

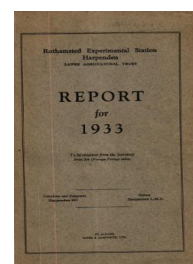
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## Special Groups of Experiments

### Rothamsted Research

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# REPLICATED EXPERIMENTS ON MALTING BARLEY, 1927-1933.

## Summary of Average Responses and Interactions

Grain : cwt. per acre

| Place.           | Year. | Mean Yield. | Average Responses. |                 |       |       | 1st order Interactions. |       |       |       | 2nd order Interaction |           |
|------------------|-------|-------------|--------------------|-----------------|-------|-------|-------------------------|-------|-------|-------|-----------------------|-----------|
|                  |       |             | N                  | St. Error for N | P     | K     | St. Error for P & K     | N × P | N × K | K × P | Standard Error.       | N × P × K |
| Rothamsted       | 1927  | 16.6        | +5.2               | ±1.21           | +1.6  | —     | ±1.21                   | +0.4  | —     | —     | ±2.42                 | —         |
| Rothamsted       | 1928  | 16.6        | +3.4               | ±0.84           | +0.8  | —     | ±0.84                   | +1.1  | —     | —     | ±1.68                 | —         |
| Woburn           | 1928  | 18.2        | +1.0               | ±1.45           | -1.2  | +2.2  | ±1.45                   | -4.1  | -6.6  | -3.8  | ±2.90                 | +7.2      |
| Woburn           | 1929  | 28.8        | +1.2               | ±0.98           | -1.4  | +2.8  | ±0.98                   | -1.6  | -6.0  | -0.6  | ±1.96                 | -3.9      |
| Wellingore       | 1929  | 20.2        | +3.3               | ±0.63           | +0.7  | +1.2  | ±0.63                   | +6.0  | +1.4  | -0.6  | ±1.26                 | +4.5      |
| Rothamsted       | 1929  | 22.9        | +3.5               | ±1.08           | +0.7  | -0.5  | ±0.86                   | +0.8  | -1.6  | -1.4  | ±1.71                 | +4.0      |
| Wellingore       | 1930  | 14.7        | +6.1               | ±0.71           | +0.4  | +0.5  | ±0.70                   | +1.5  | +2.7  | +1.4  | ±1.40                 | +1.6      |
| Sparsholt        | 1930  | 13.9        | +1.5               | ±0.74           | +1.4  | +0.2  | ±0.56                   | -0.3  | -1.2  | +0.3  | ±1.12                 | +0.2      |
| Wellingore       | 1931  | 29.8        | -0.3               | ±0.65           | -0.6  | +0.3  | ±0.88                   | -0.3  | -1.0  | +1.3  | ±1.75                 | -8.2      |
| Wye ..           | 1931  | 22.6        | +3.6               | ±0.61           | +0.9  | +0.5  | ±0.46                   | +0.3  | -1.9  | -1.9  | ±0.92                 | +3.2      |
| Sparsholt        | 1931  | 17.2        | +1.0               | ±0.62           | +0.2  | +0.6  | ±0.43                   | 0.0   | -1.0  | -0.3  | ±0.86                 | +1.0      |
| Wellingore       | 1932  | 30.1        | +1.8               | ±1.18           | -1.5  | 0.0   | ±0.98                   | +2.3  | +0.5  | +0.3  | ±1.96                 | +2.0      |
| Wye..            | 1932  | 28.7        | +2.8               | ±1.64           | +1.4  | -3.0  | ±1.34                   | -2.6  | +0.6  | +0.2  | ±2.69                 | +3.5      |
| Sparsholt        | 1932  | 24.9        | +3.8               | ±1.64           | +0.6  | -0.4  | ±1.38                   | -0.4  | -0.9  | +1.1  | ±2.77                 | +2.4      |
| Wellingore       | 1933  | 23.6        | +3.2               | ±0.76           | +1.8  | —     | ±0.76                   | +0.5  | —     | —     | ±1.53                 | —         |
| Wye..            | 1933  | 26.4        | +5.0               | ±1.46           | +2.2  | —     | ±1.46                   | +1.1  | —     | —     | ±2.92                 | —         |
| Weighted Mean*   | ..    | —           | —                  | —               | +0.64 | +0.25 | —                       | +0.28 | -0.78 | -0.29 | —                     | +1.21     |
|                  | ..    | —           | —                  | —               | ±0.21 | ±0.22 | —                       | ±0.42 | ±0.45 | ±0.45 | —                     | ±0.89     |
| Unweighted Mean* | ..    | 23.16       | +2.91              | —               | +0.68 | -0.20 | —                       | +0.26 | -0.42 | +0.11 | —                     | +1.08     |

\* 1930-33 and Rothamsted 1929.

The responses to nitrogen are either those to sulphate of ammonia or the mean responses to sulphate of ammonia and nitrate of soda.

The dressings per acre in cwt. were as follows :

1927-28 and Wellingore 1929 : 0.2N, 0.486 P<sub>2</sub>O<sub>5</sub>, 0.75K<sub>2</sub>O.

1930-33 and Rothamsted and Woburn 1929 : 0.2N, 0.4 P<sub>2</sub>O<sub>5</sub>, 0.6K<sub>2</sub>O.

Other particulars are given in this and previous reports under the reports of the separate experiments.

## CONCLUSIONS

Woburn differs significantly from the other centres in response to phosphate and potash and in the strong negative interaction between nitrogen and potash. The other first order interactions are also negative (though the differences are not significant).

Excluding Woburn and the early experiments having different levels of manuring, the remaining experiments show a significant response to nitrogen, significantly different for the different experiments (though showing no correlation with year or place). They also show a small but definitely significant general response to phosphate, not significantly different in the different experiments. The general response to potash and the interactions are not significant. The significant depression of yield with potash at Wye in 1932, therefore, and the significant interactions at Wellingore and Wye in 1931 appear to be due to chance and may be ignored.

An earlier series of single plot experiments was carried out in the years 1922-26. There were 51 experiments in which the yields were recorded, carried out at 18 centres. All experiments (with one or two minor exceptions) contained the treatments O, NPK, NP, NK, PK, the levels of manuring being the same as in the replicated experiments 1927-28. The experiments are reported in detail in (1). The mean responses were as follows:

|                                        | Grain<br>cwt. per acre.* | Standard<br>Error.† |
|----------------------------------------|--------------------------|---------------------|
| To Complete Fertiliser (NPK—O) .. .. . | +2.66                    | ±0.385              |
| To Nitrogen (NPK—PK) .. .. .           | +1.82                    | ±0.424              |
| To Phosphate (NPK—NK) .. .. .          | +0.19                    | ±0.344              |
| To Potash (NPK—NP) .. .. .             | —0.11                    | ±0.316              |

\* Dressed grain converted from bushels per acre.

† Computed from the variation in the response under consideration from experiment to experiment.

The average responses to nitrogen and the complete fertiliser are significant. There are indications of a significant variation in response to nitrogen and complete fertiliser from experiment to experiment. The difference in response between the complete fertiliser and the sum of its components does not approach significance (the standard errors shown are not appropriate for testing this difference).

<sup>1</sup> E. J. Russell and L. R. Bishop, "Investigations on Barley. Report on the Ten Years of Experiments under the Institute of Brewing Research scheme, 1922-1931." Supplement to the *Journal of the Institute of Brewing*, Vol. XXXIX., No. 7 (Vol. XXX., new series), 1933.

## EXPERIMENTS ON POULTRY MANURE AND AMMONIUM BICARBONATE

| Centres                                                                                 | Type of Expt. | No. of Plots |
|-----------------------------------------------------------------------------------------|---------------|--------------|
| Rothamsted (See pp. 146-7 for details) .. .. .                                          | 1a            | 48           |
| Woburn (See pp. 154-5 for details) .. .. .                                              | 1             | 24           |
| Lady Manner's School, Bakewell (A) .. .. .                                              | 2             | 16           |
| Lady Manner's School, Bakewell (B) .. .. .                                              | 2             | 16           |
| Grammar School, Burford .. .. .                                                         | 2             | 16           |
| Dartington Hall, Totnes, Devon (A) .. .. .                                              | 1b            | 36           |
| Dartington Hall, Totnes, Devon (B) .. .. .                                              | 1b            | 36           |
| Fakenham School, Norfolk .. .. .                                                        | 2             | 16           |
| County School, Godalming, Surrey .. .. .                                                | 2             | 16           |
| Messrs. Spencer Thomas, Honeydon, Beds. J. W. Dallas, Esq., County<br>Organiser .. .. . | 1             | 32           |
| The High School, Newcastle, Staffs. .. .. .                                             | 2             | 16           |
| Sailors' Orphan Homes School, Newlands, Hull .. .. .                                    | 2             | 16           |
| Hertfordshire Farm Institute, Oaklands, St. Albans .. .. .                              | 1             | 32           |
| T. H. Ream, Esq., Portobello Farm, nr. Potton .. .. .                                   | 1             | 32           |
| Church of England School, Staindrop, Co. Durham .. .. .                                 | 2             | 16           |
| The Horticultural College, Swanley (A) .. .. .                                          | 2b            | 25           |
| The Horticultural College, Swanley (B) .. .. .                                          | 1             | 16           |
| County School, Welshpool, Montgomeryshire (A) .. .. .                                   | 2             | 16           |
| County School, Welshpool, Montgomeryshire (B) .. .. .                                   | 2             | 16           |
| South-Eastern Agricultural College, Wye, Kent (A) .. .. .                               | 2a            | 16           |
| South-Eastern Agricultural College, Wye, Kent (B) .. .. .                               | 1             | 32           |
| Oundle School, Peterborough .. .. .                                                     | 2             | 16           |

### *Experimental Arrangements*

- (1) All combinations of  $\left\{ \begin{smallmatrix} O \\ P.M \end{smallmatrix} \right\} \times \left\{ \begin{smallmatrix} O \\ S/A \end{smallmatrix} \right\} \times \left\{ \begin{smallmatrix} O \\ Super. \end{smallmatrix} \right\}$   
Randomised blocks, second order interaction confounded.
- (1a) All combinations of  $\left\{ \begin{smallmatrix} O \\ P.M \end{smallmatrix} \right\} \times \left\{ \begin{smallmatrix} O \\ \frac{1}{2}S/A \\ S/A \end{smallmatrix} \right\} \times \left\{ \begin{smallmatrix} O \\ Super. \end{smallmatrix} \right\}$   
Randomised blocks.
- (1b) All combinations of  $\left\{ \begin{smallmatrix} O \\ Wet P.M \\ Dry P.M \end{smallmatrix} \right\} \times \left\{ \begin{smallmatrix} O \\ S/A \end{smallmatrix} \right\} \times \left\{ \begin{smallmatrix} O \\ Super. \end{smallmatrix} \right\}$   
Randomised blocks, one interaction degree of freedom confounded.
- (2) No N, S/A, B/A, P.M. }  
(2a) O, S/A, wet and dry P.M. } Latin Squares.  
(2b) O,  $\frac{1}{2}$  S/A, S/A, P.M., Guano. }

### *Rates of Manuring*

Sulphate of ammonia at the rate of 0.6 cwt. N except for Rothamsted (0.6 and 0.3 cwt. N), Dartington Hall (0.57 cwt. N), Oaklands (0.3 cwt. N), Potton (0.4 cwt. N), Swanley (A) (0.6 and 0.229 cwt. N). Superphosphate at the rate of approximately 0.5 cwt.  $P_2O_5$  in types 1, 1a, 1b, except for Oaklands (0.25 cwt.), i.e., the equivalents of the  $P_2O_5$  in the poultry manure. In types 2, 2a, 2b a basal dressing was given, at the rate of 0.6 cwt.  $P_2O_5$  except for Oundle (0.64 cwt.), Swanley (2.0 cwt.) and Wye (0.44 cwt.).

| Place.                 | Area Acres.    | Soil.                        | Variety.              | Manures Applied.              | Seed Sown.            | Harvested.                                         | Previous Crop.        | Basal Manuring (per acre).                                |
|------------------------|----------------|------------------------------|-----------------------|-------------------------------|-----------------------|----------------------------------------------------|-----------------------|-----------------------------------------------------------|
| Bakewell (A) ..        | 1/102          | Limestone                    | Garton's yellow globe | April 10th                    | May 9th               | Oct. 20th-27th                                     | Potatoes              | 2½ cwt. Sulph. Pot.<br>4 cwt. Salt                        |
| Bakewell (B) ..        | 1/102          | Limestone                    | Scotch King Edward    | May 16th-19th                 | May 16th-19th         | Sept. 20th Oct. 4th                                | Swedes                | 2½ cwt. Sulph. Pot.                                       |
| Burford ..             | 1/200          | Brashy Loam                  | King George           | April 28th                    | April 27th            | Sept. 19th-21st                                    | Perm. Grass           | 2½ cwt. Sulph. Pot.                                       |
| Dartington Hall (A) .. | 1/109          | Shale loam                   | Roskoff               | July 14th                     | July 14th             | April 12th-30th                                    | Seeds                 | Nil                                                       |
| Dartington Hall (B) .. | 1/99           | Shale loam                   | Marrow stem           | May 16th                      | May 30th              | Nov. 13th, 20th & 27th                             | Seeds                 | Nil                                                       |
| Fakenham ..            | 1/302          | Sandy loam                   | Majestic              | April 4th                     | April 5th             | Oct. 10th                                          | Potatoes              | 2½ cwt. Sulph. Pot.                                       |
| Godalming ..           | 1/290          | Sandy                        | Field Marshal         | April 24th                    | April 24th            | Sept. 1st                                          | Potatoes              | 2½ cwt. Sulph. Pot.                                       |
| Honeydon ..            | 1/50           | Boulder clay                 | —                     | April 5th & July 5th & 17th   | May 7th               | Nov. 2nd Dec. 14th Feb. 2nd March 16th             | Brussel sprouts       | Nil                                                       |
| Newcastle Newlands ..  | 1/455<br>1/223 | Heavy Heavy alluvium         | Majestic Arran banner | April 8th April 11th-12th     | April 10th April 11th | Oct. 10th Sept. 5th                                | Waste land Vegetables | 2½ cwt. Sulph. Pot.<br>2½ cwt. Sulph. Pot.                |
| Oaklands ..            | 1/56           | Gravel loam                  | King Edward           | April 9th                     | April 11th            | Sept. 27th                                         | Silage                | 2 cwt. Sulph. Pot.<br>15 tons F.Y.M.                      |
| Oundle ..              | 1/60           | Heavy loam                   | Garton's Incomparable | July 3rd                      | June 8th              | Nov. 28th                                          | Wheat                 | Nil                                                       |
| Potterton ..           | 1/50           | Poor light sand              | —                     | April 27th May 18th July 27th | April 27th            | Sept. 25th Nov. 3rd Dec. 29th Feb. 15th Sept. 11th | Runner beans          | 2 cwt. Sulph. Pot.                                        |
| Staindrop ..           | 1/162          | Loam                         | Great Scott           | April 28th June 22nd May 11th | April 28th            | Sept. 11th                                         | Potatoes              | 2½ cwt. Sulph. Pot.                                       |
| Swanley (A) ..         | 1/90           | Light calcareous loam        | Boswells R L          | May 11th                      | May 18th              | Oct. 5th-25th                                      | Brussel sprouts       | 2 cwt. Sulph. Pot.                                        |
| Swanley (B) ..         | 1/50           | Gravelly over chalk          | King Edward           | April 10th                    | April 20th            | Oct. 16th                                          | Strawberries          | 10 tons dung<br>2 cwt. Sulph. Pot.<br>2½ cwt. Sulph. Pot. |
| Welshpool (A) ..       | 1/200          | Medium loam on Wenlock shale | Great Scott           | April 9th                     | April 9th             | Sept. 21st                                         | Mangolds              | 2½ cwt. Sulph. Pot.                                       |
| Welshpool (B) ..       | 1/160          | Medium loam on Wenlock shale | Lord Derby            | May 16th                      | May 20th              | Nov. 8th                                           | Potatoes              | 2½ cwt. Sulph. Pot.                                       |
| Wye (A) ..             | 1/50           | Silt loam                    | Golden Tankard        | April 12th                    | April 22nd            | Oct. 9th                                           | Spring wheat          | 2 cwt. Mur. Pot.                                          |
| Wye (B) ..             | 1/100          | Loam                         | Ronsam park Hero      | April 7th                     | April 12th            | Sept. 5th                                          | Cauliflowers          | 3 cwt. Sulph. Pot.                                        |

*Yields of Separate Treatments. Type 1*

| Place.                  | Crop.                        | Sub-blocks A |                     |                    |                         | Sub-blocks B |             |        |                         | Mean. | Standard Error. |
|-------------------------|------------------------------|--------------|---------------------|--------------------|-------------------------|--------------|-------------|--------|-------------------------|-------|-----------------|
|                         |                              | None.        | Sulph. Amm., Super. | Poul. Man., Super. | Poul. Man., Sulph. Amm. | Poul. Man.   | Sulph. Amm. | Super. | Poul. Man., Sulph. Amm. |       |                 |
| Oaklands<br>Swanley (B) | Potatoes : tons              | 5.16         | 4.86                | 4.93               | 5.00                    | 5.07         | 4.88        | 5.28   | 5.13                    | 5.04  | ±0.360          |
|                         | " "                          | 8.94         | 8.74                | 8.36               | 8.52                    | 8.15         | 9.32        | 8.19   | 7.72                    | 8.49  | ±0.816          |
| Wye (B)                 | Onions : tons                | 7.16         | 6.42                | 8.09               | 7.79                    | 7.64         | 7.76        | 7.50   | 8.77                    | 7.64  | ±0.470          |
| Potton                  | Sprouts : cwt.*              |              |                     |                    |                         |              |             |        |                         |       |                 |
|                         | 1st harvesting               | 1.06         | 2.06                | 2.57               | 3.46                    | 2.84         | 1.78        | 2.06   | 2.73                    | 2.32  |                 |
|                         | 2nd "                        | 4.69         | 5.47                | 4.02               | 5.02                    | 5.69         | 3.68        | 4.35   | 4.35                    | 4.66  |                 |
|                         | 3rd "                        | 9.26         | 11.83               | 10.94              | 11.16                   | 11.05        | 11.83       | 10.82  | 10.16                   | 10.88 |                 |
|                         | 4th "                        | 6.70         | 7.92                | 6.36               | 6.58                    | 6.47         | 7.03        | 7.70   | 6.25                    | 6.88  |                 |
| Honeydon                | Total saleable               | 21.71        | 27.28               | 23.89              | 26.22                   | 26.05        | 24.32       | 24.93  | 23.49                   | 24.74 | ±2.03           |
|                         | Total weight including blown | 26.78        | 35.44               | 30.69              | 34.82                   | 32.09        | 31.53       | 30.24  | 30.92                   | 31.56 |                 |
|                         | Sprouts : cwt.               |              |                     |                    |                         |              |             |        |                         |       |                 |
|                         | 1st harvesting               | 3.94         | 8.66                | 9.34               | 7.31                    | 5.29         | 4.16        | 8.78   | 9.90                    | 7.17  |                 |
|                         | 2nd "                        | 10.13        | 15.98               | 18.12              | 14.52                   | 12.38        | 10.02       | 12.04  | 14.74                   | 13.49 |                 |
| Honeydon                | 3rd "                        | 7.76         | 9.68                | 10.92              | 10.46                   | 7.43         | 7.09        | 7.65   | 12.72                   | 9.21  |                 |
|                         | 4th "                        | 7.65         | 9.45                | 9.45               | 10.35                   | 13.28        | 8.89        | 12.94  | 11.37                   | 10.42 |                 |
|                         | Total saleable               | 29.48        | 43.77               | 47.83              | 42.64                   | 38.38        | 30.16       | 41.41  | 48.73                   | 40.29 | ±1.54           |
|                         | Total weight including blown | 35.22        | 52.55               | 56.27              | 50.87                   | 44.90        | 37.59       | 49.40  | 57.84                   | 48.08 |                 |

\* Nitrate of soda used instead of sulphate of ammonia.



*Comparison of Poultry Manure with Equivalent Artificial. Types 1, 1a and 1b*

| Place              | Crop                               | No<br>Manure | Poultry<br>Manure | S/A<br>and<br>Super. | P.M.—(N + P) |                       |                                  |
|--------------------|------------------------------------|--------------|-------------------|----------------------|--------------|-----------------------|----------------------------------|
|                    |                                    |              |                   |                      | Actual       | Per cent.<br>of yield | Per cent.<br>of mean<br>response |
| Oaklands           | Potatoes : tons                    | 5.21         | 5.02              | 4.91                 | +0.11        | +2.2 ± 8.8            | —                                |
| Swanley            | " "                                | 8.80         | 8.29              | 8.60                 | —0.31        | —3.7 ± 11.8           | —                                |
| Wye                | Onions : tons                      | 7.44         | 7.36              | 6.70                 | +0.66        | +8.7 ± 7.4            | —                                |
| Potton             | Sprouts : Total<br>saleable : cwt. | 21.67        | 26.09             | 27.24                | —1.15        | —4.7 ± 10.1           | 23.0                             |
| Honeydon           | " " " "                            | 28.85        | 39.01             | 43.14                | —4.13        | —10.3 ± 4.7           | 33.8                             |
| Dartington<br>Hall | Broccoli—Centres<br>tons           | 1.39         | 1.37              | 1.54                 | —0.17        | —10.9 ± 13.2          | —                                |
| " " "              | Kale : tons                        | 21.30        | 23.75             | 25.14                | —1.39        | —5.8 ± 3.1            | 44.3                             |
| Rotham-<br>sted    | Sprouts—Total<br>saleable : cwt.   | 30.95        | 27.50             | 31.20                | —3.70        | —12.5 ± 10.3          | —                                |
| Woburn             | " " "                              | 33.76        | 40.63             | 42.94                | —2.31        | —5.7 ± 8.1            | 28.8                             |

In constructing this table the second order interactions are assumed to be negligible except at Rothamsted where there was no confounding.

### *Conclusions*

Sulphate of ammonia and superphosphate give significantly greater yields on the average than poultry manure, there being no significant differences in response (considered as a percentage of mean yield) at the four stations where there was clear response to fertilisers.

*Summary*  
*Types 2, 2a and 2b*

| Place                             | Crop                                                   | No Nitrogen | $\frac{1}{2}$ Sulph. Amm. | Sulph. Amm. | Amm. Bicarb.  | Poultry Manure | Mean  | Standard Error |
|-----------------------------------|--------------------------------------------------------|-------------|---------------------------|-------------|---------------|----------------|-------|----------------|
| Godalming                         | Potatoes : tons per acre                               | 7.83        |                           | 10.15       | 9.45          | 9.44           | 9.22  | 0.323          |
| Staindrop                         | " " " "                                                | 10.62       |                           | 11.90       | 11.63         | 11.56          | 11.43 | 0.507          |
| Welshpool (A)                     | " " " "                                                | 7.63        |                           | 8.95        | 8.86          | 8.70           | 8.53  | 0.250          |
| Burford                           | " " " "                                                | 6.81        |                           | 7.25        | 6.67          | 7.59           | 7.08  | 0.155          |
| Newcastle                         | " " " "                                                | 12.15       |                           | 12.36       | 12.28         | 12.18          | 12.24 | 0.925          |
| Fakenham                          | " " " "                                                | 8.61        |                           | 9.27        | 9.32          | 9.50           | 9.17  | 0.304          |
| Bakewell (B)                      | " " " "                                                | 6.65        |                           | 8.29        | 7.77          | 7.70           | 7.60  | 0.287          |
| Newlands                          | " " " "                                                | 11.57       |                           | 12.09       | 11.67         | 12.23          | 11.89 | 0.633          |
| <i>Mean of Potato Experiments</i> |                                                        | 8.98        |                           | 10.03       | 9.71          | 9.86           | 9.64  | 0.172          |
| Welshpool (B)                     | Swedes : Roots : tons per acre                         | 8.50        |                           | 10.32       | 10.64         | 9.68           | 9.78  | 0.612          |
|                                   | Tops : " "                                             | 2.39        |                           | 3.43        | 3.64          | 4.09           | 3.39  | 0.263          |
| Oundle                            | Swedes : Roots ,,                                      | 7.41        |                           | 10.03       | 8.53          | 6.84           | 8.20  | 0.491          |
| Bakewell (A)                      | Mangolds : Roots tons per acre                         | 24.91       |                           | 28.19       | 27.35         | 26.46          | 26.73 | 0.557          |
| Wye (A)                           | " " " "                                                | 24.29       |                           | 28.54       | WetP.M. 23.62 | 26.27          | 25.68 | 0.542          |
| Swanley (A)                       | Brussel Sprouts : cwt. per acre 1st and 2nd pickings*† | 3.11        | 2.58                      | 2.17        | Guano 2.87    | 3.91           | 2.93  | 0.665          |
|                                   | Total of all pickings†                                 | 25.16       | 22.19                     | 19.50       | 21.95         | 23.43          | 22.45 | 1.299          |
|                                   | Total of blown sprouts                                 | 8.88        | 7.38                      | 7.90        | 9.06          | 9.34           | 8.51  |                |

\*First picking October 5th, second picking October 18th. After this eleven more pickings were made, but most of the individual pickings did not cover the whole experiment and are not worth considering separately.

†Saleable sprouts.

*Conclusions*

Most of the experiments show a significant response to nitrogen. The yields of potatoes with poultry manure and ammonium bicarbonate are less, but not significantly so, than with sulphate of ammonia. Swedes and mangolds give significantly smaller yields with poultry manure than with sulphate of ammonia; the difference with ammonium bicarbonate is not significant. Wet poultry manure at Wye produced no response. Sulphate of ammonia depressed the yields of sprouts at Swanley significantly whereas the depression with poultry manure was small and not significant, being significantly less than the depression with sulphate of ammonia; guano occupied an intermediate position.

## SUGAR BEET FERTILISER EXPERIMENTS

### FACTORY SERIES

Treatments : All combinations of sulphate of ammonia at the rate of 0.4 cwt. N, superphosphate at the rate of 0.4 cwt.  $P_2O_5$ , and muriate of potash at the rate of 0.5 cwt.  $K_2O$  per acre.  
 System of replication : 6 randomised blocks of 4 plots each (the second order interaction being confounded) at each of 14 centres.  
 Area of each plot : 1/10 acre. (Ipswich : 0.0684. Newark : 0.0975. Felstead : 0.0485. Poppleton : 0.0905. Wissington : 0.0875. King's Lynn : 0.0981. Ely : 0.0833. Cantley : 0.0978.)  
 Varieties : Ely and Peterborough, Kuhn P.; King's Lynn, Marsters; Poppleton, Dobrovica; remainder, Kleinwanzleben E.  
 Mechanical and chemical analyses of soil samples from each experiment have been carried out.

| Factory               | Soil                | Previous Crop  | Date of Sowing       | Date of Harvesting   | Farming notes                                                                                                                                                                                                                                                             |
|-----------------------|---------------------|----------------|----------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Balderton (Newark) | Sandy loam          | —              | —                    | —                    | Very acid, crop failed.                                                                                                                                                                                                                                                   |
| 2. Ipswich            | Sandy loam          | Beet           | April 25th           | Oct. 16-23rd         | Dung for 1932 beet, tops folded by sheep in autumn.                                                                                                                                                                                                                       |
| 3. Colwick            | Sandy loam          | Oats           | May 10th             | Nov. 16-21st         | 10 cwt. lime per acre a few days before sowing.                                                                                                                                                                                                                           |
| 4. Newark             | Sandy loam          | Wheat (dunged) | April 24th & May 1st | Nov. 2-6th           | Not highly farmed recently.                                                                                                                                                                                                                                               |
| 5. Felstead           | Heavy loam on clay. | Beet           | May 5th              | Nov. 1st             | 6 tons chalk per acre for beet.                                                                                                                                                                                                                                           |
| 6. Brigg              | Sandy loam          | Wheat          | April 25th           | Oct. 16-17th         | Held out well against drought but not up to standard of district.                                                                                                                                                                                                         |
| 7. Poppleton          | Sandy loam          | Kale           | April 28-29th        | Sept. 30th-Oct. 3rd. | Poorish land very highly farmed. Previous crop kale sheeped with cake.                                                                                                                                                                                                    |
| 8. Bardney            | Sandy loam          | Barley         | May 9th              | Nov. 14-16th         | Dunged in Dec., 1932, at 10 loads per acre. Wireworm damage.                                                                                                                                                                                                              |
| 9. Allscott           | Sandy loam          | Clover Hay     | May 8th.             | Nov. 9th.            | Field naturally poor but highly farmed.                                                                                                                                                                                                                                   |
| 10. Wissington        | Sandy loam          | Barley         | May 11th             | Nov. 15-20th         | Poor land well cultivated.                                                                                                                                                                                                                                                |
| 11. Peterboro'        | Heavy fen           | Peas (dunged)  | May 12th             | Dec. 1-14th          |                                                                                                                                                                                                                                                                           |
| 12. King's Lynn       | Fine sandy Loam     | Early potatoes | April 14th           | Oct. 20-21st         | Rich soil, with fairly high water table. $\frac{1}{2}$ cwt. Nitrate of soda given in June.                                                                                                                                                                                |
| 13. Ely               | Rich clay fen       | Beet           | April 11th           | Nov. 25-28th         | After 2 beet crops.                                                                                                                                                                                                                                                       |
| 14. Cantley           | Sandy loam          | Potatoes       | April 27th           | Dec. 18-19th         | 5 tons waste lime in Jan., 1933. Poor soil very well farmed. Crop so damaged by wireworm that in June it was proposed by the grower to abandon the experiment as a failure. The soil is on a terrace which may receive water and nutrients by seepage from higher ground. |

*Plant Density (Mean Values)*

| Centre          | Yield in tons per acre. | Plants in thousands per acre. | Distance in inches between rows | Weight of roots in lbs. per plant. | Increase in yield for one additional beet | S.E. per plot t.p.a. Adjusting for plant number |       |
|-----------------|-------------------------|-------------------------------|---------------------------------|------------------------------------|-------------------------------------------|-------------------------------------------------|-------|
| 3. Colwick      | 7.2                     | 32                            | 19½                             | 0.5                                | —                                         | ±1.12                                           | —     |
| 5. Felstead     | 9.1                     | 22                            | 23                              | 0.9                                | 1.918                                     | ±0.70                                           | ±0.62 |
| 6. Brigg        | 10.7                    | 25                            | 18                              | 1.0                                | 1.942                                     | ±0.93                                           | ±0.91 |
| 8. Bardney      | 12.3                    | 19                            | 21                              | 1.4                                | -0.748                                    | ±1.73                                           | ±1.81 |
| 9. Allscott     | 12.4                    | 22                            | 20                              | 1.3                                | -0.008                                    | ±0.68                                           | ±0.71 |
| 12. King's Lynn | 14.4                    | 37                            | 18                              | 0.9                                | —                                         | ±0.81                                           | —     |
| 14. Cantley     | 16.4                    | 25                            | 17                              | 1.5                                | 1.850                                     | ±1.70                                           | ±1.50 |

*Sampling errors in Sampling for Sugar Content*

(10 Roots in Each Sample)

| Centre               | No. of samples analysed per plot | Standard Error Per Sample |
|----------------------|----------------------------------|---------------------------|
| 4. Newark .. ..      | 2                                | 0.37                      |
| 6. Brigg .. ..       | 2                                | 0.27                      |
| 9. Allscott .. ..    | 2                                | 0.52*                     |
| 10. Wissington .. .. | 4                                | 0.36                      |
| 13. Ely .. ..        | 4                                | 0.48                      |
| 14. Cantley .. ..    | 2                                | 0.32                      |

\* Estimate of S.E. between plots is lower (but not significantly so) than 0.52 and probably 0.46 is the best estimate of sampling error.

*Summary Tables*

See following pages.

*Conclusions*

The responses of roots to sulphate of ammonia and potash are significantly different at the different centres, and there is a significant negative interaction between them, though this interaction does not differ significantly from centre to centre.

The sugar percentages are significantly decreased by sulphate of ammonia, and increased by potash, the variations in these effects from centre to centre not being significant.

The tops on those experiments where they were weighed show significantly different responses to sulphate of ammonia at the different centres, but show no potash effects.

The responses to superphosphate are not significant when considered as a whole, nor are there any significant interactions involving superphosphate.

It is difficult to offer any explanation of the complex significant effects on plant number at Allscott.

*Yields of Individual Treatments*

| Centre.                        | Mean of all<br>Treatments. | Sub-blocks A. |       |       |       | Sub-blocks B. |       |       |       | Standard<br>Error | S.E.<br>Per Plot |
|--------------------------------|----------------------------|---------------|-------|-------|-------|---------------|-------|-------|-------|-------------------|------------------|
|                                |                            | O             | NP    | NK    | PK    | N             | P     | K     | NPK   |                   |                  |
|                                |                            |               |       |       |       |               |       |       |       |                   |                  |
| Roots (washed) tons per acre : |                            |               |       |       |       |               |       |       |       |                   |                  |
| 2. Ipswich                     | 5.17                       | 5.5           | 5.4   | 5.1   | 5.0   | 5.2           | 4.9   | 5.2   | 5.0   | ±0.25             | ±0.43            |
| 3. Colwick                     | 7.17                       | 5.7           | 8.2   | 7.4   | 6.6   | 7.9           | 6.5   | 6.9   | 8.2   | ±0.65             | ±1.12            |
| 4. Newark                      | 8.29                       | 8.2           | 8.7   | 9.0   | 9.6   | 7.9           | 8.0   | 7.2   | 7.7   | ±0.51             | ±0.88            |
| 5. Felstead                    | 9.09                       | 8.4           | 8.8   | 9.3   | 9.5   | 9.0           | 8.9   | 9.1   | 9.5   | ±0.41             | ±0.70            |
| 6. Brigg                       | 10.74                      | 10.3          | 11.3  | 12.9  | 10.5  | 11.9          | 9.2   | 9.3   | 10.4  | ±0.54             | ±0.93            |
| 7. Poppleton                   | 11.71                      | 11.8          | 11.1  | 11.0  | 12.0  | 12.4          | 11.4  | 11.6  | 12.3  | ±0.53             | ±0.92            |
| 8. Bardney                     | 12.32                      | 11.5          | 12.9  | 13.8  | 11.3  | 12.1          | 12.2  | 11.8  | 12.9  | ±1.00             | ±1.73            |
| 9. Allscott                    | 12.38                      | 11.7          | 12.9  | 12.8  | 13.3  | 12.1          | 10.5  | 13.3  | 12.5  | ±0.39             | ±0.68            |
| 10. Wissington                 | 13.82                      | 14.9          | 14.9  | 14.0  | 14.2  | 13.3          | 12.9  | 12.8  | 13.4  | ±0.40             | ±0.69            |
| 11. Peterborough               | 14.06                      | 13.9          | 14.4  | 14.3  | 15.2  | 14.2          | 13.8  | 13.9  | 12.8  | ±0.37             | ±0.63            |
| 12. King's Lynn                | 14.36                      | 14.9          | 14.3  | 13.8  | 14.1  | 14.9          | 14.6  | 14.6  | 13.7  | ±0.47             | ±0.81            |
| 13. Ely                        | 14.74                      | 13.9          | 15.5  | 14.6  | 15.3  | 14.6          | 14.7  | 14.6  | 14.7  | ±0.52             | ±0.90            |
| 14. Cantley                    | 16.36                      | 16.7          | 16.7  | 15.5  | 16.9  | 14.9          | 16.4  | 17.1  | 16.7  | ±0.98             | ±1.70            |
| Mean                           | 11.53                      | 11.32         | 11.92 | 11.78 | 11.78 | 11.55         | 11.06 | 11.32 | 11.50 |                   |                  |
| Sugar Percentage               |                            |               |       |       |       |               |       |       |       |                   |                  |
| 2. Ipswich                     | 15.92                      | 16.4          | 15.0  | 15.9  | 16.4  | 15.6          | 16.0  | 16.6  | 15.5  | ±0.45             | ±0.78            |
| 3. Colwick                     | 15.10                      | 14.8          | 14.8  | 15.0  | 15.0  | 15.2          | 15.2  | 15.7  | 15.2  | ±0.46             | ±0.79            |
| 4. Newark                      | 16.23                      | 16.4          | 15.8  | 16.2  | 16.5  | 16.3          | 16.3  | 16.5  | 15.9  | ±0.17             | ±0.29            |
| 5. Felstead                    | 16.72                      | 16.9          | 16.4  | 16.5  | 17.4  | 16.2          | 17.1  | 16.8  | 16.4  | ±0.18             | ±0.32            |
| 6. Brigg                       | 17.74                      | 18.0          | 17.6  | 17.7  | 17.8  | 17.5          | 17.8  | 18.1  | 17.5  | ±0.14             | ±0.23            |
| 7. Poppleton                   | 17.94                      | 17.9          | 17.7  | 18.3  | 18.1  | 17.6          | 18.0  | 18.1  | 17.8  | ±0.37             | ±0.64            |
| 8. Bardney                     | 16.15                      | 16.3          | 16.0  | 16.1  | 16.3  | 15.4          | 16.5  | 16.7  | 15.9  | ±0.40             | ±0.70            |
| 9. Allscott                    | 15.93                      | 15.8          | 15.8  | 16.2  | 16.3  | 15.5          | 15.8  | 16.2  | 15.8  | ±0.16             | ±0.28            |
| 10. Wissington                 | 16.40                      | 16.6          | 16.2  | 16.5  | 17.0  | 15.7          | 16.7  | 16.6  | 16.0  | ±0.23             | ±0.41            |
| 11. Peterborough               | 14.84                      | 14.8          | 14.6  | 14.8  | 15.5  | 14.8          | 14.8  | 14.6  | 14.9  | ±0.31             | ±0.54            |
| 12. King's Lynn                | 16.69                      | 16.5          | 17.3  | 16.8  | 17.0  | 16.3          | 17.1  | 15.8  | 16.6  | ±0.42             | ±0.72            |
| 13. Ely                        | 15.89                      | 15.9          | 15.8  | 15.9  | 15.7  | 15.9          | 16.2  | 15.9  | 15.8  | ±0.27             | ±0.46            |
| 14. Cantley                    | 15.70                      | 16.0          | 15.3  | 15.7  | 15.8  | 15.3          | 16.0  | 15.7  | 15.8  | ±0.30             | ±0.52            |
| Mean                           | 16.25                      | 16.33         | 16.02 | 16.28 | 16.52 | 15.95         | 16.42 | 16.41 | 16.08 |                   |                  |

| Centre.                           | Mean of all<br>Treatments | Sub-blocks A. |       |       |       | Sub-blocks B. |       |       |       | Standard<br>Error. | S.E.<br>Per Plot |
|-----------------------------------|---------------------------|---------------|-------|-------|-------|---------------|-------|-------|-------|--------------------|------------------|
|                                   |                           | O             | NP    | NK    | PK    | N             | P     | K     | NPK   |                    |                  |
| Plant Number : thousands per acre |                           |               |       |       |       |               |       |       |       |                    |                  |
| 5. Felstead                       | 22.4                      | 20.9          | 21.9  | 22.7  | 23.0  | 21.9          | 23.9  | 21.5  | 23.8  | ±0.71              | ±1.22            |
| 6. Brigg ..                       | 24.7                      | 23.5          | 25.2  | 24.3  | 24.9  | 24.3          | 25.6  | 24.2  | 25.6  | ±1.11              | ±1.92            |
| 8. Bardney                        | 18.8                      | 17.1          | 19.0  | 19.2  | 19.1  | 19.0          | 19.2  | 18.9  | 19.0  | ±0.62              | ±1.07            |
| 9. Allscott                       | 22.4                      | 20.3          | 25.4  | 22.1  | 20.5  | 21.8          | 21.4  | 26.7  | 21.4  | ±1.08              | ±1.88            |
| 14. Cantley                       | 25.4                      | 25.8          | 25.7  | 25.4  | 24.8  | 24.9          | -25.1 | 26.2  | 25.6  | ±0.63              | ±1.09            |
| Mean                              | 22.77                     | 21.53         | 23.44 | 22.74 | 22.46 | 22.37         | 23.05 | 23.51 | 23.08 |                    |                  |
| Tops : tons per acre              |                           |               |       |       |       |               |       |       |       |                    |                  |
| 4. Newark                         | 6.05                      | 6.3           | 6.4   | 6.7   | 6.7   | 5.9           | 5.4   | 4.7   | 6.2   | ±0.43              | ±0.74            |
| 6. Brigg ..                       | 6.56                      | 5.1           | 7.8   | 8.2   | 5.7   | 8.2           | 5.3   | 5.1   | 7.0   | ±0.42              | ±0.73            |
| 7. Poppleton                      | 9.59                      | 8.6           | 10.1  | 9.6   | 8.0   | 11.0          | 8.1   | 10.3  | 11.1  | ±0.87              | ±1.52            |
| 9. Allscott                       | 10.99                     | 9.9           | 10.5  | 11.5  | 10.2  | 11.9          | 11.8  | 10.6  | 11.4  | ±1.08              | ±1.88            |
| 13. Ely ..                        | 21.96                     | 21.4          | 22.6  | 21.1  | 23.6  | 21.3          | 21.1  | 22.0  | 22.7  | ±0.83              | ±1.44            |
| Mean                              | 11.03                     | 10.26         | 11.48 | 11.42 | 10.84 | 11.66         | 10.34 | 10.54 | 11.68 |                    |                  |
| Percentage Purity                 |                           |               |       |       |       |               |       |       |       |                    |                  |
| 12. King's Lynn                   | 90.4                      | 90.3          | 90.6  | 89.8  | 90.8  | 90.0          | 90.7  | 90.3  | 90.5  | ±0.10              | ±0.18            |

## Mean responses and interactions

\* 5 per cent Significance. \*\* 1 per cent. Significance.

| Centre.                        | Mean Yield. | Mean response to |        |         | Standard Error. | Interactions |         |        | Standard Error. |
|--------------------------------|-------------|------------------|--------|---------|-----------------|--------------|---------|--------|-----------------|
|                                |             | N                | P      | K       |                 | N × P        | N × K   | P × K  |                 |
|                                |             |                  |        |         |                 |              |         |        |                 |
| Roots (washed) : tons per acre |             |                  |        |         |                 |              |         |        |                 |
| 2. Ipswich                     | 5.17        | +0.02            | -0.17  | -0.15   | ±0.17           | +0.44        | -0.12   | +0.06  | ±0.35           |
| 3. Colwick                     | 7.17        | +1.53**          | +0.36  | +0.21   | ±0.46           | +0.28        | -0.92   | -0.30  | ±0.93           |
| 4. Newark                      | 8.29        | +0.10            | +0.39  | +0.20   | ±0.36           | -1.28        | -0.26   | +0.24  | ±0.72           |
| 5. Felstead                    | 9.09        | +0.17            | +0.26  | +0.56   | ±0.29           | -0.44        | -0.16   | +0.18  | ±0.58           |
| 6. Brigg ..                    | 10.74       | +1.76**          | -0.74  | +0.10   | ±0.38           | -1.65        | -0.06   | +0.19  | ±0.76           |
| 7. Poppleton                   | 11.71       | +0.02            | -0.02  | +0.04   | ±0.38           | -0.04        | -0.27   | +1.66* | ±0.75           |
| 8. Bardney                     | 12.32       | +1.26            | +0.01  | +0.30   | ±0.71           | -0.14        | +1.10   | -1.48  | ±1.42           |
| 9. Allscott                    | 12.38       | +0.38            | -0.16  | +1.16** | ±0.28           | +0.84        | -2.08** | 0.00   | ±0.55           |
| 10. Wissington                 | 13.82       | +0.20            | +0.08  | -0.39   | ±0.28           | +0.82        | +0.09   | +0.61  | ±0.56           |
| 11. Peterborough               | 14.06       | -0.29            | -0.03  | -0.03   | ±0.26           | -1.26*       | -1.44*  | -0.10  | ±0.52           |
| 12. King's Lynn                | 14.36       | -0.39            | -0.33  | -0.65   | ±0.33           | +0.06        | -0.38   | +0.16  | ±0.66           |
| 13. Ely ..                     | 14.74       | +0.24            | +0.63  | +0.12   | ±0.36           | -0.21        | -1.00   | -0.53  | ±0.73           |
| 14. Cantley                    | 16.36       | -0.83            | +0.62  | +0.36   | ±0.69           | +1.70        | -0.08   | -0.26  | ±1.38           |
| Mean .. ..                     | 11.53       | +0.32            | +0.07  | +0.14   |                 | -0.07        | -0.43   | +0.03  |                 |
| Sugar Percentage               |             |                  |        |         |                 |              |         |        |                 |
| 2. Ipswich                     | 15.92       | -0.84*           | -0.38  | +0.34   | ±0.320          | -0.20        | +0.10   | +0.14  | ±0.640          |
| 3. Colwick                     | 15.10       | -0.13            | -0.12  | +0.22   | ±0.322          | +0.10        | -0.30   | -0.26  | ±0.643          |
| 4. Newark                      | 16.23       | -0.38**          | -0.22  | +0.12   | ±0.119          | -0.32        | -0.15   | +0.14  | ±0.238          |
| 5. Felstead                    | 16.72       | -0.66**          | +0.22  | +0.14   | ±0.129          | -0.35        | +0.02   | -0.01  | ±0.258          |
| 6. Brigg ..                    | 17.74       | -0.36**          | -0.14  | +0.09   | ±0.096          | +0.18        | -0.01   | -0.17  | ±0.191          |
| 7. Poppleton                   | 17.94       | -0.15            | -0.05  | +0.25   | ±0.263          | -0.24        | +0.24   | -0.30  | ±0.526          |
| 8. Bardney                     | 16.15       | -0.62*           | +0.01  | +0.21   | ±0.286          | +0.32        | +0.18   | -0.68  | ±0.573          |
| 9. Allscott                    | 15.93       | -0.19            | +0.02  | +0.39** | ±0.113          | -0.08        | -0.08   | -0.28  | ±0.226          |
| 10. Wissington                 | 16.40       | -0.62**          | +0.12  | +0.24   | ±0.166          | -0.23        | +0.22   | -0.33  | ±0.331          |
| 11. Peterborough               | 14.84       | -0.15            | +0.22  | +0.20   | ±0.222          | -0.53        | -0.16   | +0.63  | ±0.444          |
| 12. King's Lynn                | 16.69       | +0.14            | +0.63* | -0.24   | ±0.294          | -0.48        | +0.32   | -0.32  | ±0.587          |
| 13. Ely ..                     | 15.89       | -0.07            | -0.04  | -0.13   | ±0.189          | -0.14        | +0.14   | -0.26  | ±0.378          |
| 14. Cantley                    | 15.70       | -0.33            | +0.07  | +0.14   | ±0.212          | -0.06        | +0.68   | +0.14  | ±0.424          |
| Mean .. ..                     | 16.25       | -0.34            | +0.03  | +0.15   |                 | -0.16        | +0.09   | -0.12  |                 |

| Centre                            | Mean Yield | Mean response to |         |       | Standard Error. | Interactions |        |         | Standard Error. |
|-----------------------------------|------------|------------------|---------|-------|-----------------|--------------|--------|---------|-----------------|
|                                   |            | N                | P       | K     |                 | N × P        | N × K  | P × K   |                 |
| Total Sugar : cwt. per acre       |            |                  |         |       |                 |              |        |         |                 |
| 2. Ipswich                        | 16.46      | -0.80            | -0.94   | -0.12 |                 | +1.20        | -0.28  | +0.34   |                 |
| 3. Colwick                        | 21.66      | +4.44            | +0.92   | +0.94 |                 | +0.98        | -3.20  | -1.28   |                 |
| 4. Newark                         | 26.90      | -0.30            | +0.90   | +0.84 |                 | -4.68        | -1.10  | +1.00   |                 |
| 5. Felstead                       | 29.46      | -0.62            | +1.22   | +2.06 |                 | -2.02        | -0.50  | +0.56   |                 |
| 6. Brigg                          | 38.10      | +5.48            | -2.92   | +0.54 |                 | -5.46        | -0.24  | +0.30   |                 |
| 7. Poppleton                      | 42.02      | -0.28            | -0.18   | +0.72 |                 | -0.70        | -0.40  | +5.26   |                 |
| 8. Bardney                        | 39.80      | +2.54            | +0.06   | +1.48 |                 | +0.34        | +4.00  | -6.46   |                 |
| 9. Allscott                       | 39.44      | +0.74            | -0.46   | +4.66 |                 | +2.48        | -6.82  | -0.70   |                 |
| 10. Wissington                    | 45.32      | -1.06            | +0.60   | -0.62 |                 | +2.06        | +0.90  | +1.08   |                 |
| 11. Peterborough                  | 41.72      | -1.28            | +0.52   | +0.48 |                 | -5.24        | -4.72  | +1.48   |                 |
| 12. King's Lynn                   | 47.94      | -0.90            | +0.70   | -2.86 |                 | -1.18        | -0.34  | -0.38   |                 |
| 13. Ely                           | 46.84      | +0.56            | +1.88   | 0.00  |                 | -1.08        | -2.76  | -2.44   |                 |
| 14. Cantley                       | 51.36      | -3.68            | +2.18   | +1.58 |                 | +5.14        | +1.98  | -0.36   |                 |
| Mean                              | 37.46      | +0.37            | +0.34   | +0.75 |                 | -0.63        | -1.04  | -0.12   |                 |
| Plant Number : thousands per acre |            |                  |         |       |                 |              |        |         |                 |
| 5. Felstead                       | 22.45      | +0.25            | +1.40*  | +0.60 |                 | -1.70        | +1.50  | -0.20   | ±1.00           |
| 6. Brigg                          | 24.70      | +0.30            | +1.25   | +0.13 |                 | -0.22        | +0.22  | -0.42   | ±1.57           |
| 8. Bardney                        | 18.81      | +0.48            | +0.52   | +0.48 |                 | -1.25        | -0.75  | -1.05   | ±0.87           |
| 9. Allscott                       | 22.45      | +0.45            | -0.55   | +0.45 |                 | +4.00*       | -4.60* | -5.80** | ±1.53           |
| 14. Cantley                       | 25.44      | -0.08            | -0.28   | +0.12 |                 | +1.55        | +0.15  | -0.65   | ±0.89           |
| Mean                              | 22.77      | +0.28            | +0.47   | +0.36 |                 | +0.48        | -0.70  | -1.62   |                 |
| Tops : tons per acre              |            |                  |         |       |                 |              |        |         |                 |
| 4. Newark                         | 6.05       | +0.51            | +0.28   | +0.05 |                 | -0.58        | +0.46  | +0.92   | ±0.61           |
| 6. Brigg                          | 6.56       | +2.51**          | -0.20   | -0.10 |                 | -1.21        | -0.57  | -0.18   | ±0.60           |
| 7. Poppleton                      | 9.59       | +1.76*           | -0.55   | +0.28 |                 | +1.70        | -1.04  | +0.28   | ±1.24           |
| 9. Allscott                       | 10.99      | +0.70            | -0.03   | -0.11 |                 | -1.44        | +0.66  | -0.50   | ±1.53           |
| 13. Ely                           | 21.96      | -0.10            | +1.03   | +0.78 |                 | +0.85        | -1.59  | +1.09   | ±1.18           |
| Mean                              | 11.03      | +1.08            | +0.11   | +0.18 |                 | -0.14        | -0.42  | +0.32   |                 |
| Percentage Purity.                |            |                  |         |       |                 |              |        |         |                 |
| 12. King's Lynn                   | 90.40      | -0.32**          | +0.56** | -0.06 |                 | +0.17        | -0.21  | +0.04   | ±0.15           |