   | -0.86                     | -0.29                     | 0.07                    | -0.39           | 0.17                       | -                      | -                         | -0.10                     | -0.12                   | -0.17           | -0.05                      |
| Virus infection                                       | -0.44   | -0.41                     | -0.13                     | -0.75                   | -0.49           | -0.39                      | -0.43                  | -0.45                     | -                         | -                       | -0.17           | -0.71                      |
| Comp. fert.   | 1.23 <sup>a</sup>                                   | 1.31                      | 1.30                      | 1.16                    | 1.10            | 1.36                       | 1.17                   | 1.29                      | 1.50                      | 0.96                    | -               | -                          |
| Sugar Percentage Mean 14.26<br>±0.17                  |   |                           |                           |                         |                 |                            |                        |                           |                           |                         |                 |                            |
| Sulph. of amm.  | 0.12  | -                         | 0.27                      | -0.03                   | 0.03            | 0.21                       | 0.06                   | 0.18                      | 0.22                      | 0.02                    | 0.21            | 0.03                       |
| Superphosphate  | -0.01   | 0.14                      | -                         | -                       | 0.38            | -0.40                      | -0.04                  | 0.02                      | 0.13                      | -0.15                   | 0.06            | -0.08                      |
| Mur. of pot.  | -0.18   | -0.27                     | 0.21                      | -0.57                   | -               | -                          | -0.16                  | -0.20                     | -0.20                     | -0.16                   | -0.16           | -0.20                      |
| Salt  | 0.17  | 0.11                      | 0.14                      | 0.20                    | 0.19            | 0.15                       | -                      | -                         | 0.16                      | 0.18                    | 0.10            | 0.24                       |
| Virus infection                                       | 0.00  | 0.10                      | 0.14                      | -0.14                   | -0.02           | 0.02                       | -0.01                  | 0.01                      | -                         | -                       | 0.01            | -0.01                      |
| Comp. fert.   | -0.38   | -0.29                     | -0.31                     | -0.45                   | -0.36           | -0.40                      | -0.45                  | -0.31                     | -0.37                     | -0.39                   | -               | -                          |
| Total Sugar, cwt. per acre Mean yield 17.0<br>±0.92   |   |                           |                           |                         |                 |                            |                        |                           |                           |                         |                 |                            |
| Sulph. of amm.  | 1.0   | -                         | 2.6                       | -0.6                    | 1.5             | 0.5                        | -1.2                   | 3.2                       | 1.2                       | 0.8                     | 1.4             | 0.6                        |
| Superphosphate  | -0.8  | 0.8                       | -                         | -                       | -0.7            | -0.9                       | -1.2                   | -0.4                      | 0.3                       | -1.9                    | -0.6            | -1.0                       |
| Mur. of pot.  | 0.3   | 0.8                       | 0.4                       | 0.2                     | -               | -                          | -0.4                   | 1.0                       | 0.1                       | 0.5                     | 0.0             | 0.6                        |
| Salt  | -0.1  | -2.3                      | -0.5                      | 0.3                     | -0.8            | 0.6                        | -                      | -                         | -0.1                      | -0.1                    | -0.4            | 0.2                        |
| Virus infection                                       | -1.2 <sup>b</sup>                                   | -1.0                      | -0.1                      | -2.3                    | -1.4            | -1.0                       | -1.2                   | -1.2                      | -                         | -                       | -0.4            | -2.0                       |
| Comp. fert.   | 3.0   | 3.4                       | 3.2                       | 2.8                     | 2.7             | 3.3                        | 2.7                    | 3.3                       | 3.8                       | 2.2                     | -               | -                          |
| Standard errors<br>(a) 0.26<br>(b) 0.76               |   |                           |                           |                         |                 |                            |                        |                           |                           |                         |                 |                            |

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|                 | Differential Responses to Fertilizers and Infection |       |                 |       |              |       |       |       |                 |       | Sugar Beet  |       |
|-----------------|---|-------|-----------------|-------|--------------|-------|-------|-------|-----------------|-------|-------------|-------|
|                 | Sulph. of amm.                                      |       | Super phosphate |       | Mur. of pot. |       | Salt  |       | Virus infection |       | Comp. fert. |       |
|                 | Abs.  | Pres. | Abs.            | Pres. | Abs.         | Pres. | Abs.  | Pres. | Abs.            | Pres. | Abs.        | Pres. |
| Mean            |   |       |                 |       |              |       |       |       |                 |       |             |       |
|                 | Tops, tons per acre. Mean Yield 16.68               |       |                 |       |              |       |       |       |                 |       |             |       |
|                 | ±0.40   |       |                 |       |              |       |       |       |                 |       |             |       |
| Sulph. of amm.  | -   | -     | 0.57            | 1.03  | 0.86         | 0.74  | -1.25 | 2.85  | 0.99            | 0.61  | 0.59        | 1.01  |
| Superphosphate  | -0.38   | 0.08  | -               | -     | 0.16         | -0.46 | -1.16 | 0.86  | 0.25            | -0.55 | -0.25       | -0.05 |
| Mur. of pot.    | 0.68  | 0.56  | 0.93            | 0.31  | -            | -     | 0.23  | 1.01  | 0.62            | 0.62  | 0.14        | 1.10  |
| Salt            | -2.51   | 1.59  | -1.47           | 0.55  | -0.85        | -0.07 | -     | -     | -0.53           | -0.39 | -0.87       | -0.05 |
| Virus infection | -0.91   | -1.29 | -0.70           | -1.50 | -1.10        | -1.10 | -1.17 | -1.03 | -               | -     | -0.45       | -1.75 |
| Comp.fert.±0.65 | 7.45  | 7.87  | 7.56            | 7.76  | 7.18         | 8.14  | 7.25  | 8.07  | 8.31            | 7.01  | -           | -     |
|                 | ±0.66   |       |                 |       |              |       |       |       |                 |       |             |       |
|                 | Plant Number, thousands per acre. Mean 25.5         |       |                 |       |              |       |       |       |                 |       |             |       |
|                 | ±0.94   |       |                 |       |              |       |       |       |                 |       |             |       |
| Sulph. of amm.  | -   | -     | 0.5             | -1.5  | -0.2         | -0.8  | -0.7  | -0.3  | -0.5            | -0.5  | -1.1        | 0.1   |
| Superphosphate  | 1.9   | -0.1  | -               | -     | 0.8          | 1.0   | 0.4   | 1.4   | 0.7             | 1.1   | 1.4         | 0.4   |
| Mur. of pot.    | -0.5  | -1.1  | -0.9            | -0.7  | -            | -     | -1.4  | -0.2  | -0.2            | -1.4  | -1.4        | -0.2  |
| Salt            | -0.2  | 0.2   | -0.5            | 0.5   | -0.6         | 0.6   | -     | -     | 0.2             | -0.2  | 0.4         | -0.4  |
| Virus infection | 0.0   | 0.0   | -0.2            | 0.2   | 0.6          | -0.6  | 0.2   | -0.2  | -               | -     | 0.4         | -0.4  |
| Comp. fert.     | -3.3  | -2.1  | -2.2            | -3.2  | -3.3         | -2.1  | -2.3  | -3.1  | -2.3            | -3.1  | -           | -     |

Standard error: (a) 0.46.

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P/27

SUGAR BEET

Woburn Butt Close 1944

Effects of deep cultivation by hand. Notes on the development of the crop were made by the Physics Dept.

Design: 4 x 4 Latin square.

Area of each plot: 0.00155 acre.

Treatments

No cultivation beyond ordinary ploughing; digging by hand one spit deep; digging by hand two spits deep, leaving the lower spit in situ; digging by hand two spits deep, bringing the lower spit to the surface.

Crop Notes.

Sown: May 1. Lifted: Nov 27. Variety: Kleinwanzleben. Previous crop, Barley.

Standard Errors per plot:

Roots (washed): 1.24 tons per acre or 8.6%, 6 d.f.  
 Sugar percentage: 0.461, 6 d.f.  
 Total sugar: 5.29 cwt. per acre or 10.9%, 6 d.f.  
 Tops: 2.59 tons per acre or 14.8%, 6 d.f.

| Hand digging                          | Roots (washed)<br>tons per acre | Sugar<br>Percentage | Total sugar<br>cwt per acre | Tops<br>Tons per acre |
|---------------------------------------|---------------------------------|---------------------|-----------------------------|-----------------------|
|                                       | ±0.62                           | ±0.23               | ±2.6                        | ±1.30                 |
| No land digging                       | 13.90                           | 17.13               | 47.6                        | 16.21                 |
| 1 Spit deep                           | 14.40                           | 16.51               | 47.6                        | 17.86                 |
| 2 Spits deep                          | 14.55                           | 16.96               | 49.3                        | 17.50                 |
| 2 Spits, bringing<br>lower to surface | 15.05                           | 16.58               | 49.9                        | 18.29                 |
| Mean                                  | 14.48                           | 16.79               | 48.6                        | 17.47                 |



Q/1

CARROTS

Woburn Lansome 1939 (6th year)

The effects of sulphate of ammonia, poultry manure, soot, rape dust and dung.

Design; 4 randomized blocks of 12 plots each.

Area of each plot; 0.00588 acre.

Treatments

None: Sulphate of ammonia at 0.4 and 0.8 cwt. N per acre (half in seed bed and half as top dressing) Poultry manure, soot and rape dust all at 0.8 cwt. N per acre: dung ploughed-in at 0.8 and 1.6 cwt. N per acre every second year including 1939, and every second year excluding 1939, and at 0.8 cwt. N per acre every year.

Basal manuring; superphosphate and muriate of potash applied to give a total of 1.0 cwt.  $P_2O_5$  and 1.0 cwt.  $K_2O$ , per acre, including the  $P_2O_5$  and  $K_2O$  in the organic fertilizer.

Crop Notes

Sown: May 22. Harvested: Oct. 27 and Nov. 11. Variety, Cooper's Early Market. Previous crop, kale (see 1938 Station Report, p.164).

Standard error per plot: 2.41 tons per acre or 20.5%, (34 d.f.)

Mean Yields: tons per acre

| None   | Sulphate of ammonia |       | Poultry Manure | Soot  | Rape dust | 0.8 cwt. N per acre |
|--------|---------------------|-------|----------------|-------|-----------|---------------------|
|        | 0.4                 | 0.8   | 0.8            | 0.8   | 0.8       |                     |
| ±0.852 |                     |       | ±1.20          |       |           |                     |
| 10.56  | 11.04               | 11.88 | 13.83          | 12.92 | 13.03     |                     |
|        | Dung                |       |                |       |           |                     |
| 1938   | 0.8                 | 1.6   | 0.8            | 0     | 0         | Mean of all plots   |
| 1939   | 0                   | 0     | 0.8            | 0.8   | 1.6       |                     |
|        |                     |       | ±1.20          |       |           |                     |
|        | 10.19               | 11.35 | 11.74          | 11.36 | 12.45     | 11.74               |



Q/2

CARROTS

Woburn - Lansome 1941

Woburn - Butt Close 1942

Effects of sulphate of ammonia, superphosphate, muriate of potash and agricultural salt. These two experiments form part of a country wide series of 25 similar experiments.

Design; 4 randomized blocks of 8 plots each, the third order interaction being confounded with block differences.

Area of each plot, 0.00875 acre.

Treatments

Sulphate of ammonia: 1941, None, 0.4 cwt. N per acre.  
 1942, None, 0.3 cwt. N per acre.  
 Superphosphate: 1941, None, 0.8 cwt. P<sub>2</sub>O<sub>5</sub> per acre.  
 1942, None, 0.6 cwt. P<sub>2</sub>O<sub>5</sub> per acre.  
 Muriate of potash: 1941, None, 1.0 cwt. K<sub>2</sub>O per acre.  
 1942, None, 0.9 cwt. K<sub>2</sub>O per acre.  
 Agricultural salt: 1941 and 1942: None, 3.0 cwt. per acre.

Crop Notes

|      | Seed sown | Harvested                              | Variety                  | Previous crop |
|------|-----------|--|--------------------------|---------------|
| 1941 | June 23   | Oct. 21, 31, Nov. 4, 12*               | Cooper's<br>Early Market | Oats          |
| 1942 | April 14  | Aug. 27, Sept. 3. Oct.<br>20 - Nov. 12 | Cooper's<br>Intermediate | Sugar beet    |

\*On each day a strip was taken through all plots.

Standard errors per plot:

1941 Total roots: 0.655 tons per acre or 12.6%, 12 d.f.  
 1942 1sts: 5.39 tons per acre or 23.5%, 14 d.f.  
 2nds: 0.590 tons per acre or 52.5%, 14 d.f.

Note: 2nds consisted mostly of splits together with the smalls.



Q/3

1941 Differential responses; tons per acre

|   | Mean   | Sulph. amm. |       | Super |       | Mur. Pot. |       | Salt  |        |
|---|--------|-------------|-------|-------|-------|-----------|-------|-------|--------|
|   |        | Abs.        | Pres. | Abs.  | Pres. | Abs.      | Pres. | Abs.  | Pres.  |
| Total Roots. Mean yield: 5.21 tons per acre |        |             |       |       |       |           |       |       |        |
|   | ±0.231 |             |       |       |       |           |       |       |        |
|   |        |             |       |       |       |           |       |       | ±0.327 |
| Sulph. amm.                                 | 2.11   | -           | -     | 2.42  | 1.80  | 2.32      | 1.90  | 1.92  | 2.30   |
| Super                                       | 0.11   | 0.42        | -0.20 | -     | -     | 0.25      | -0.03 | 0.57  | -0.35  |
| Mur. pot.                                   | -0.22  | -0.01       | -0.43 | -0.08 | -0.36 | -         | -     | -0.40 | -0.04  |
| Salt  | 0.38   | 0.19        | 0.57  | 0.84  | -0.08 | 0.20      | 0.56  | -     | -      |

1942

1sts: Mean yield, 22.92 tons per acre

|             | ±1.91 |       |       |       |      |       |       |       |       |
|-------------|-------|-------|-------|-------|------|-------|-------|-------|-------|
|             |       |       |       |       |      |       |       |       | ±2.70 |
| Sulph. amm. | 0.52  | -     | -     | -1.20 | 2.24 | 4.17  | -3.13 | -0.35 | 1.39  |
| Super.      | 0.11  | -1.61 | 1.83  | -     | -    | -2.40 | 2.62  | 2.30  | -2.08 |
| Mur. pot.   | 1.51  | 5.16  | -2.14 | -1.00 | 4.02 | -     | -     | 1.29  | 1.73  |
| Salt        | 4.22  | 3.35  | 5.09  | 6.41  | 2.03 | 4.00  | 4.44  | -     | -     |

2nds: Mean yield, 1.12 tons per acre

|             | ±0.209 |       |       |       |       |       |       |       |        |
|-------------|--------|-------|-------|-------|-------|-------|-------|-------|--------|
|             |        |       |       |       |       |       |       |       | ±0.296 |
| Sulph. amm. | 0.14   | -     | -     | 0.05  | 0.23  | 0.18  | 0.10  | -0.13 | 0.41   |
| Super.      | -0.12  | -0.21 | -0.03 | -     | -     | -0.11 | -0.13 | 0.22  | -0.46  |
| Mur. pot.   | -0.03  | 0.01  | -0.07 | -0.02 | -0.04 | -     | -     | -0.10 | 0.04   |
| Salt        | 0.42   | 0.15  | 0.69  | 0.76  | 0.08  | 0.35  | 0.49  | -     | -      |



*[Faint, illegible text and table structure visible through the paper.]*



R/1

FLAX

Long Hoos 1942  
Long Hoos 1943  
Sawyers I 1944

Effects of sulphate of ammonia, superphosphate, muriate of potash and agricultural salt (the latter in 1942 and 1943 only). These three experiments form part of a country wide series of 39 similar experiments.

Designs; 1942, 1943: 4 randomized blocks of 8 plots each, the third order interactions being confounded with block differences.  
 1944: 4 randomized blocks of 8 plots each.

Area of each plot: 1942, 0.0141 acre  
 1943, 0.0196 acre  
 1944, 0.0200 acre

Treatments

All years: Sulphate of ammonia: None, 0.2 cwt. N per acre  
 Superphosphate: None, 0.5 cwt. P<sub>2</sub>O<sub>5</sub> per acre  
 Muriate of potash: None, 0.75 cwt. K<sub>2</sub>O per acre  
 1942, 1943: Agricultural salt: None, 3.00 cwt. per acre.

Crop Notes

|      | Seed sown | Harvested<br>(hand pulled) | Variety       | Previous<br>crop |
|------|-----------|----------------------------|---------------|------------------|
| 1942 | April 13  | July 15-20                 | Liral Monarch | Barley           |
| 1943 | March 29  | July 9-15                  | Liral Monarch | Sugar beet       |
| 1944 | April 10  | July 24-27                 | Liral Prince  | Wheat            |

Standard errors per plot:

|                      | 1942             |      | 1943             |      | 1944             |      |
|----------------------|------------------|------|------------------|------|------------------|------|
|                      | cwt. per<br>acre | %    | cwt. per<br>acre | %    | cwt. per<br>acre | %    |
| Total produce        | 3.76             | 16.5 | 2.66             | 8.2  | 2.06             | 5.6  |
| Seed                 | 0.669            | 28.9 | 0.305            | 8.5  | 0.68             | 18.2 |
| Scutched flax Retted | -                | -    | -                | -    | 0.44             | 11.7 |
| Scutched flax Green  | 0.525            | 17.8 | 0.802            | 17.6 | 0.49             | 8.7  |
| All based on         | 14 d.f.          |      | 14 d.f.          |      | 21 d.f.          |      |



R/2

Flax

1942 Differential Responses, cwt. per acre

|   | Mean  | Sulph. of amm. |       | Superphosphate |       | Mur. of Pot. |       | Salt |       |
|---|-------|----------------|-------|----------------|-------|--------------|-------|------|-------|
|   |       | Abs.           | Pres. | Abs.           | Pres. | Abs.         | Pres. | Abs. | Pres. |
| Total produce. Mean yield 22.74 cwt. per acre |       |                |       |                |       |              |       |      |       |
|   | ±1.33 |                |       |                |       |              |       |      | ±1.88 |
| Sulph. amm.                                   | 2.58  | -              | -     | 3.29           | 1.87  | 0.84         | 4.32  | 1.47 | 3.69  |
| Super.  | 0.36  | 1.07           | -0.35 | -              | -     | 0.44         | 0.28  | 1.23 | -0.51 |
| Mur. pot.                                     | 0.20  | -1.54          | 1.94  | 0.28           | 0.12  | -            | -     | 2.66 | -2.26 |
| Salt  | 2.02  | 0.91           | 3.13  | 2.89           | 1.15  | 4.48         | -0.44 | -    | -     |

Seed. Mean yield 2.31 cwt. per acre

|             |        |       |      |       |      |       |      |       |        |
|-------------|--------|-------|------|-------|------|-------|------|-------|--------|
|             | ±0.237 |       |      |       |      |       |      |       | ±0.335 |
| Sulph. amm. | -0.07  | -     | -    | -0.14 | 0.00 | -0.44 | 0.30 | -0.50 | 0.36   |
| Super.      | 0.37   | 0.30  | 0.44 | -     | -    | 0.20  | 0.54 | 0.58  | 0.16   |
| Mur. pot.   | -0.09  | -0.46 | 0.28 | -0.26 | 0.08 | -     | -    | -0.18 | 0.00   |
| Salt        | 0.25   | -0.18 | 0.68 | 0.46  | 0.04 | 0.16  | 0.34 | -     | -      |

Scutched flax (green) Mean yield 2.94 cwt. per acre

|             |        |       |      |       |       |      |       |      |        |
|-------------|--------|-------|------|-------|-------|------|-------|------|--------|
|             | ±0.185 |       |      |       |       |      |       |      | ±0.262 |
| Sulph. amm. | 0.77   | -     | -    | 0.61  | 0.93  | 0.57 | 0.97  | 0.57 | 0.97   |
| Super.      | 0.20   | 0.04  | 0.36 | -     | -     | 0.06 | 0.34  | 0.38 | 0.02   |
| Mur. pot.   | -0.20  | -0.40 | 0.00 | -0.34 | -0.06 | -    | -     | 0.33 | -0.73  |
| Salt        | 0.44   | 0.24  | 0.64 | 0.62  | 0.26  | 0.97 | -0.09 | -    | -      |

1943

Total produce. Mean yield 32.2 cwt. per acre

|             |        |      |      |      |      |     |     |      |       |
|-------------|--------|------|------|------|------|-----|-----|------|-------|
|             | ±0.940 |      |      |      |      |     |     |      | ±1.33 |
| Sulph. amm. | 3.7    | -    | -    | 5.2  | 2.2  | 3.2 | 4.2 | 3.2  | 4.2   |
| Super.      | 1.3    | 2.8  | -0.2 | -    | -    | 2.4 | 0.2 | -0.1 | 2.7   |
| Mur. pot.   | -1.7   | -2.2 | -1.2 | -0.6 | -2.8 | -   | -   | -1.7 | -1.7  |
| Salt        | 1.1    | 0.6  | 1.6  | -0.3 | 2.5  | 1.1 | 1.1 | -    | 0     |

Seed. Mean yield 3.59 cwt. per acre

|             |        |       |       |       |       |      |       |       |        |
|-------------|--------|-------|-------|-------|-------|------|-------|-------|--------|
|             | ±0.108 |       |       |       |       |      |       |       | ±0.153 |
| Sulph. amm. | 0.38   | -     | -     | 0.54  | 0.22  | 0.36 | 0.40  | 0.39  | 0.37   |
| Super.      | 0.06   | 0.22  | -0.10 | -     | -     | 0.20 | -0.08 | -0.07 | 0.19   |
| Mur. pot.   | -0.16  | -0.18 | -0.14 | -0.02 | -0.30 | -    | -     | -0.13 | -0.19  |
| Salt        | 0.19   | 0.20  | 0.18  | 0.06  | 0.32  | 0.22 | 0.16  | -     | -      |

Scutched flax (green) Mean yield 4.57 cwt. per acre

|             |        |       |      |       |       |       |       |      |        |
|-------------|--------|-------|------|-------|-------|-------|-------|------|--------|
|             | ±0.284 |       |      |       |       |       |       |      | ±0.402 |
| Sulph. amm. | 0.38   | -     | -    | 0.32  | 0.44  | 0.11  | 0.65  | 0.06 | 0.70   |
| Super.      | 0.21   | 0.15  | 0.27 | -     | -     | 0.50  | -0.08 | 0.13 | 0.29   |
| Mur. pot.   | 0.05   | -0.22 | 0.32 | 0.34  | -0.24 | -     | -     | 0.03 | 0.07   |
| Salt        | -0.09  | -0.41 | 0.23 | -0.17 | -0.01 | -0.11 | -0.07 | -    | -      |

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R/3

1944. Differential Responses, cwt. per acre

|  | Mean  | Sulph. of amm. |       | Superphosphate |       | Mur. of Pot. |       |
|--|-------|----------------|-------|----------------|-------|--------------|-------|
|  |       | Abs.           | Pres. | Abs.           | Pres. | Abs.         | Pres. |
| Total produce. Mean yield 37.0 cwt. per acre |       |                |       |                |       |              |       |
|  | ±0.73 |                |       |                | ±1.03 |              |       |
| Sulph. amm.                                  | 1.7   | -              | -     | 1.1            | 2.3   | 1.7          | 1.7   |
| Super.                                       | -1.0  | -1.6           | -0.4  | -              | -     | 1.2          | -3.2  |
| Mur. of Pot.                                 | 1.1   | 1.1            | 1.1   | 3.3            | -1.1  | -            | -     |

Seed. Mean yield 3.72 cwt. per acre

|                                     | Mean  | Sulph. of amm. |       | Superphosphate |       | Mur. of Pot. |       |
|-------------------------------------|-------|----------------|-------|----------------|-------|--------------|-------|
|                                     |       | Abs.           | Pres. | Abs.           | Pres. | Abs.         | Pres. |
| Seed. Mean yield 3.72 cwt. per acre |       |                |       |                |       |              |       |
|                                     | ±0.24 |                |       |                | ±0.34 |              |       |
| Sulph. amm.                         | -0.04 | -              | -     | 0.25           | -0.33 | 0.14         | -0.22 |
| Super.                              | 0.36  | 0.65           | 0.07  | -              | -     | 0.33         | 0.39  |
| Mur. of Pot.                        | 0.52  | 0.70           | 0.34  | 0.49           | 0.55  | -            | -     |

Scutched flax (retted) Mean yield 3.74 cwt. per acre

|  | Mean  | Sulph. of amm. |       | Superphosphate |       | Mur. of Pot. |       |
|--|-------|----------------|-------|----------------|-------|--------------|-------|
|  |       | Abs.           | Pres. | Abs.           | Pres. | Abs.         | Pres. |
| Scutched flax (retted) Mean yield 3.74 cwt. per acre |       |                |       |                |       |              |       |
|  | ±0.15 |                |       |                | ±0.21 |              |       |
| Sulph. amm.  | 0.18  | -              | -     | 0.24           | 0.12  | 0.35         | 0.01  |
| Super.   | -0.34 | -0.28          | -0.40 | -              | -     | -0.21        | -0.47 |
| Mur. of Pot.   | -0.10 | 0.07           | -0.27 | 0.03           | -0.23 | -            | -     |

Scutched flax (Green) Mean yield 5.58 cwt. per acre

|   | Mean  | Sulph. of amm. |       | Superphosphate |       | Mur. of Pot. |       |
|---|-------|----------------|-------|----------------|-------|--------------|-------|
|   |       | Abs.           | Pres. | Abs.           | Pres. | Abs.         | Pres. |
| Scutched flax (Green) Mean yield 5.58 cwt. per acre |       |                |       |                |       |              |       |
|   | ±0.17 |                |       |                | ±0.24 |              |       |
| Sulph. amm.   | 0.20  | -              | -     | -0.10          | 0.50  | 0.15         | 0.25  |
| Super.  | -0.23 | -0.53          | 0.07  | -              | -     | 0.03         | -0.49 |
| Mur. of Pot.  | 0.08  | 0.03           | 0.13  | 0.34           | -0.18 | -            | -     |







LETTUCE

Woburn Butt Close 1942

Effects of intensity of weedings, of pulling and hoeing weeds, of basal nitrogen in inorganic or in organic form, and of top dressing. Notes on the development of the crop were made by the Physics Department.

Design; 4 randomized blocks of 8 plots each, certain high order interactions being confounded with block differences.

Area of each plot, 0.00287 acre.

Treatments

Weeding: Light, intensive.

Removal of weeds: Pulling, hoeing.

Nitrogen in seed bed: None, 0.6 cwt. N per acre

Form of nitrogen: Inorganic (nitrochalk), organic (hoof meal).

Top dressing: None, 0.2 cwt. N per acre (nitrochalk).

The difference between the light and intensively weeded plots was an extra weeding for the latter.

Basal Manuring: Superphosphate 0.5 cwt. P<sub>2</sub>O<sub>5</sub> per acre, muriate of potash 0.5 cwt. K<sub>2</sub>O per acre.

Crop Notes

Sown: May 20. Cut: Aug. 4 and 12. Variety: All the Year Round. Previous crop: Sugar beet.

Standard errors per Plot: Total weight: 29.4 cwt. per acre or 20.1%, 13 d.f.  
Total number: 2.97 thousands per acre or 11.1%, 13 d.f.

Differential responses

| Mean response | Weeding |           | Hoeing | Pulling | Seedbed nitrogen |         | Top dressing |     |
|---------------|---------|-----------|--------|---------|------------------|---------|--------------|-----|
|               | Light   | Intensive |        |         | Inorganic        | Organic | None         | ing |

Total weight, cwt. per acre: Mean 146.6

|   | ±10.4             |            |       |                  | ±14.7             |      |       |                    |                    |                   |                    |
|---|-------------------|------------|-------|------------------|-------------------|------|-------|--------------------|--------------------|-------------------|--------------------|
| A | 34.9              | -          | -     | 34.2             | 35.6              | 28.7 | 41.1  | confounded         | 46.7               | 23.1              |                    |
| B | 14.9              | 14.2       | 15.6  | -                | -                 | -5.4 | 35.2  | 18.0 <sup>b</sup>  | 52.4 <sup>b</sup>  | -7.4              | 37.2               |
| C | 13.8              | 7.6        | 20.0  | -6.5             | 34.1              | -    | -     | -                  | -                  | 47.0              | -19.4 <sup>b</sup> |
| D | 22.0 <sup>a</sup> | confounded |       | 4.8 <sup>b</sup> | 39.2 <sup>b</sup> | -    | -     | -                  | -                  | 39.6 <sup>b</sup> | 4.4                |
| E | -33.7             | -21.9      | -45.5 | -56.0            | -11.4             | -0.5 | -66.9 | -49.3 <sup>b</sup> | -84.5 <sup>b</sup> | -                 | -                  |

A = Intensive - light weeding

B = Pulling - hoeing

C = Nitrogen in seed-bed

D = Seedbed nitrogen organic v.inorganic

E = Top dressing nitrogen

Standard errors (a) 14.7 (b) 20.8



S/2

Lettuce - Woburn 1942

Differential Responses

| Mean response | Weeding |           | Hoeing | Pulling | Seed-bed nitrogen | Seedbed nitrogen |         | Top dressing |
|---------------|---------|-----------|--------|---------|-------------------|------------------|---------|--------------|
|               | Light   | Intensive |        |         |                   | Inorganic        | Organic |              |

Plant number (thousands per acre): Mean 26.7

|   | ±1.05            |            |      | ±1.48             |                  |      |      |                   |                   |                  |                   |
|---|------------------|------------|------|-------------------|------------------|------|------|-------------------|-------------------|------------------|-------------------|
| A | 1.9              | -          | -    | 1.9               | 1.9              | 2.3  | 1.5  | confounded        |                   | 2.9              | 0.9               |
| B | 0.5              | 0.5        | 0.5  | -                 | -                | -1.3 | 2.3  | 1.7 <sup>d</sup>  | 2.9 <sup>d</sup>  | -1.6             | 2.6               |
| C | -0.6             | -0.2       | -1.0 | -2.4 <sup>d</sup> | 1.2 <sup>d</sup> | -    | -    | -                 | -                 | 1.5 <sup>d</sup> | -2.7 <sup>d</sup> |
| D | 2.1 <sup>c</sup> | confounded |      | 1.5               | 2.7 <sup>d</sup> | -    | -    | -                 | -                 | 2.2 <sup>d</sup> | 2.0 <sup>d</sup>  |
| E | -2.8             | -1.8       | -3.8 | -4.9              | -0.7             | -0.7 | -4.9 | -4.8 <sup>d</sup> | -5.0 <sup>d</sup> | -                | -                 |

A = Intensive - light weeding

B = Pulling - hoeing

C = Nitrogen in seed-bed

D = Seedbed nitrogen organic v. inorganic

E = Top dressing nitrogen

Standard errors (c) 1.48 (d) 2.09



LETTUCE

Woburn Butt Close 1943

The effect of dung, of sulphate of ammonia and of method and intensity of weeding. Notes on the development of the crop were made by the Physics Dept.

Design; 2 randomized blocks of 8 plots each, the third order interaction being confounded with block differences.

Area of each plot: 0.00287 acre.

Treatments

Dung: None, 15 tons per acre.  
 Sulphate of ammonia: None, 0.6 cwt. N per acre  
 Weeding: Normal (on 3 days) or intensive (on 5 days).  
 Method of weeding: Hoeing or pulling.

Crop Notes

Sown: Mar 29. Cut: June 21-29, July 5-14. Variety: All the Year Round.  
 Previous crop: Potatoes.

Note: Some of the plants in the first cutting were attacked by Botrytis.

Standard errors per plot:

Total weight: 0.86 tons per acre or 7.6%, 9 d.f.  
 Weight of first cutting: 1.01 tons per acre or 10.0%, 9 d.f.  
 Plant number, first cutting: 3.30 thousands per acre or 8.4%, 9 d.f.

Differential Responses

|   | Mean  | Cultivations     |           | Weeding |         |
|---|-------|------------------|-----------|---------|---------|
|   |       | Normal           | Intensive | Hoeing  | Pulling |
| Total weight: tons per acre.                      |       | Mean yield 11.28 |           |         |         |
|   | ±0.43 |                  |           | ±0.61   |         |
| Dung  | 1.06  |                  |           |         |         |
| Nitrogen  | 4.67  |                  |           |         |         |
| Intensive -                                       |       |                  |           |         |         |
| Normal Cultivation                                | 2.02  |                  |           | 1.48    | 2.56    |
| Hoeing - Pulling                                  | 0.88  | 1.42             | 0.34      |         |         |
| Total weight cut before June 29th: tons per acre. |       | Mean yield 10.05 |           |         |         |
|   | ±0.50 |                  |           | ±0.71   |         |
| Dung  | 1.33  |                  |           |         |         |
| Nitrogen  | 5.59  |                  |           |         |         |
| Intensive -                                       |       |                  |           |         |         |
| Normal Cultivation                                | 2.61  |                  |           | 1.88    | 3.34    |
| Hoeing - Pulling                                  | 1.09  | 1.82             | 0.36      |         |         |



S/4

Lettuce - Woburn 1943

Differential Responses

|  | Mean  | Cultivations |           | Weeding |         |  |
|--|-------|--------------|-----------|---------|---------|--|
|  |       | Normal       | Intensive | Hoeing  | Pulling |  |
| Total number cut before June 29th: thousands per acre. Mean yield 39.4 |       |              |           |         |         |  |
|  | ±1.65 |              |           | ±2.33   |         |  |
| Dung   | 1.9   |              |           |         |         |  |
| Nitrogen   | 7.8   |              |           |         |         |  |
| Intensive -  |       |              |           |         |         |  |
| Normal Cultivation   | 5.0   |              |           |         |         |  |
| Hoeing - Pulling   | 2.6   | 4.1          | 1.1       | 3.5     | 6.5     |  |

• Percentage number over 400 gms. Mean 9.5

|                    |      |     |     |     |     |  |
|--------------------|------|-----|-----|-----|-----|--|
| Dung               | 3.2  |     |     |     |     |  |
| Nitrogen           | 15.0 |     |     |     |     |  |
| Intensive -        |      |     |     |     |     |  |
| Normal Cultivation | 7.5  |     |     |     |     |  |
| Hoeing - Pulling   | 2.7  | 3.0 | 2.5 | 7.3 | 7.8 |  |



LETTUCE

Woburn Butt Furlong 1944

Effects of cultivation under various manurial conditions (dung, hoof meal and sulphate of ammonia). Notes on the development of the crop were made by the Physics Department.

Design; 2 randomized blocks of 8 plots each, the 3rd order interaction being confounded with blocks.

Area of each plot, 0.00307 acre.

Treatments

Dung: None, 15 tons per acre (surface mulch)  
 Nitrogen: Hoof meal or sulphate of ammonia, 0.6 cwt. N per acre.  
 Method of removing weeds: Pulling or hoeing.  
 Weeding: Continuous intensive May and June, or early intensive May only

Crop Notes

Sown: April 14. Cut: July 8 to Aug. 4. Variety All the Year Round.  
 Previous crop: Sugar beet.

Standard errors per plot: Total Weight, 0.53 tons per acre or 6.3%, 9 d.f.  
 Total number, 3.14 thousands per acre or 10.5%, 9 d.f.

|                            | Differential Responses             |        |         |                   |            |
|----------------------------|------------------------------------|--------|---------|-------------------|------------|
|                            | Mean                               | Dung   |         | Intensive Weeding |            |
|                            |                                    | Absent | Present | Early             | Continuous |
| Total weight.              | Mean yield 11.79 tons per acre     |        |         |                   |            |
|                            | ±0.36                              |        |         | ±0.52             |            |
| Response to dung           | 1.04                               | -      | -       | -0.59             | 2.66       |
| Continuous - Early weeding | 4.94                               | 3.32   | 6.57    | -                 | -          |
| Hoof meal - Sulph. amm.    | -0.84                              |        |         |                   |            |
| Pulling - Hoeing           | -0.90                              |        |         |                   |            |
| Total number.              | Mean yield 41.9 thousands per acre |        |         |                   |            |
|                            | ±2.2                               |        |         | ±3.2              |            |
| Response to dung           | 1.8                                | -      | -       | -2.1              | 5.7        |
| Continuous - Early weeding | 11.3                               | 7.4    | 15.3    | -                 | -          |
| Hoof meal - Sulph. amm.    | -0.8                               |        |         |                   |            |
| Pulling - Hoeing           | -2.1                               |        |         |                   |            |
| Percentage total weight.   | Class I Lettuce. Mean 21.5         |        |         |                   |            |
|                            | -0.1                               | -      | -       | -4.5              | 4.3        |
| Continuous - early weeding | 10.3                               | 5.9    | 14.7    | -                 | -          |
| Hoof meal - Sulph. amm.    | -7.3                               |        |         |                   |            |
| Pulling - Hoeing           | -4.7                               |        |         |                   |            |

Class I lettuces weigh over  $\frac{3}{4}$  lb. each.



S/6  
Lettuce - Woburn 1944

|   | Differential Responses |             |              | Intensive Weeding |            |
|---|------------------------|-------------|--------------|-------------------|------------|
|   | Mean                   | Dung Absent | Dung Present | Early             | Continuous |
| Percentage total weight cut before July 19. Mean 92.3 |                        |             |              |                   |            |
| Response to dung                                      | 3.1                    | -           | -            | 2.1               | 4.1        |
| Continuous - Early weeding                            | -8.6                   | -9.6        | -7.6         | -                 | -          |
| Hoof Meal - Sulph. amm.                               | -0.8                   |             |              |                   |            |
| Pulling - Hoeing                                      | 5.5                    |             |              |                   |            |



T/1

KALE

Woburn - Lansome 1937-39

The residual effects of Lupins as green manure.

Design; 4 x 4 Latin square.

Area of each plot, 0.0102 acre.

Treatments

Lupins were grown over the whole area in 1937.

O = Whole plant removed.

R = Tops removed, roots only buried.

TR = Whole plants buried.

2TR= Whole plants and additional tops from plots receiving treatment (R) buried.

These treatments were applied to kale sown in 1937. This kale crop was a failure on account of drought. Kale was grown again in 1938 and 1939 without further treatments.

Crop Notes

1938. Sown: March 29. Harvested: Jan. 19, 1939. Variety: Thousand Head.  
 1939. Sown: May 23. Harvested: Jan. 26, 1940. Variety: Thousand Head

Standard errors per plot:

1938. 0.697 tons per acre or 8.4%, 6 d.f.

1939. 0.796 tons per acre or 18.7%, 6 d.f.

| Treatment | Nitrogen content of buried lupins. lb. per acre (1937) |          | Total |
|-----------|--|----------|-------|
|           | As tops  | As roots |       |
| O         | -  | -        | -     |
| R         | -  | 11.9     | 11.9  |
| TR        | 106.6  | 11.6     | 118.2 |
| 2TR       | 216.9  | 11.6     | 228.5 |

Total produce, tons per acre

|      | 1938   | 1939   |
|------|--------|--------|
|      | ±0.348 | ±0.398 |
| O    | 6.74   | 3.50   |
| R    | 7.20   | 3.51   |
| TR   | 8.68   | 4.73   |
| 2TR  | 10.76  | 5.31   |
| Mean | 8.35   | 4.26   |



T/2

KALE

Woburn Butt Furlong 1938-39

The effect of roots and tops of mustard, tares and lupins used as green manures.

Design; 4 randomized blocks of 15 plots each.

Area of each plot, 0.00478 acre.

Treatments

Green manures: Fallow, Mustard, Lupins, Tares. Plants pulled up after growing (O), plants cut and removed, but roots left in ground (R), plants ploughed in as grown (TR), plants ploughed in and additional tops from (R) plots also buried (2TR).

Crop Notes

1939. Green manures sown, April 21. Ploughed-in, July 4. Cut, Feb. 23, 1940.  
Kale sown, July 5. Variety, Thousand Head. Previous crop, Kale.

Standard error per plot; 0.444 tons per acre or 10.3%, 44 d.f.

Green manures, nitrogen content lb. per acre (1939)

|         | R    | TR   | 2TR          |
|---------|------|------|--------------|
| Fallow  |      | 13.2 | (from weeds) |
| Mustard | 4.2  | 36.0 | 73.8         |
| Lupins  | 14.5 | 91.8 | 159.8        |
| Tares   | 16.5 | 58.5 | 94.0         |

1939, Total produce, tons per acre

|             | O    | R                 | TR   | 2TR  | Mean              |
|-------------|------|-------------------|------|------|-------------------|
|             |      | ±0.222            |      |      | ±0.111            |
| Fallow      |      | 4.20 <sup>a</sup> |      |      | 4.20 <sup>a</sup> |
| Mustard     | 3.44 | 3.02              | 3.72 | 4.88 | 3.76              |
| Lupins      | 3.48 | 4.23              | 5.73 | 6.31 | 4.94              |
| Tares       | 3.30 | 3.79              | 4.93 | 5.14 | 4.29              |
| Mean ±0.128 | 3.41 | 3.68              | 4.79 | 5.44 | 4.30              |

Standard error (a) 0.128

For 1938 yields, see 1938 Station Report, p. 163.



SPRING CABBAGE

Woburn Lansome 1942  
Woburn Butt Close 1943

Effects of various waste organic manures and sulphate of ammonia, and of different times of application of sulphate of ammonia.

Design; 4 randomized blocks of 14 plots each.

Area of each plot, 0.00155 acre.

Treatments

Hoof meal, de-tanned leather waste (two types, L & M), erinoid casein plastic waste and sulphate of ammonia, each at rates of 0.6 and 1.2 cwt. N per acre.

Sulphate of ammonia applied in one dose at the time of planting out, in one dose in early spring, or in 2 equal doses one at the time of planting out and one in early spring.

Crop Notes

|      | Planted  | Cut               | Variety                 | Previous crop |
|------|----------|-------------------|-------------------------|---------------|
| 1942 | 16/10/41 | June 24 - July 13 | Sutton's Early<br>Giant | Carrots       |
| 1943 | 16/10/42 | May               | Flower of Spring        | Potatoes      |

In 1943, very considerable damage was done by hares and rabbits; the results given are based on two blocks only, and from these two plots were missing.

Standard error per plot: 1942. Total produce, 0.846 tons per acre or 33.3%,  
40 d.f.  
1943. Total produce, 1.10 tons per acre or 30.4%,  
12 d.f.

Total produce: tons per acre

| cwt. N per<br>acre                   | Sulphate of ammonia |              |                    |                   |                     |                  |                 |               |
|--------------------------------------|---------------------|--------------|--------------------|-------------------|---------------------|------------------|-----------------|---------------|
|                                      | None                | Hoof<br>meal | Leather waste<br>L | M                 | Casein<br>waste     | Planting<br>time | Early<br>spring | Both<br>times |
| 1942. Mean yield: 2.54 tons per acre |                     |              |                    |                   |                     |                  |                 |               |
|                                      |                     |              |                    |                   | ±0.423              |                  |                 |               |
| 0.6                                  |                     | 3.74         | 1.88               | 2.23              | 2.33                | 2.59             | 3.32            | 2.39          |
| 1.2                                  |                     | 2.55         | 2.17               | 1.49              | 2.34                |                  |                 | 4.95          |
| Mean ±0.299                          | 1.81                | 3.14         | 2.02               | 1.86              | 2.34                |                  |                 | 3.67          |
| 1943. Mean yield 3.61 tons per acre  |                     |              |                    |                   |                     |                  |                 |               |
|                                      |                     |              |                    |                   | ±0.778 <sup>a</sup> |                  |                 |               |
| 0.6                                  |                     | 2.45         | 3.04               | 4.21 <sup>a</sup> | 1.83 <sup>a</sup>   | 2.74             | 5.06            | 4.56          |
| 1.2                                  |                     | 3.64         | 3.27               | 3.92              | 2.64                |                  |                 | 7.70          |
| Mean ±0.550                          | 2.76                | 3.04         | 3.16               | 4.06 <sup>b</sup> | 2.24 <sup>b</sup>   |                  |                 | 6.13          |

Standard errors: (a) 1.10, (b) 0.635



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U/1

KOK - SAGHYZ

Hoosfield 1943

Effects of fertilizers and spacing. *Taraxacum kok-saghyz* is a dandelion found wild at an altitude of 7,000 feet in Kazakstan and cultivated in Russia as a source of latex. The rubber content of the roots is about 4% and 200 lb. per acre of rubber has been obtained in Russia.

Design; 12 randomized blocks of 4 plots each, certain interactions being confounded between blocks.

Area of each plot: For early harvesting, 0.00055 acre; for late harvesting, 0.00179 acre.

Treatments

Sulphate of ammonia: None, 0.6 cwt. N per acre (0.2 cwt. N in Autumn and 0.4 cwt. N in Spring).

Superphosphate: None, 0.6 cwt. P<sub>2</sub>O<sub>5</sub> per acre

Muriate of potash: None, 1.0 cwt. K<sub>2</sub>O per acre.

Spacings (applied to blocks): 18" between rows, 4" in row (i.e. between adjacent plants)

18" between rows, 8" in row.

12" between rows, 12" in row.

Crop Notes

Seed sown: Oct. 16. This sowing was not successful and the crop was resown on March 22. Harvested: Sept. 7 ('Early') and Nov. 8 ('Late'). Previous crop, Ryegrass.

Standard errors: between blocks, applicable to spacings:

Roots (early harvest) 1.56 cwt. per acre or 20.5%, 6 d.f.

Roots (late harvest) 1.64 cwt. per acre or 16.2%, 6 d.f.

applicable to artificials:

Roots (early harvest) 1.47 cwt. per acre or 19.4%, 18 d.f.

Roots (late harvest) 3.63 cwt. per acre or 35.9%, 18 d.f.

Plant number (early harvest) 9.51 thousands per acre or 19.9%, 18 d.f.

Plant number (late harvest) 7.27 thousands per acre or 16.1%, 18 d.f.

The seed used for the second sowing had been soaked and kept at 0°C for 14 days. This treatment increased the field germination (50% germination in 2 days compared with 5 days for untreated seed).



U/2

Kok-Saghyz

Differential Responses

|   | Mean  | Sulph. amm. |       | Superphosphate |       | Mur. Pot. |       |
|---|-------|-------------|-------|----------------|-------|-----------|-------|
|   |       | Abs.        | Pres. | Abs.           | Pres. | Abs.      | Pres. |
| Roots, early harvest, cwt. per acre. Mean, 7.6              |       |             |       |                |       |           |       |
|   | ±0.42 |             |       | ±0.59          |       |           |       |
| Sulphate of ammonia   | 0.0   |             |       | 0.0            | 0.0   | -1.3      | 1.3   |
| Superphosphate  | 0.1   | 0.1         | 0.1   |                |       | -0.4      | 0.6   |
| Muriate of Potash   | 0.9   | -0.4        | 2.2   | 0.4            | 1.4   |           |       |
| Roots, late harvest, cwt. per acre. Mean, 10.1              |       |             |       |                |       |           |       |
|   | ±1.05 |             |       | ±1.48          |       |           |       |
| Sulphate of ammonia   | 0.5   |             |       | -0.8           | 1.8   | 0.4       | 0.6   |
| Superphosphate  | -0.4  | -1.7        | 0.9   |                |       | -0.6      | -0.2  |
| Muriate of Potash   | 0.1   | 0.0         | 0.2   | -0.1           | 0.3   |           |       |
| Plant number, early harvest, thousands per acre. Mean, 47.9 |       |             |       |                |       |           |       |
|   | ±2.75 |             |       | ±3.88          |       |           |       |
| Sulphate of ammonia   | -4.2  |             |       | -0.6           | -7.8  | -4.4      | -4.0  |
| Superphosphate  | 0.5   | 4.1         | -3.1  |                |       | -2.6      | 3.6   |
| Muriate of Potash   | 4.6   | 4.4         | 4.8   | 1.5            | 7.7   |           |       |
| Plant number, late harvest, thousands per acre. Mean, 45.1  |       |             |       |                |       |           |       |
|   | ±2.10 |             |       | ±2.97          |       |           |       |
| Sulphate of ammonia   | -8.2  |             |       | -9.1           | -7.3  | -5.9      | -10.5 |
| Superphosphate  | 1.9   | 1.0         | 2.8   |                |       | -0.6      | 4.4   |
| Muriate of Potash   | 2.2   | 4.5         | -0.1  | -0.3           | 4.7   |           |       |

| Spacing                      | Roots, cwt. per acre |       | Plant no., thous. per acre |      |
|------------------------------|----------------------|-------|----------------------------|------|
|                              | Early                | Late  | Early                      | Late |
|                              | ±0.78                | ±0.82 |                            |      |
| 18" between rows, 4" in row  | 7.6                  | 9.5   | 48.2                       | 47.0 |
| 18" between rows, 8" in row  | 6.7                  | 9.9   | 40.8                       | 40.1 |
| 12" between rows, 12" in row | 8.5                  | 10.9  | 54.7                       | 48.3 |

The first spacing involved a seed-rate per unit area double that of the other two spacings.



V/1

## CLOVER

### Great Knott 1937-39

Second year residual effect of dung, ploughed-in in January or applied in the ridges, and of straw, sulphate of ammonia, superphosphate and sulphate of potash. The manures were applied to the potato crop of 1937.

Design; 4 randomized blocks of 18 plots each, certain interactions being confounded with block differences.

Area of each plot: 0.0250 acre

### Treatments

Applied to potatoes in 1937.

Dung: None, 15 tons per acre, either ploughed-in in January or stored and applied in the ridges in May.

Straw: None, 40 cwt. per acre (chaffed) ploughed-in in January, except when applied with the dung in May in which case the straw and dung were mixed and stored.

Sulphate of ammonia: None, 0.4, 0.8 cwt. N per acre.

Superphosphate: None, 0.8 cwt.  $P_2O_5$  per acre.

Sulphate of potash: None, 1.6 cwt.  $K_2O$  per acre.

Basal manuring: None, 1 cwt. per acre sulphate of ammonia in 1938.

### Crop Notes

Clover undersown in oats: June 7, 1938. Clover cut: July 28, 1939.

Variety: Montgomery Red. Previous crop: Spring oats.

Standard error per plot: 4.36 cwt. per acre or 11.8%, 43 d.f.

For yields of potatoes in 1937 and oats in 1938, see Station Reports for 1937, p.155 and 1938, p.145.



V/2

Clover

Green Clover, cwt. per acre

| Dung        | Sulphate of ammonia<br>cwt. N |       |      | Straw<br>cwt. |       | Super<br>cwt. P <sub>2</sub> O <sub>5</sub> |       | Sulph. pot.<br>cwt. K <sub>2</sub> O |       | Mean  |
|-------------|-------------------------------|-------|------|---------------|-------|---|-------|--------------------------------------|-------|-------|
|             | 0.0                           | 0.4   | 0.8  | 0             | 40    | 0.0   | 0.8   | 0.0                                  | 1.6   |       |
|             |                               | ±1.54 |      |               | ±1.26 |   | ±1.26 |                                      | ±1.26 | ±0.89 |
| None        | 36.8                          | 38.4  | 36.1 | 36.5          | 37.6  | 37.1  | 37.1  | 36.2                                 | 37.9  | 37.1  |
| Ploughed in | 36.9                          | 37.9  | 37.1 | 37.9          | 36.7  | 37.3  | 37.4  | 37.3                                 | 37.4  | 37.3  |
| In ridges   | 38.3                          | 35.2  | 34.7 | 35.7          | 36.5  | 35.8  | 36.3  | 35.1                                 | 37.0  | 36.1  |
| Mean        | 37.3                          | 37.2  | 36.0 | 36.7          | 36.9  | 36.7  | 36.9  | 36.2                                 | 37.4  | 36.8  |
|             |                               | ±0.89 |      |               | ±0.73 |   | ±0.73 |                                      | ±0.73 |       |

| Sulph. amm.<br>cwt. N | Straw<br>cwt. |       | Super<br>cwt. P <sub>2</sub> O <sub>5</sub> |       | Sulph. pot.<br>cwt. K <sub>2</sub> O |       |
|-----------------------|---------------|-------|---|-------|--------------------------------------|-------|
|                       | 0             | 40    | 0.0   | 0.8   | 0.0                                  | 1.6   |
|                       |               | ±1.26 |   | ±1.26 |                                      | ±1.26 |
| 0.0                   | 36.9          | 37.8  | 37.8  | 36.9  | 36.5                                 | 38.2  |
| 0.4                   | 37.1          | 37.2  | 36.9  | 37.4  | 36.5                                 | 37.9  |
| 0.8                   | 36.1          | 35.8  | 35.5  | 36.4  | 35.7                                 | 36.2  |

| Straw<br>cwt. | Super<br>cwt. P <sub>2</sub> O <sub>5</sub> |       | Sulph. pot.<br>cwt. K <sub>2</sub> O |       | Super<br>cwt. P <sub>2</sub> O <sub>5</sub> | Sulph. pot.<br>cwt. K <sub>2</sub> O |       |
|---------------|---|-------|--------------------------------------|-------|---|--------------------------------------|-------|
|               | 0.0   | 0.8   | 0.0                                  | 1.6   |   | 0.0                                  | 1.6   |
|               |   | ±1.03 |                                      | ±1.03 |   |                                      | ±1.03 |
| 0             | 37.5  | 35.9  | 34.8                                 | 38.6  | 0.0   | 37.0                                 | 36.5  |
| 40            | 35.9  | 37.9  | 37.6                                 | 36.3  | 0.8   | 35.4                                 | 38.4  |



LUCERNE

Woburn Stackyard 1937-1940

Influence of dung on effectiveness of inoculation. In some soils the bacteria necessary to the formation of the nitrogen-producing root nodules in lucerne are absent, and are introduced by inoculation.

Design; 6 randomized blocks of 2 plots each, the plots being split for different applications of dung.

Area of each sub-plot: 0.0100 acre.

Treatments

(applied in 1937)

Inoculated and not inoculated.

Dung: None, 5 tons, 20 tons per acre.

Basal manuring; 1939 and 1940: None.

Crop Notes

Cut; 1939, July 6, Aug. 18, Nov. 15; 1940, June 27, Sept. 3.

Standard errors:

Per whole plot, 1939: 4.52 cwt. per acre or 5.7%, 5 d.f.

1940: 6.54 cwt. per acre or 10.3%, 5 d.f.

Per sub plot: 1939: 6.87 cwt. per acre or 8.6%, 20 d.f.

1940: 10.50 cwt. per acre or 16.6%, 20 d.f.

Hay, cwt. per acre

| Dung, tons per acre | None        | 5     | 20   | Mean               |
|---------------------|-------------|-------|------|--------------------|
|                     | <u>1939</u> |       |      |                    |
|                     |             | ±2.81 |      | ±1.85 <sup>a</sup> |
| Not inoculated      | 77.6        | 78.8  | 81.0 | 79.1               |
| Inoculated          | 78.0        | 80.2  | 82.8 | 80.3               |
| Mean ±1.98          | 77.8        | 79.5  | 81.9 | 79.8               |
|                     | <u>1940</u> |       |      |                    |
|                     |             | ±4.29 |      | ±2.67 <sup>a</sup> |
| Not inoculated      | 57.7        | 58.5  | 65.4 | 60.5               |
| Inoculated          | 61.8        | 67.7  | 68.5 | 66.0               |
| Mean ±3.03          | 59.8        | 63.1  | 67.0 | 63.2               |

(a) For use in vertical comparisons only. The other standard errors quoted are for use in comparisons between levels of dung.



*[The text in this section is extremely faint and illegible due to the quality of the scan. It appears to be a series of paragraphs or a list of items.]*

| Year         | 1911 | 1912 | 1913 | 1914 | 1915 |
|--------------|------|------|------|------|------|
| Not recorded |      |      |      |      |      |
| Included     |      |      |      |      |      |
| Non-1915     |      |      |      |      |      |
| Not recorded |      |      |      |      |      |
| Included     |      |      |      |      |      |
| Non-1915     |      |      |      |      |      |

(a) For use in vertical comparison only. The other standard errors given are for use in comparison between levels of data.



Z/1.1

METEOROLOGICAL RECORDS

Rothamsted, 1939-47

|       | Total<br>hours of<br>sunshine | Mean Temperature<br>(°F) |                     | Ground<br>Frosts <sup>(2)</sup> | Rainfall                      |                             | Drainage<br>through<br>20 in. soil<br>(in.) |
|-------|-------------------------------|--------------------------|---------------------|---------------------------------|-------------------------------|-----------------------------|---|
|       |                               | Air <sup>(1)</sup>       | 1 foot<br>in ground |                                 | total <sup>(3)</sup><br>(in.) | Rain<br>days <sup>(4)</sup> |   |
| 1939  |                               |                          |                     |                                 |                               |                             |   |
| Jan.  | 46                            | 39.0                     | 38.4                | 10                              | 55.72                         | 23                          | 5.43  |
| Feb.  | 106                           | 41.1                     | 39.1                | 13                              | 0.95                          | 13                          | 0.15  |
| Mar.  | 96                            | 40.9                     | 40.4                | 9                               | 1.74                          | 14                          | 0.51  |
| Apr.  | 165                           | 46.7                     | 46.2                | 10                              | 2.91                          | 14                          | 1.37  |
| May   | 159                           | 50.7                     | 50.9                | 3                               | 1.83                          | 7                           | 1.12  |
| June  | 205                           | 56.5                     | 57.5                | 0                               | 2.07                          | 12                          | 0.13  |
| July  | 158                           | 59.3                     | 59.5                | 0                               | 2.14                          | 18                          | 0.23  |
| Aug.  | 152                           | 60.9                     | 61.1                | 0                               | 3.22                          | 13                          | 1.28  |
| Sept. | 142                           | 57.9                     | 59.2                | 0                               | 1.42                          | 9                           | 0.37  |
| Oct.  | 90                            | 46.4                     | 48.6                | 5                               | 4.72                          | 21                          | 2.87  |
| Nov.  | 38                            | 46.9                     | 46.0                | 3                               | 4.49                          | 20                          | 3.85  |
| Dec.  | 44                            | 36.0                     | 39.3                | 18                              | 1.50                          | 11                          | 1.06  |
| Year  | 1400                          | 48.5                     | 48.8                | 71                              | 32.71                         | 175                         | 18.39                                       |
| 1940  |                               |                          |                     |                                 |                               |                             |   |
| Jan.  | 87                            | 28.5                     | 32.5                | 27                              | 4.01                          | 10                          | 0.37  |
| Feb.  | 22                            | 34.7                     | 33.8                | 14                              | 1.86                          | 18                          | 3.55  |
| Mar.  | 127                           | 41.6                     | 39.9                | 13                              | 2.75                          | 14                          | 1.66  |
| Apr.  | 124                           | 47.1                     | 45.5                | 11                              | 1.82                          | 16                          | 0.07  |
| May   | 225                           | 53.9                     | 54.1                | 5                               | 2.01                          | 12                          | 0.30  |
| June  | 270                           | 60.5                     | 60.9                | 0                               | 0.89                          | 5                           | -   |
| July  | 190                           | 58.5                     | 60.1                | 0                               | 2.39                          | 16                          | 0.03  |
| Aug.  | 191                           | 60.0                     | 60.5                | 0                               | 0.22                          | 2                           | -   |
| Sept. | 171                           | 55.1                     | 55.9                | 1                               | 1.16                          | 9                           | -   |
| Oct.  | 94                            | 48.6                     | 49.0                | 3                               | 3.40                          | 17                          | 1.46  |
| Nov.  | 77                            | 43.2                     | 43.1                | 9                               | 7.86                          | 20                          | 7.23  |
| Dec.  | 41                            | 37.5                     | 37.4                | 17                              | 1.49                          | 13                          | 1.02  |
| Year  | 1616                          | 47.4                     | 47.7                | 100                             | 29.87                         | 152                         | 15.70                                       |

(1) Mean of Maximum and Minimum Temperatures

(2) Number of nights grass minimum was 30°F or less

(3) Area of rain gauge, 1/1000 acre

(4) Number of days rainfall was 0.01 inches or more



Meteorological Records - Rothamsted  
Z/1.2

|       | Total<br>hours of<br>sunshine | Mean Temperature<br>(°F) |                     | Ground<br>Frosts | Rainfall      |              | Drainage<br>through<br>20 in. soil<br>(in.) |
|-------|-------------------------------|--------------------------|---------------------|------------------|---------------|--------------|---|
|       |                               | Air                      | 1 foot<br>in ground |                  | total<br>(in) | Rain<br>days |   |
| 1941  |                               |                          |                     |                  |               |              |   |
| Jan.  | 41                            | 32.4                     | 34.8                | 18               | 2.46          | 18           | 2.41  |
| Feb.  | 61                            | 37.6                     | 36.2                | 16               | 2.52          | 17           | 2.02  |
| Mar.  | 109                           | 40.5                     | 39.7                | 15               | 2.92          | 12           | 1.99  |
| Apr.  | 96                            | 43.4                     | 42.7                | 10               | 1.50          | 8            | 0.62  |
| May   | 131                           | 47.4                     | 47.7                | 12               | 2.15          | 10           | 0.65  |
| June  | 201                           | 58.7                     | 58.1                | 0                | 1.23          | 7            | 0.50  |
| July  | 226                           | 63.4                     | 64.6                | 0                | 5.42          | 14           | 2.27  |
| Aug.  | 166                           | 57.7                     | 59.3                | 0                | 4.42          | 24           | 1.89  |
| Sept. | 105                           | 57.7                     | 58.3                | 0                | 0.70          | 3            | -   |
| Oct.  | 108                           | 49.7                     | 51.6                | 5                | 1.09          | 15           | 0.20  |
| Nov.  | 37                            | 42.6                     | 43.5                | 9                | 2.73          | 17           | 1.85  |
| Dec.  | 48                            | 40.4                     | 41.7                | 16               | 1.51          | 12           | 1.21  |
| Year  | 1330                          | 47.6                     | 48.2                | 101              | 28.64         | 157          | 15.61                                       |
| 1942  |                               |                          |                     |                  |               |              |   |
| Jan.  | 43                            | 31.6                     | 35.0                | 23               | 3.02          | 16           | 1.17  |
| Feb.  | 39                            | 30.8                     | 32.7                | 25               | 0.84          | 6            | 1.07  |
| Mar.  | 73                            | 40.3                     | 37.7                | 17               | 1.68          | 11           | 1.44  |
| Apr.  | 221                           | 47.9                     | 46.1                | 4                | 1.65          | 8            | 0.69  |
| May   | 194                           | 51.5                     | 51.8                | 4                | 2.96          | 13           | 0.36  |
| June  | 226                           | 57.9                     | 58.8                | 1                | 0.30          | 2            | -   |
| July  | 155                           | 60.0                     | 60.2                | 0                | 2.30          | 14           | 0.01  |
| Aug.  | 147                           | 61.6                     | 61.0                | 0                | 2.46          | 19           | 0.33  |
| Sept. | 121                           | 56.7                     | 57.8                | 0                | 1.45          | 12           | -   |
| Oct.  | 85                            | 51.0                     | 51.6                | 2                | 4.01          | 19           | 2.48  |
| Nov.  | 67                            | 40.6                     | 42.7                | 14               | 1.40          | 12           | 1.12  |
| Dec.  | 44                            | 42.5                     | 42.7                | 10               | 3.11          | 23           | 2.50  |
| Year  | 1416                          | 47.7                     | 48.2                | 100              | 25.18         | 155          | 11.18                                       |
| 1943  |                               |                          |                     |                  |               |              |   |
| Jan.  | 49                            | 40.0                     | 38.6                | 12               | 4.93          | 23           | 4.61  |
| Feb.  | 79                            | 41.1                     | 40.4                | 14               | 1.18          | 10           | 1.01  |
| Mar.  | 137                           | 43.3                     | 41.6                | 20               | 0.62          | 6            | -   |
| Apr.  | 156                           | 51.0                     | 49.0                | 4                | 1.09          | 14           | -   |
| May   | 245                           | 54.0                     | 54.1                | 3                | 2.54          | 10           | 0.70  |
| June  | 207                           | 57.4                     | 59.6                | 0                | 1.55          | 10           | 0.01  |
| July  | 193                           | 61.2                     | 61.4                | 0                | 1.60          | 10           | -   |
| Aug.  | 176                           | 61.2                     | 61.5                | 0                | 2.24          | 17           | -   |
| Sept. | 146                           | 55.9                     | 57.1                | 1                | 1.96          | 12           | 0.27  |
| Oct.  | 95                            | 51.1                     | 51.8                | 0                | 3.42          | 18           | 2.21  |
| Nov.  | 75                            | 41.8                     | 43.5                | 12               | 1.48          | 20           | 0.88  |
| Dec.  | 54                            | 37.5                     | 38.2                | 14               | 1.58          | 13           | 1.37  |
| Year  | 1612                          | 49.6                     | 49.7                | 80               | 24.17         | 163          | 11.06                                       |



Z/1.3

|       | Total<br>hours of<br>sunshine | Mean Temperature<br>(°F) |                     | Ground<br>Frosts | Rainfall       |              | Drainage<br>through<br>20 in. soil<br>(in.) |
|-------|-------------------------------|--------------------------|---------------------|------------------|----------------|--------------|---|
|       |                               | Air                      | 1 foot<br>in ground |                  | total<br>(in.) | Rain<br>days |   |
| 1944  |                               |                          |                     |                  |                |              |   |
| Jan.  | 47                            | 40.9                     | 40.1                | 13               | 1.64           | 12           | 1.20  |
| Feb.  | 51                            | 36.8                     | 38.1                | 17               | 1.13           | 17           | 0.34  |
| Mar.  | 112                           | 40.1                     | 38.9                | 22               | 0.21           | 8            | -   |
| Apr.  | 137                           | 49.4                     | 47.9                | 4                | 2.06           | 9            | 0.87  |
| May   | 230                           | 52.0                     | 52.5                | 8                | 0.71           | 5            | -   |
| June  | 172                           | 55.9                     | 57.4                | 1                | 1.76           | 14           | -   |
| July  | 118                           | 61.7                     | 61.3                | 0                | 1.58           | 12           | 0.02  |
| Aug.  | 197                           | 63.8                     | 63.3                | 0                | 2.89           | 13           | 0.93  |
| Sept. | 139                           | 54.4                     | 56.2                | 1                | 2.74           | 14           | 1.09  |
| Oct.  | 89                            | 48.3                     | 49.9                | 1                | 3.70           | 19           | 2.41  |
| Nov.  | 58                            | 42.6                     | 43.2                | 14               | 3.75           | 21           | 3.17  |
| Dec.  | 67                            | 36.8                     | 38.8                | 18               | 1.78           | 16           | 1.42  |
| Year  | 1418                          | 48.6                     | 49.0                | 99               | 23.92          | 160          | 11.44                                       |
| 1945  |                               |                          |                     |                  |                |              |   |
| Jan.  | 49                            | 31.4                     | 33.9                | 26               | 2.32           | 18           | 1.87  |
| Feb.  | 70                            | 44.0                     | 40.6                | 8                | 2.11           | 13           | 2.00  |
| Mar.  | 152                           | 45.6                     | 43.4                | 13               | 0.68           | 8            | -   |
| Apr.  | 180                           | 49.8                     | 49.8                | 7                | 1.36           | 12           | -   |
| May   | 168                           | 54.0                     | 54.0                | 3                | 2.31           | 12           | 0.44  |
| June  | 201                           | 57.7                     | 59.2                | 0                | 2.29           | 16           | 0.11  |
| July  | 181                           | 61.5                     | 61.8                | 0                | 2.83           | 10           | 1.35  |
| Aug.  | 147                           | 60.1                     | 60.4                | 0                | 1.38           | 11           | -   |
| Sept. | 66                            | 57.7                     | 57.3                | 0                | 2.24           | 12           | 0.29  |
| Oct.  | 106                           | 52.5                     | 52.3                | 1                | 3.00           | 11           | 1.99  |
| Nov.  | 41                            | 44.3                     | 45.6                | 5                | 0.40           | 9            | 0.07  |
| Dec.  | 50                            | 39.4                     | 40.3                | 16               | 3.23           | 17           | 2.79  |
| Year  | 1411                          | 49.9                     | 49.9                | 79               | 24.15          | 149          | 10.91                                       |
| 1946  |                               |                          |                     |                  |                |              |   |
| Jan.  | 65                            | 36.7                     | 36.9                | 21               | 2.52           | 11           | 2.03  |
| Feb.  | 79                            | 42.1                     | 40.9                | 7                | 2.81           | 19           | 1.99  |
| Mar.  | 99                            | 39.9                     | 38.6                | 20               | 1.58           | 6            | 1.00  |
| Apr.  | 204                           | 48.9                     | 48.5                | 11               | 1.06           | 8            | -   |
| May   | 168                           | 49.1                     | 50.8                | 3                | 2.49           | 15           | 0.51  |
| June  | 155                           | 55.6                     | 55.6                | 0                | 2.65           | 21           | 0.33  |
| July  | 218                           | 61.3                     | 63.0                | 0                | 2.21           | 10           | 0.32  |
| Aug.  | 151                           | 58.4                     | 59.6                | 0                | 3.97           | 21           | 1.39  |
| Sept. | 110                           | 56.9                     | 56.2                | 0                | 3.85           | 18           | 2.27  |
| Oct.  | 85                            | 49.5                     | 51.3                | 4                | 1.58           | 12           | 0.40  |
| Nov.  | 42                            | 45.3                     | 45.5                | 3                | 5.73           | 20           | 5.29  |
| Dec.  | 73                            | 35.5                     | 37.8                | 24               | 2.25           | 20           | 2.03  |
| Year  | 1449                          | 48.4                     | 48.7                | 93               | 32.70          | 181          | 17.56                                       |



Meteorological Records - Rothamsted

Z/1.4

|       | Total<br>hours of<br>sunshine | Mean Temperature<br>(°F) |                     | Ground<br>Frosts | Rainfall       |              | Drainage<br>through<br>20 in. soil<br>(in.) |
|-------|-------------------------------|--------------------------|---------------------|------------------|----------------|--------------|---|
|       |                               | Air                      | 1 foot<br>in ground |                  | total<br>(in.) | Rain<br>days |   |
| 1947  |                               |                          |                     |                  |                |              |   |
| Jan.  | 71                            | 33.9                     | 36.2                | 24               | 1.63           | 16           | 1.50  |
| Feb.  | 34                            | 27.1                     | 33.1                | 26               | 1.75           | 11           | 0.02  |
| Mar.  | 69                            | 38.7                     | 36.2                | 15               | 5.10           | 25           | 4.47  |
| Apr.  | 162                           | 47.3                     | 45.3                | 6                | 2.21           | 14           | 0.65  |
| May   | 186                           | 56.1                     | 53.1                | 0                | 1.26           | 12           | 0.23  |
| June  | 202                           | 59.9                     | 61.1                | 0                | 2.49           | 12           | 0.25  |
| July  | 158                           | 63.1                     | 62.9                | 0                | 1.62           | 13           | 0.18  |
| Aug.  | 271                           | 65.5                     | 66.9                | 0                | 0.09           | 5            | -   |
| Sept. | 164                           | 59.5                     | 60.9                | 0                | 1.44           | 10           | -   |
| Oct.  | 107                           | 50.5                     | 52.2                | 3                | 0.10           | 8            | -   |
| Nov.  | 74                            | 43.9                     | 45.3                | 10               | 1.21           | 19           | -   |
| Dec.  | 27                            | 40.7                     | 40.9                | 8                | 3.18           | 22           | 2.35  |
| Year  | 1523                          | 49.2                     | 49.5                | 92               | 22.08          | 166          | 9.65  |

Averages\*  
for

|       | 46 years | 61 years | 86 years |
|-------|----------|----------|----------|
| Jan.  | 52       | 37.6     | 2.46     |
| Feb.  | 70       | 38.5     | 1.91     |
| Mar.  | 119      | 41.2     | 1.92     |
| Apr.  | 153      | 45.4     | 1.98     |
| May   | 199      | 51.9     | 2.15     |
| June  | 204      | 57.2     | 2.24     |
| July  | 199      | 60.7     | 2.59     |
| Aug.  | 188      | 60.1     | 2.57     |
| Sept. | 150      | 55.8     | 2.43     |
| Oct.  | 106      | 48.7     | 3.03     |
| Nov.  | 64       | 42.2     | 2.71     |
| Dec.  | 44       | 38.5     | 2.64     |
| Year  | 1549     | 48.1     | 28.64    |

\*For period ending in 1938



Z/2.1

METEOROLOGICAL RECORDS

Woburn, 1939-47

|       | Total<br>hours of<br>sunshine | Mean Temperature (°F) |                  |                     | Ground<br>frosts | Rainfall<br>total (in.) | Rain<br>days |
|-------|-------------------------------|-----------------------|------------------|---------------------|------------------|-------------------------|--------------|
|       |                               | Air                   | Grass<br>minimum | 1 foot<br>in ground |                  |                         |              |
| 1939  |                               |                       |                  |                     |                  |                         |              |
| Jan.  | 42.2                          | 39.2                  | 32.5             | 39.0                | 6                | 4.26                    | 22           |
| Feb.  | 106.2                         | 41.6                  | 33.0             | 40.2                | 11               | 0.72                    | 10           |
| Mar.  | 94.0                          | 41.8                  | 33.9             | 41.9                | 7                | 1.74                    | 15           |
| Apr.  | 176.7                         | 47.0                  | 34.4             | 48.7                | 10               | 3.41                    | 19           |
| May   | 172.6                         | 51.0                  | 38.8             | 53.8                | 2                | 1.26                    | 7            |
| June  | 217.6                         | 56.4                  | 43.9             | 61.6                | 0                | 2.92                    | 14           |
| July  | 160.5                         | 60.0                  | 49.8             | 62.5                | 0                | 2.28                    | 23           |
| Aug.  | 153.1                         | 60.9                  | 50.0             | 62.6                | 0                | 3.43                    | 14           |
| Sept. | 130.8                         | 57.4                  | 45.8             | 60.1                | 1                | 0.54                    | 9            |
| Oct.  | 94.9                          | 46.2                  | 34.3             | 48.5                | 8                | 3.83                    | 20           |
| Nov.  | 40.6                          | 47.2                  | 37.8             | 46.0                | 3                | 3.59                    | 21           |
| Dec.  | 40.8                          | 36.0                  | 28.5             | 39.1                | 16               | 1.91                    | 14           |
| Year  | 1430.0                        | 48.7                  | 38.6             | 50.3                | 64               | 29.89                   | 188          |
| 1940  |                               |                       |                  |                     |                  |                         |              |
| Jan.  | 65.9                          | 27.3                  | 19.2             | 31.8                | 27               | 2.14                    | 10           |
| Feb.  | 24.7                          | 34.9                  | 28.2             | 34.2                | 12               | 1.83                    | 18           |
| Mar.  | 135.8                         | 42.6                  | 31.7             | 41.5                | 14               | 2.93                    | 15           |
| Apr.  | 122.4                         | 47.4                  | 34.9             | 47.4                | 9                | 2.46                    | 16           |
| May   | 227.0                         | 53.8                  | 38.1             | 57.3                | 5                | 1.57                    | 12           |
| June  | 258.1                         | 59.8                  | 44.5             | 64.3                | 0                | 1.22                    | 7            |
| July  | 180.7                         | 58.6                  | 45.7             | 62.2                | 0                | 3.14                    | 18           |
| Aug.  | 191.1                         | 59.8                  | 44.2             | 64.2                | 1                | 0.11                    | 2            |
| Sept. | 170.0                         | 54.8                  | 37.9             | 57.5                | 5                | 0.96                    | 9            |
| Oct.  | 96.3                          | 47.8                  | 35.4             | 48.7                | 10               | 2.67                    | 13           |
| Nov.  | 83.1                          | 43.5                  | 34.1             | 43.3                | 8                | 7.16                    | 20           |
| Dec.  | 39.2                          | 37.4                  | 28.9             | 37.6                | 10               | 1.41                    | 16           |
| Year  | 1594.3                        | 47.3                  | 35.2             | 49.2                | 101              | 27.60                   | 156          |
| 1941  |                               |                       |                  |                     |                  |                         |              |
| Jan.  | 33.4                          | 32.0                  | 26.5             | 34.6                | 20               | 2.78                    | 24           |
| Feb.  | 66.9                          | 37.9                  | 29.4             | 37.8                | 18               | 2.06                    | 18           |
| Mar.  | 104.0                         | 40.1                  | 29.7             | 40.5                | 16               | 3.21                    | 13           |
| Apr.  | 98.0                          | 43.1                  | 32.8             | 44.1                | 10               | 1.67                    | 11           |
| May   | 133.3                         | 47.2                  | 35.2             | 50.4                | 12               | 2.03                    | 11           |
| June  | 220.0                         | 59.0                  | 46.8             | 61.3                | 0                | 1.52                    | 8            |
| July  | 227.6                         | 63.5                  | 49.4             | 67.7                | 0                | 2.56                    | 18           |
| Aug.  | 176.1                         | 58.1                  | 47.8             | 59.0                | 0                | 3.78                    | 24           |
| Sept. | 109.1                         | 57.1                  | 44.5             | 59.1                | 1                | 0.70                    | 6            |
| Oct.  | 119.3                         | 49.7                  | 39.1             | 50.7                | 7                | 1.67                    | 14           |
| Nov.  | 40.4                          | 43.2                  | 35.0             | 43.1                | 7                | 2.32                    | 17           |
| Dec.  | 36.8                          | 40.9                  | 32.3             | 41.5                | 10               | 1.22                    | 10           |
| Year  | 1364.9                        | 47.6                  | 37.4             | 49.1                | 101              | 25.52                   | 174          |



Z/2.2

Meteorological Records - Woburn

|       | Total<br>hours of<br>sunshine | Mean Temperature (°F) |                  |                     | Ground<br>frosts | Rainfall<br>total (in.) | Rain<br>days |
|-------|-------------------------------|-----------------------|------------------|---------------------|------------------|-------------------------|--------------|
|       |                               | Air                   | Grass<br>minimum | 1 foot<br>in ground |                  |                         |              |
| 1942  |                               |                       |                  |                     |                  |                         |              |
| Jan.  | 36.0                          | 31.6                  | 25.3             | 34.3                | 23               | 2.32                    | 13           |
| Feb.  | 46.0                          | 31.3                  | 24.3             | 33.1                | 25               | 0.79                    | 10           |
| Mar.  | 73.5                          | 40.6                  | 31.5             | 39.8                | 17               | 1.33                    | 13           |
| Apr.  | 233.0                         | 47.8                  | 35.1             | 48.3                | 5                | 1.19                    | 7            |
| May   | 227.3                         | 51.9                  | 41.3             | 54.8                | 4                | 2.53                    | 14           |
| June  | 232.5                         | 58.2                  | 44.5             | 63.0                | 0                | 0.28                    | 3            |
| July  | 175.4                         | 60.2                  | 51.0             | 62.9                | 0                | 2.46                    | 15           |
| Aug.  | 139.1                         | 61.8                  | 51.0             | 53.0                | 0                | 1.37                    | 16           |
| Sept. | 140.3                         | 56.9                  | 45.3             | 58.7                | 0                | 0.88                    | 13           |
| Oct.  | 98.8                          | 51.0                  | 41.5             | 51.3                | 1                | 2.27                    | 15           |
| Nov.  | 63.2                          | 40.4                  | 31.8             | 42.0                | 12               | 1.80                    | 12           |
| Dec.  | 51.4                          | 43.6                  | 36.0             | 42.9                | 5                | 2.27                    | 19           |
| Year  | 1516.5                        | 47.9                  | 38.2             | 50.3                | 92               | 19.49                   | 150          |
| 1943  |                               |                       |                  |                     |                  |                         |              |
| Jan.  | 47.3                          | 40.4                  | 32.5             | 39.3                | 9                | 3.87                    | 22           |
| Feb.  | 74.5                          | 41.7                  | 32.7             | 40.5                | 7                | 0.84                    | 11           |
| Mar.  | 134.7                         | 42.7                  | 29.3             | 42.6                | 20               | 0.83                    | 6            |
| Apr.  | 158.7                         | 50.2                  | 38.0             | 50.9                | 4                | 1.36                    | 12           |
| May   | 250.1                         | 53.8                  | 38.9             | 56.1                | 1                | 2.20                    | 10           |
| June  | 221.3                         | 57.7                  | 45.5             | 61.9                | 0                | 1.74                    | 11           |
| July  | 205.7                         | 61.4                  | 47.5             | 65.2                | 0                | 0.65                    | 10           |
| Aug.  | 177.4                         | 61.6                  | 48.8             | 63.8                | 0                | 1.76                    | 14           |
| Sept. | 153.7                         | 56.0                  | 43.0             | 57.6                | 3                | 1.35                    | 9            |
| Oct.  | 105.9                         | 50.7                  | 39.1             | 50.9                | 1                | 2.25                    | 13           |
| Nov.  | 74.1                          | 41.8                  | 32.1             | 42.3                | 13               | 1.14                    | 17           |
| Dec.  | 49.8                          | 37.0                  | 28.4             | 37.5                | 20               | 1.10                    | 10           |
| Year  | 1653.2                        | 49.6                  | 38.0             | 50.7                | 78               | 19.09                   | 145          |
| 1944  |                               |                       |                  |                     |                  |                         |              |
| Jan.  | 50.4                          | 42.1                  | 33.2             | 40.7                | 8                | 1.34                    | 13           |
| Feb.  | 51.4                          | 37.2                  | 29.2             | 38.1                | 16               | 1.09                    | 17           |
| Mar.  | 116.6                         | 40.6                  | 28.6             | 40.3                | 20               | 0.20                    | 9            |
| Apr.  | 143.6                         | 50.1                  | 39.0             | 50.1                | 0                | 2.52                    | 10           |
| May   | 223.5                         | 52.3                  | 39.5             | 55.9                | 3                | 1.94                    | 9            |
| June  | 170.7                         | 56.4                  | 45.7             | 60.6                | 0                | 1.59                    | 17           |
| July  | 126.3                         | 61.9                  | 53.0             | 63.2                | 0                | 2.00                    | 13           |
| Aug.  | 193.8                         | 63.2                  | 52.9             | 65.6                | 0                | 2.20                    | 11           |
| Sept. | 146.3                         | 54.4                  | 42.9             | 55.6                | 1                | 1.99                    | 14           |
| Oct.  | 90.7                          | 48.6                  | 38.5             | 49.1                | 2                | 3.15                    | 20           |
| Nov.  | 55.0                          | 42.8                  | 33.2             | 42.6                | 13               | 3.33                    | 21           |
| Dec.  | 57.1                          | 37.1                  | 29.0             | 38.3                | 16               | 0.98                    | 10           |
| Year  | 1425.4                        | 48.9                  | 38.7             | 50.0                | 79               | 22.33                   | 164          |



Z/2.3

|       | Total<br>hours of<br>sunshine | Mean Temperature (°F) |                  |                     | Ground<br>frosts | Rainfall<br>total (in.) | Rain<br>days |
|-------|-------------------------------|-----------------------|------------------|---------------------|------------------|-------------------------|--------------|
|       |                               | Air                   | Grass<br>minimum | 1 foot<br>in ground |                  |                         |              |
| 1945  |                               |                       |                  |                     |                  |                         |              |
| Jan.  | 41.8                          | 31.5                  | 24.3             | 33.8                | 24               | 1.75                    | 17           |
| Feb.  | 79.1                          | 44.8                  | 35.2             | 42.2                | 6                | 1.52                    | 13           |
| Mar.  | 150.2                         | 46.0                  | 33.5             | 45.4                | 8                | 0.80                    | 10           |
| Apr.  | 180.3                         | 49.6                  | 36.1             | 52.9                | 7                | 0.78                    | 12           |
| May   | 183.1                         | 54.8                  | 44.0             | 56.6                | 3                | 1.85                    | 15           |
| June  | 204.2                         | 58.0                  | 47.5             | 61.5                | 0                | 2.21                    | 16           |
| July  | 190.1                         | 62.2                  | 51.0             | 64.6                | 0                | 1.95                    | 9            |
| Aug.  | 148.3                         | 60.1                  | 49.4             | 62.5                | 0                | 1.30                    | 15           |
| Sept. | 69.3                          | 57.9                  | 49.4             | 58.2                | 0                | 2.04                    | 15           |
| Oct.  | 114.4                         | 52.9                  | 41.1             | 53.0                | 2                | 2.65                    | 10           |
| Nov.  | 34.6                          | 44.4                  | 37.9             | 46.2                | 4                | 0.49                    | 8            |
| Dec.  | 49.2                          | 40.0                  | 32.1             | 40.8                | 12               | 3.31                    | 18           |
| Year  | 1445.6                        | 50.2                  | 40.1             | 51.5                | 66               | 20.65                   | 158          |
| 1946  |                               |                       |                  |                     |                  |                         |              |
| Jan.  | 56.5                          | 37.0                  | 28.9             | 37.1                | 19               | 1.47                    | 9            |
| Feb.  | 74.6                          | 42.5                  | 35.2             | 41.7                | 6                | 1.98                    | 17           |
| Mar.  | 98.9                          | 40.3                  | 31.0             | 39.8                | 12               | 1.32                    | 9            |
| Apr.  | 202.8                         | 49.2                  | 35.9             | 50.9                | 8                | 1.23                    | 10           |
| May   | 166.3                         | 50.2                  | 37.5             | 53.2                | 4                | 2.07                    | 14           |
| June  | 163.4                         | 55.8                  | 45.9             | 58.0                | 0                | 3.57                    | 20           |
| July  | 223.5                         | 61.8                  | 49.1             | 64.7                | 0                | 1.44                    | 10           |
| Aug.  | 161.1                         | 58.8                  | 46.8             | 60.7                | 0                | 3.38                    | 20           |
| Sept. | 121.0                         | 57.2                  | 46.9             | 57.0                | 0                | 2.66                    | 18           |
| Oct.  | 88.6                          | 48.8                  | 39.3             | 51.2                | 7                | 1.65                    | 11           |
| Nov.  | 40.2                          | 46.1                  | 38.5             | 45.7                | 2                | 4.89                    | 21           |
| Dec.  | 63.9                          | 35.6                  | 26.6             | 36.9                | 19               | 2.08                    | 19           |
| Year  | 1460.3                        | 48.6                  | 38.5             | 49.7                | 77               | 28.24                   | 178          |
| 1947  |                               |                       |                  |                     |                  |                         |              |
| Jan.  | 65.7                          | 34.0                  | 26.9             | 36.1                | 21               | 1.61                    | 15           |
| Feb.  | 32.6                          | 26.6                  | 23.5             | 32.4                | 26               | 1.61                    | 12           |
| Mar.  | 76.1                          | 38.2                  | 31.0             | 36.7                | 12               | 4.72                    | 25           |
| Apr.  | 160.8                         | 47.2                  | 35.4             | 47.0                | 6                | 1.70                    | 13           |
| May   | 192.3                         | 56.2                  | 42.7             | 56.0                | 0                | 1.01                    | 14           |
| June  | 195.4                         | 60.0                  | 45.7             | 63.6                | 0                | 1.46                    | 17           |
| July  | 163.1                         | 63.4                  | 51.5             | 65.5                | 0                | 1.15                    | 11           |
| Aug.  | 267.2                         | 64.9                  | 45.5             | 69.9                | 0                | 0.04                    | 2            |
| Sept. | 159.4                         | 59.2                  | 44.6             | 61.5                | 2                | 1.02                    | 12           |
| Oct.  | 120.0                         | 49.8                  | 35.3             | 51.1                | 9                | 0.23                    | 7            |
| Nov.  | 81.8                          | 44.5                  | 35.4             | 44.3                | 10               | 1.32                    | 16           |
| Dec.  | 32.0                          | 40.9                  | 33.7             | 40.4                | 8                | 2.60                    | 18           |
| Year  | 1546.4                        | 48.7                  | 37.6             | 50.4                | 94               | 18.47                   | 162          |



192 sides

| Year | Month | Day | Time  | Location | Remarks |
|------|-------|-----|-------|----------|---------|
| 1912 | Jan   | 1   | 10:00 | ...      | ...     |
| 1912 | Jan   | 2   | 10:00 | ...      | ...     |
| 1912 | Jan   | 3   | 10:00 | ...      | ...     |
| 1912 | Jan   | 4   | 10:00 | ...      | ...     |
| 1912 | Jan   | 5   | 10:00 | ...      | ...     |
| 1912 | Jan   | 6   | 10:00 | ...      | ...     |
| 1912 | Jan   | 7   | 10:00 | ...      | ...     |
| 1912 | Jan   | 8   | 10:00 | ...      | ...     |
| 1912 | Jan   | 9   | 10:00 | ...      | ...     |
| 1912 | Jan   | 10  | 10:00 | ...      | ...     |
| 1912 | Jan   | 11  | 10:00 | ...      | ...     |
| 1912 | Jan   | 12  | 10:00 | ...      | ...     |
| 1912 | Jan   | 13  | 10:00 | ...      | ...     |
| 1912 | Jan   | 14  | 10:00 | ...      | ...     |
| 1912 | Jan   | 15  | 10:00 | ...      | ...     |
| 1912 | Jan   | 16  | 10:00 | ...      | ...     |
| 1912 | Jan   | 17  | 10:00 | ...      | ...     |
| 1912 | Jan   | 18  | 10:00 | ...      | ...     |
| 1912 | Jan   | 19  | 10:00 | ...      | ...     |
| 1912 | Jan   | 20  | 10:00 | ...      | ...     |
| 1912 | Jan   | 21  | 10:00 | ...      | ...     |
| 1912 | Jan   | 22  | 10:00 | ...      | ...     |
| 1912 | Jan   | 23  | 10:00 | ...      | ...     |
| 1912 | Jan   | 24  | 10:00 | ...      | ...     |
| 1912 | Jan   | 25  | 10:00 | ...      | ...     |
| 1912 | Jan   | 26  | 10:00 | ...      | ...     |
| 1912 | Jan   | 27  | 10:00 | ...      | ...     |
| 1912 | Jan   | 28  | 10:00 | ...      | ...     |
| 1912 | Jan   | 29  | 10:00 | ...      | ...     |
| 1912 | Jan   | 30  | 10:00 | ...      | ...     |
| 1912 | Jan   | 31  | 10:00 | ...      | ...     |
| 1912 | Feb   | 1   | 10:00 | ...      | ...     |
| 1912 | Feb   | 2   | 10:00 | ...      | ...     |
| 1912 | Feb   | 3   | 10:00 | ...      | ...     |
| 1912 | Feb   | 4   | 10:00 | ...      | ...     |
| 1912 | Feb   | 5   | 10:00 | ...      | ...     |
| 1912 | Feb   | 6   | 10:00 | ...      | ...     |
| 1912 | Feb   | 7   | 10:00 | ...      | ...     |
| 1912 | Feb   | 8   | 10:00 | ...      | ...     |
| 1912 | Feb   | 9   | 10:00 | ...      | ...     |
| 1912 | Feb   | 10  | 10:00 | ...      | ...     |
| 1912 | Feb   | 11  | 10:00 | ...      | ...     |
| 1912 | Feb   | 12  | 10:00 | ...      | ...     |
| 1912 | Feb   | 13  | 10:00 | ...      | ...     |
| 1912 | Feb   | 14  | 10:00 | ...      | ...     |
| 1912 | Feb   | 15  | 10:00 | ...      | ...     |
| 1912 | Feb   | 16  | 10:00 | ...      | ...     |
| 1912 | Feb   | 17  | 10:00 | ...      | ...     |
| 1912 | Feb   | 18  | 10:00 | ...      | ...     |
| 1912 | Feb   | 19  | 10:00 | ...      | ...     |
| 1912 | Feb   | 20  | 10:00 | ...      | ...     |
| 1912 | Feb   | 21  | 10:00 | ...      | ...     |
| 1912 | Feb   | 22  | 10:00 | ...      | ...     |
| 1912 | Feb   | 23  | 10:00 | ...      | ...     |
| 1912 | Feb   | 24  | 10:00 | ...      | ...     |
| 1912 | Feb   | 25  | 10:00 | ...      | ...     |
| 1912 | Feb   | 26  | 10:00 | ...      | ...     |
| 1912 | Feb   | 27  | 10:00 | ...      | ...     |
| 1912 | Feb   | 28  | 10:00 | ...      | ...     |
| 1912 | Feb   | 29  | 10:00 | ...      | ...     |
| 1912 | Feb   | 30  | 10:00 | ...      | ...     |
| 1912 | Mar   | 1   | 10:00 | ...      | ...     |
| 1912 | Mar   | 2   | 10:00 | ...      | ...     |
| 1912 | Mar   | 3   | 10:00 | ...      | ...     |
| 1912 | Mar   | 4   | 10:00 | ...      | ...     |
| 1912 | Mar   | 5   | 10:00 | ...      | ...     |
| 1912 | Mar   | 6   | 10:00 | ...      | ...     |
| 1912 | Mar   | 7   | 10:00 | ...      | ...     |
| 1912 | Mar   | 8   | 10:00 | ...      | ...     |
| 1912 | Mar   | 9   | 10:00 | ...      | ...     |
| 1912 | Mar   | 10  | 10:00 | ...      | ...     |
| 1912 | Mar   | 11  | 10:00 | ...      | ...     |
| 1912 | Mar   | 12  | 10:00 | ...      | ...     |
| 1912 | Mar   | 13  | 10:00 | ...      | ...     |
| 1912 | Mar   | 14  | 10:00 | ...      | ...     |
| 1912 | Mar   | 15  | 10:00 | ...      | ...     |
| 1912 | Mar   | 16  | 10:00 | ...      | ...     |
| 1912 | Mar   | 17  | 10:00 | ...      | ...     |
| 1912 | Mar   | 18  | 10:00 | ...      | ...     |
| 1912 | Mar   | 19  | 10:00 | ...      | ...     |
| 1912 | Mar   | 20  | 10:00 | ...      | ...     |
| 1912 | Mar   | 21  | 10:00 | ...      | ...     |
| 1912 | Mar   | 22  | 10:00 | ...      | ...     |
| 1912 | Mar   | 23  | 10:00 | ...      | ...     |
| 1912 | Mar   | 24  | 10:00 | ...      | ...     |
| 1912 | Mar   | 25  | 10:00 | ...      | ...     |
| 1912 | Mar   | 26  | 10:00 | ...      | ...     |
| 1912 | Mar   | 27  | 10:00 | ...      | ...     |
| 1912 | Mar   | 28  | 10:00 | ...      | ...     |
| 1912 | Mar   | 29  | 10:00 | ...      | ...     |
| 1912 | Mar   | 30  | 10:00 | ...      | ...     |
| 1912 | Mar   | 31  | 10:00 | ...      | ...     |
| 1912 | Apr   | 1   | 10:00 | ...      | ...     |
| 1912 | Apr   | 2   | 10:00 | ...      | ...     |
| 1912 | Apr   | 3   | 10:00 | ...      | ...     |
| 1912 | Apr   | 4   | 10:00 | ...      | ...     |
| 1912 | Apr   | 5   | 10:00 | ...      | ...     |
| 1912 | Apr   | 6   | 10:00 | ...      | ...     |
| 1912 | Apr   | 7   | 10:00 | ...      | ...     |
| 1912 | Apr   | 8   | 10:00 | ...      | ...     |
| 1912 | Apr   | 9   | 10:00 | ...      | ...     |
| 1912 | Apr   | 10  | 10:00 | ...      | ...     |
| 1912 | Apr   | 11  | 10:00 | ...      | ...     |
| 1912 | Apr   | 12  | 10:00 | ...      | ...     |
| 1912 | Apr   | 13  | 10:00 | ...      | ...     |
| 1912 | Apr   | 14  | 10:00 | ...      | ...     |
| 1912 | Apr   | 15  | 10:00 | ...      | ...     |
| 1912 | Apr   | 16  | 10:00 | ...      | ...     |
| 1912 | Apr   | 17  | 10:00 | ...      | ...     |
| 1912 | Apr   | 18  | 10:00 | ...      | ...     |
| 1912 | Apr   | 19  | 10:00 | ...      | ...     |
| 1912 | Apr   | 20  | 10:00 | ...      | ...     |
| 1912 | Apr   | 21  | 10:00 | ...      | ...     |
| 1912 | Apr   | 22  | 10:00 | ...      | ...     |
| 1912 | Apr   | 23  | 10:00 | ...      | ...     |
| 1912 | Apr   | 24  | 10:00 | ...      | ...     |
| 1912 | Apr   | 25  | 10:00 | ...      | ...     |
| 1912 | Apr   | 26  | 10:00 | ...      | ...     |
| 1912 | Apr   | 27  | 10:00 | ...      | ...     |
| 1912 | Apr   | 28  | 10:00 | ...      | ...     |
| 1912 | Apr   | 29  | 10:00 | ...      | ...     |
| 1912 | Apr   | 30  | 10:00 | ...      | ...     |
| 1912 | Apr   | 30  | 10:00 | ...      | ...     |

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