

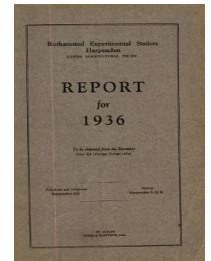
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Special Groups of Experiments

Rothamsted Research

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EXPERIMENTS ON POULTRY MANURE

Centres.	Type of Experiment	No. of plots	Year
Rothamsted (see pp. 223 for details)	2CR	48	3
Woburn (see pp. 229 for details)	2CR	48	3
Lady Manner's School, Bakewell (A)	1C	16	3
Lady Manners' School, Bakewell (B)	1C	16	3
Grammar School, Burford	1C	16	3
Senior School, Cadishead, Lancs.	1	12	1
St. Joseph's School, Castleford, Yorks.	1	16	1
T. Hughes, Esq., Chittoe, Wilts.	2CR	24	3
Royal Agricultural College, Cirencester	2CR	36	1
Fakenham School, Norfolk	1C	16	3
County School, Godalming, Surrey	1C	16	3
Sailors' Orphan Homes School, Newlands, Hull	1C	16	2
A. G. Brightman, Esq., Maulden, Beds. J. W. Dallas, Esq., County Organiser	3	24	2
The High School, Newcastle, Staffs.	1C	16	2
Norton New Council School, Doncaster, York	1	16	1
Hertfordshire Farm Institute, Oaklands, St. Albans (A)	1a	25	1
Hertfordshire Farm Institute, Oaklands, St. Albans (B)	2aCR	36	2
L. Pope, Esq., Pelton, Durham	1C	12	2
Cheshire School of Agriculture, Reaseheath, Nantwich, Cheshire..	2CR	36	1
J. Martland, Ltd., Rufford, Ormskirk. J. J. Green, Esq., County Organiser	2CR	24	1
Church of England School, Staindrop, Darlington, Co. Durham ..	1C	16	3
J. Bonner, Esq., Steppingley, Beds.	2CR	24	3
County School, Welshpool, Montgomeryshire	1C	16	3
Central School, Withernsea, E. Yorks.	1	16	1
R. S. Maudlin, Esq., Wyboston. J. W. Dallas, Esq., County Organiser	2R	24	3
F. J. Broughton, Esq., Yeabridge, South Petherton, Somerset ..	2CR	36	1

Experimental arrangements

- (1) 2
- ²
- factorial design. O, P.M., S/A.

4 × 4 Latin squares or randomised blocks.

* Basal manuring ; 1.0 cwt. K₂O and 0.8 cwt. P₂O₅ per acre.

- (1a) O, P.M., S/A, Soot, S/A and Soot.

- (1c) Cumulative ; As (1) with treatments repeated on the same plots each year.

- (2CR) Immediate, cumulative and residual effects. Manures S/A (S) and P.M. (M). Treatments as follows ;

1st year	..	..	O	O	1S	1M	2S	2M
2nd year	..	..	2S	2M	1S	1M	O	O
3rd year	..	..	O	O	1S	1M	2S	2M

*Basal manuring : 1.0 cwt. K₂O and 1.0 cwt. P₂O₅ per acre.

- (2aCR) As (2CR), with soot.

- (2R) As (2CR), for the first two years, but with no treatments in the third year.

- (3) Immediate, cumulative and residual effects. Treatments as follows ;

1st year	..	..	O	O	M	M	O	O	S	S
2nd year	..	..	O	M	O	M	O	S	O	S
3rd year	..	..	M	M	O	O	S	S	O	O
4th year	..	..	M	O	M	O	S	O	S	O

Randomised blocks.

Basal manuring : 1.0 cwt. K₂O and 0.8 cwt. P₂O₅ per acre. NOTE.—In all cases the mineral manures per plot were made up to 1.0 cwt. K₂O and 0.8 cwt. or 1.0 cwt. P₂O₅, using muriate of potash and superphosphate.*Rates of manuring*

- (1), (1C) N at the rate of O, 0.6 and 1.2 cwt. per acre.

- (1a) N at the rate of 1.0 and 2.0 cwt. per acre.

- (2), (2CR), (2aCR) N at the rate of O, 0.4 and 0.8 cwt. per acre.

- (3) N at the rate of O, and 0.6 cwt. per acre.

Place	Crop	Area Acres	Soil	Variety	Manures applied	Seed sown	Harvested	Previous Crop
Bakewell (A)	Mangolds	2/205	Limestone loam	Yellow Globe	May 7	May 8	Oct. 16-30	Kale
Bakewell (B)*	Rye grass	2/205	Limestone loam	Westernwolds	May 1-11	May 15	Aug. 31	Mangolds
Burford	Swedes	1/120	Limestone loam	—	May 2	May 25	Nov. 6	Kale
Cadishhead	Potatoes	1/272	Heavy loam	Arran Banner	April 13	April 29	Sept. 24	Mixed vegetables
Castleford**	Potatoes	1/160	Heavy loam	Majestic	April 12	April 12	Oct. 14	Potatoes
Chittoe	Potatoes	1/24	Lower greensand	Majestic	April 29	April 30	Oct. 14	Carrots
Cirencester	Swedes	1/40	Light brashy loam	Garton's Magnificent	June 1	June 8	Jan. 22-31	Wheat
Fakenham	Peas	1/302	Sandy loam	Stratagem	Mar. 13	Mar. 13-20	From July 3	Potatoes
Godalming	Beetroot	1/239	Sandy	Globe	May 2 and 9	May 15-16	Aug. 25-28	French Beans
Hull	Swedes	1/161	Heavy alluvium	Conqueror Green Top	May 11	May 11	Oct. 24	Potatoes
Maulden†	Potatoes	1/73	Lower greensand	Ninetyfold	April 2 & 14	April 14	July 1-6	Potatoes and Savoy's
Newcastle	Swedes	1/303	Old garden	Leighton's Garden	May 13	May 16-18	Oct. 1-6	Potatoes
Norton	Potatoes	1/237	Good light loam	Majestic	April 20	April 20	Sept. 27	Mixed vegetables
Oaklands (A)	Brussels	1/170	Sandy loam	Cambridge Strain	June 3	June 4	Oct. 13-Feb. 18	Wheat
Oaklands (B)	Sprouts	1/109	Silty loam	Yellow Globe	May 1	May 2	Nov. 6	Sprouts
Pelton	Mangolds	1/186	Medium loam	King of Globe	April 24	May 7-8	Sept. 3	Potatoes
Reaseheath	Beetroot	1/104	Light loam	Kerr's Pink	May 4-7	May 8	Oct. 2	Ley
Rufford††	Potatoes	1/80	Light sandy loam	Doon Star	April 22	April 22	Oct. 13	Oats
Staindrop	Swedes	1/160	Loam	Carter's Ninety-nine	May 4	May 6	Nov. 19	Beetroot
Steppingley‡	Runner Beans	1/50	Sandy	Scarlet Emperor	April 24	April 27	July 29-Sept. 16	Potatoes
Welshpool	Swedes	1/160	Medium loam	Lord Derby	May 20	May 22	Nov. 30	Potatoes
Withernsea	Potatoes	1/222	Heavy clay	Majestic	May 8	May 8	Sept. 16	Cabbages
Wyboston§	Wheat	1/50	Silty gravel	Marster's Pedigree	—	Nov. 14	Aug. 20	Potatoes
Yeabridge	Swedes	1/40	Medium loam	Yeoman	June 18	June 25	Dec. 22	Oats and Tares

* Crop weighed green.

** The land sloped very badly which seriously affected certain rows.

† Presence of potato eelworm was noted in certain plots.

†† Crop was poor. Cold spring allowed a certain amount of eelworm to affect growth.

‡ The site was very patchy, partly due to acidity.

§ The wheat was undersown with clover which had grown high in the straw.

Summary — One year experiments — The standard errors given in the tables apply to the individual treatment means — Types 1 and 1a

Place	Crop	No N	P.M. S/A	P.M. and S/A	Soot and S/A	Mean St. error	Mean response to N
Cadishhead	Potatoes; tons per acre	9.54	7.07	10.25		8.95 ± 1.24	-0.88
Castleford	Potatoes; tons per acre	4.27	5.48	7.43	7.98	6.29 ± 0.555	+2.18
Norton	Potatoes; tons per acre	7.33	7.72	8.84	9.07	8.24 ± 0.061	+0.95
Withernsea	Potatoes; tons per acre	9.07	10.53	10.98	11.50	10.52 ± 0.560	+1.68
Mean of potato experiments ²		6.89	7.91	9.08	9.52	8.35	
Oaklands	Brussels Sprouts; cwt. per acre						
	1st harvesting	6.0	8.2	12.9	18.8 ¹	14.5	+4.6
	2nd harvesting	24.4	39.2	49.3	52.7 ¹	46.3	+19.8
	3rd harvesting	31.0	34.5	35.2	32.8 ¹	33.7	+3.8
	4th harvesting	17.5	17.0	18.3	16.6 ¹	17.0	+0.2
	5th harvesting	19.9	19.5	18.7	19.0 ¹	19.3	-0.8
	6th harvesting	12.6	13.6	13.4	11.4 ¹	12.2	+0.9
	Total saleable	111.4	132.0	147.8	151.3	143.0 ± 3.77	+28.5

¹ Soot.² Excluding Cadishhead.

Conclusions

Poultry manure and sulphate of ammonia alone and in combination

There was a significant response to nitrogen in three of the four potato experiments. In each of these three, the response to sulphate of ammonia was greater than that to poultry manure, the difference being significant at Castleford and Norton. At the fourth centre, Cadishhead, the standard error was very high and there were no significant effects.

In the brussels sprouts experiment at Oaklands, there were significant responses to nitrogen and to soot in total saleable produce. Sulphate of ammonia and soot both give significantly higher yields than poultry manure. The responses to the fertilisers were confined to the first three pickings.

Type 2CR. First year

Place	Crop	No N.	1 P.M	2 P.M	1 S/A	2 S/A	Mean	St. error
Reaseheath ..	Potatoes ; tons per acre	8.68 ¹	8.64	9.59	9.40	9.20	9.03	±0.254
Rufford ..	Potatoes ; tons per acre	2.36 ²	4.23	5.19	4.26	3.45	3.64	±0.271
Reaseheath ..	Percentage ware	80.4 ³	86.0	81.6	83.9	81.3	82.3	±0.989
Cirencester ..	Swedes ; tons per acre	18.96 ⁴	21.34	20.68	22.98	23.15	21.01	±0.596
Yeabridge ..	Swedes ; tons per acre	19.24 ⁵	19.84	19.85	20.71	22.18	20.18	±0.363

Standard errors ; (1) ±0.180, (2) ±0.192, (3) ±0.699, (4) ±0.421, (5) ±0.257.

*Conclusions**Single and double dressings of poultry manure and sulphate of ammonia.*

There was a significant response to nitrogen in both potato experiments. On the average of both levels of application there was little difference between poultry manure and sulphate of ammonia at Reaseheath, but poultry manure gave a significantly higher yield at Rufford. In both experiments the double dressing of sulphate of ammonia gave lower yields than the single dressing and lower yields than the double dressing of poultry manure and it is to this that the superiority of poultry manure at Rufford is due. Nitrogen produced a significant increase in percentage ware at Reaseheath, but the difference between the average responses to poultry manure and sulphate of ammonia was not significant.

In both experiments on swedes there was a significant response to the first dressing of nitrogen, but little or no further response to the second dressing. Sulphate of ammonia gave significantly higher yields than poultry manure at both centres.

Cumulative experiments — Type 1c

Place	Crop	No N.	P.M.	S/A	P.M. and S/A	Mean	St. error
Hull	Swedes; Roots; tons per acre Tops; tons per acre	21.04	Second year experiments 23.40 22.78		24.13	22.84	±1.18
Newcastle	Roots; tons per acre Tops; tons per acre	7.91	8.91 7.31		8.25	7.79	±0.820
Pelton	Beetroot; Roots; tons per acre Tops; tons per acre	8.42	8.59 8.42		7.98	8.22	±0.292
Burford	Roots; tons per acre Tops; tons per acre	10.38	15.83 12.79		12.82	12.96	±0.265
Staindrop	Roots; tons per acre Tops; tons per acre	3.71	4.04 4.93		4.70	4.35	±0.327
Welshpool	Swedes; Roots; tons per acre Tops; tons per acre	23.30	Third year experiments 24.31 24.11		28.32	25.01	±2.24
Bakewell (A)	Roots; tons per acre Tops; tons per acre	4.42	4.82 4.82		7.23	5.32	±0.505
Bakewell (B)	Roots; tons per acre Tops; tons per acre	21.57	23.78 24.68		26.25	24.07	±0.895
Bakewell (B)	Roots; tons per acre Tops; tons per acre	8.04	12.25 12.82		14.89	12.00	±0.328
Bakewell (B)	Roots; tons per acre Tops; tons per acre	2.93	3.34 3.78		4.61	3.66	±0.138
Bakewell (A)	Mangolds; Roots; tons per acre Tops; tons per acre	16.58	20.60 21.21		24.54	20.73	±0.428
Bakewell (B)	Ryegrass; Green wts. ; tons per acre	3.63	4.37 4.47		5.47	4.48	±0.0665
Fakenham	Peas in pod; cwt. per acre	7.86	8.88 8.77		10.42	8.98	±0.341
Fakenham	Peas in pod; cwt. per acre	18.7	17.9 23.3		24.0	21.0	±2.47
Godalming	Beetroot; Roots; tons per acre Tops; tons per acre	3.82	7.00 6.92		6.12	5.96	±0.347
Godalming	Beetroot; Roots; tons per acre Tops; tons per acre	2.29	3.96 4.42		4.28	3.74	±0.220

Conclusions

Poultry manure and sulphate of ammonia alone and in combination. Second and third year cumulative effects.

Of the five experiments on swedes, those at Hull, Burford and Staindrop had high yields and those at Newcastle and Welshpool low yields. All five experiments showed positive responses in roots to nitrogen, but the average response was significant only at Staindrop and Welshpool. There were no significant differences between poultry manure and sulphate of ammonia: poultry manure giving higher yields at three centres and sulphate of ammonia at two. The results for tops appeared to be similar to those for roots.

There was a large response to nitrogen in mangolds' roots at Bakewell, but little difference between poultry manure and sulphate of ammonia.

At Bakewell there was a significant response to nitrogen in ryegrass, but no sign of any difference between the effects of poultry manure and sulphate of ammonia.

At Fakenham, the response to sulphate of ammonia in peas in the pod was almost significant, but there was no sign of any response to poultry manure. The experimental error was high.

There was a significant response to nitrogen in both experiments on red beet, but the combined dressing of poultry manure and sulphate of ammonia gave no better yields than the single dressings. Poultry manure gave a significantly higher yield than sulphate of ammonia at Pelton, and at Godalming the two fertilisers gave almost the same yield.

*Experiments on residual effects
Type 2R*

Place.	Crop.	Treatments.			PM	S/A	Mean	St. error
		1934	1935	1936				
Wyboston	Wheat ; total produce ; cwt. per acre	2N	ON	ON	55.6	57.5	56.6	±3.10
		1N	1N	ON	57.8	56.4	57.1	
		ON	2N	ON	59.9	50.9	55.4	
		Mean			57.8	54.9	56.4	

Conclusions

Single and double dressings of poultry manure and sulphate of ammonia. Residual effects of 1934 and 1935 dressings.

The residual effects of the fertilizers on wheat total produce were not significant.

Experiment on immediate, cumulative and residual effects

Place.	Crop.	Type 3 Treatments.		PM	S/A	Mean	St. error
		1935	1936				
Maulden	Potatoes ; tons per acre	O	O	3.14 ¹		3.14	±1.34
		N	O	3.52	3.90	3.71	
		O	N	4.98	7.39	6.18	
		N	N	6.01	5.26	5.64	

Standard error ; (1) ±0.951.

Conclusions

The experiment on potatoes at Maulden had a high standard error. The response to nitrogen applied in 1936 was significant, but the differences between poultry manure and sulphate of ammonia were not. The residual effect of the 1935 dressing of nitrogen was not significant.

*Experiments on immediate, cumulative and residual effects**Type 2aCR and 2CR*

Place.	Crop.	1934 1935 1936	ON 2N ON	1N 1N 1N	2N ON 2N	Mean	St. error.
Chittoe	Potatoes ; tons per acre	PM	6.18	8.43	8.86	7.82	± 0.255
		SA	5.73	9.12	9.58	8.14	
		Mean	5.96	8.78	9.22	7.98	
Oaklands	Mangolds ; Roots ; tons per acre	PM	23.85	25.13	24.68	24.55	± 0.715
		SA	23.20	24.95	27.37	25.17	
		Soot	23.99	25.70	27.21	25.63	
		Mean	23.68	25.26	26.42	25.12	
	Mangolds ; Tops ; tons per acre	PM	4.95	5.31	5.91	5.39	
		SA	5.58	5.47	6.24	5.76	
		Soot	5.35	5.96	6.58	5.96	
		Mean	5.29	5.58	6.24	5.70	
Steppingley	Runner Beans: Pickings cwt. per acre 1-3	PM	5.6	10.7	18.3	11.5	
		SA	8.3	6.1	4.1	6.2	
	,, 4-5	PM	20.9	25.5	30.0	25.5	
		SA	20.4	19.6	20.5	20.2	
	,, 6-8	PM	11.5	14.8	15.5	13.9	
		SA	12.4	15.0	20.9	16.1	
	Total	PM	38.0	51.0	63.8	50.9	± 6.25
		SA	41.1	40.7	45.5	42.4	
		Mean	39.6	45.8	54.6	46.7	

*Conclusions**Immediate, cumulative and residual effects.*

There was a significant response to the 1936 applications of nitrogen on potatoes at Chittoe, with a significant falling-off in response at the higher level of application. On the 1936 applications, sulphate of ammonia gave significantly higher yields than poultry manure, but on the plots receiving the double dressing of nitrogen in 1935 and no nitrogen in 1936, poultry manure gave slightly higher yields, though the difference was not significant.

There was also a significant response to nitrogen applied in 1936 in mangolds roots at Oaklands, with little difference between either the direct or residual effects of soot and sulphate of ammonia. Poultry manure also gave similar results in the zero and single 1936 dressings, but the double dressing in 1936 failed to respond.

The crop of runner beans at Steppingley, on an acid soil, was rather variable. Poultry manure gave a large response to the direct application, and sulphate of ammonia a small response, the difference in favour of poultry manure being significant. The responses to poultry manure appeared in all pickings, though principally in the earlier ones, while sulphate of ammonia only produced a response at the later pickings.

SUGAR BEET FERTILISER EXPERIMENTS FACTORY SERIES

SYSTEM OF REPLICATION: 3 randomised blocks of 9 plots each with two degrees of freedom, representing second order interactions, confounded with block differences.

AREA OF EACH PLOT: Cantley I and Cantley II: 1/10 acre. Wissington I and Wissington II: 1/80 acre. Oaklands: 1/90 acre. Remainder: 1/40 acre.

TREATMENTS: $3 \times 3 \times 3$ factorial design.

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

Superphosphate: None, 0.5 cwt., 1.0 cwt. P_2O_5 per acre.

Muriate of Potash: None, 0.6 cwt., 1.2 cwt. K_2O per acre.

VARIETIES: Ely: Johnson's P. Bury I and Bury II: Kuhn. Kings Lynn I and Wissington I: Kuhn P. King's Lynn II: Masters. Brigg I: Dippe E. Bardney II: Dobrovice. Remainder: Kleinwanzleben E.

Mechanical and chemical analyses of soil samples from each experiment have been carried out.

Plant Density (mean values)

Station					Yield in tons per acre	Plants in thousands per acre	Distance in inches between rows	Weight of roots in lb. per plant
COARSE SANDS								
1	Allscott II	..	..	..	6.93	30.6	19.8	0.507
2	Bardney I	..	..	..	8.47	31.0	18.0	0.612
3	Brigg I..	..	..	..	8.25	32.0	18.0	0.578
4	King's Lynn I	..	..	..	9.53	20.7	19.8	1.03
5	King's Lynn II	..	..	..	12.42	21.7	18.8	1.28
6	Newark	..	..	..	14.48	27.9	18.0	1.16
FINE SANDS								
7	Bury I..	..	..	..	6.68	22.5	18.0	0.665
8	Bury II	..	..	..	5.18	17.1	24.0	0.678
9	Cantley I	..	..	..	13.30	—	19.0	—
10	Kidderminster	..	..	..	13.10	26.1	22.0	1.12
11	Wissington I	..	..	..	7.02	28.5	22.0	0.552
LIGHT LOAMS								
12	Allscott I	..	..	..	9.71	26.3	20.8	0.827
13	Brigg II	..	..	..	4.46	18.3	18.0	0.546
14	Cantley II	..	..	..	17.56	—	18.0	—
15	Colwick	..	..	..	16.18	34.9	18.1	1.04
16	Selby	..	..	..	11.46	24.4	21.0	1.05
17	Wissington II	..	..	..	13.10	26.3	21.5	1.12
HEAVY LOAMS								
18	Bardney II	..	..	..	12.33	22.2	19.0	1.24
19	Ipswich	..	..	..	11.25	24.2	20.8	1.04
20	Peterboro' I	..	..	..	10.22	29.0	—	0.789
21	Poppleton	..	..	..	6.60	20.2	23.6	0.732
CLAY LOAMS								
22	Felstead I	..	..	..	9.06	26.6	22.4	0.763
23	Felstead II	..	..	..	13.90	27.6	22.8	1.13
24	Felstead Area (Oaklands)	..	..	..	6.45	23.1	27.0*	0.625
FENS								
25	Ely	..	..	..	12.42	29.9	22.0	0.930
26	Peterboro' II	..	..	..	10.81	31.2	19.5	0.776

*On ridges.

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Station	Soil	Previous crop	Date of sowing	Date of lifting	Farming notes
1 Allscott II ..	Coarse sandy loam	Potatoes	May 14	Nov. 26	
2 Bardney I ..	Light sandy loam	Wheat	April 29	Nov. 9	
3 Brigg I ..	Sandy	Wheat	April 23	Oct. 22	Slightly acid in places. Very poor land, marginal for beet cultivation.
4 King's Lynn I	Poor coarse sand	Barley	April 25	Jan. 1	
5 King's Lynn II	Coarse sand	Barley	April 3	Oct. 26	Gyrotilled for beet crop.
6 Newark	Sandy	Wheat	April 27	Nov. 27	
7 Bury I ..	Light sandy loam	Seeds	May 1	Oct. 27	
8 Bury II ..	Coarse sand	Barley	May 1	Dec. 15	Damaged by game and vermin.
9 Cantley I ..	Sandy loam	Wheat	May 5	Dec. 12	Dung to previous crop. Slightly acid in places.
10 Kidderminster	Sandy loam	Potatoes	May 1	Nov. 3	Dung to previous crop.
11 Wissington I..	Light loam	Barley	May 14	Jan. 4	
12 Allscott I ..	Coarse sandy loam	Wheat	May 15	Dec. 10	
13 Brigg II ..	Sandy	Oats	April 27	Nov. 11	Slightly acid. Limed for beet. Very poor uneven crop.
14 Cantley II ..	Sandy	Wheat	April 29	Nov. 25-28	Dung to previous crop. Excellent land. Some wireworm trouble.
15 Colwick ..	Light sandy loam	Potatoes	April 27	Nov. 6	Dung to previous crop. Slightly acid. Limed for beet.
16 Selby ..	Sandy loam	Oats	May 6	Oct. 28	
17 Wissington II..	Medium loam	Wheat	April 21	Nov. 19	
18 Bardney II ..	Silty loam	Wheat	April 17	Nov. 16	Signs of poor drainage, suffered in wet summer.
19 Ipswich ..	Medium loam on clay	Barley	April 30	Dec. 31	
20 Peterboro' I ..	Silty loam	Barley	April 30	Dec. 3	Some sign of poor drainage in wet summer.
21 Poppleton ..	Sandy loam	Wheat	April 29	Oct. 21	
22 Felstead I ..	Clay loam	Wheat	May 8	Oct. 27	Dung applied to the experimental crop.
23 Felstead II ..	Clay loam	Wheat	April 25	Oct. 20	
24 Felstead Area (Oaklands)	Medium loam	Winter Oats	June 10	Nov. 10	Sown on 27 in. ridges. Land completely unmanured for previous 5 years.
25 Ely ..	Black fen on peat	Wheat	April 28	Nov. 28-30	
26 Peterboro' II..	Black fen on peat	Wheat	April 24	Oct. 27	

Sampling errors in sampling for sugar content
(10 roots in each sample)

Station	No. of Samples analysed per plot	Standard error per sample
11 Wissington I	4	0.351
17 Wissington II	4	0.315

Significant Responses

	N	P	K	Symbols
Total Sugar (26)	+	+	+	+ = Positive } Significant 0 = No } Average - = Negative } Response (26) = No. of centres * = Significant differences between centres
Tops (18)	+	+	0	
		Curvature		
Total sugar ..	—	—	0	
Tops ..	0	0	0	
	N × P	N × K	P × K	
Total sugar ..	0	0	0	
Tops ..	0	0	0	

Mean Responses per 1 cwt. of N, P₂O₅ and K₂O

	N		P		K	
	Average 1933-35	1936	Average 1933-35	1936	Average 1933-35	1936
Total sugar—cwt.	+2.7	+9.6	+0.7	+3.0	+0.9	+1.6
Roots—tons	+1.18	+2.82	+0.21	+0.84	+0.12	+0.38
Tops—tons ..	+3.11	+4.26	+0.27	+0.72	+0.09	+0.08
Sugar % ..	—0.72	—0.22	0.00	+0.08	+0.22	+0.20
Plant number ..	+0.5	0.0	+0.4	+0.6	+0.3	+0.2
Purity % ..	—0.9	—0.1	+0.5	—0.2	0.0	+0.2

*Main Effects and First Order Interactions**Total Sugar : cwt. per acre*

		P ₀	P ₁	P ₂	K ₀	K ₁	K ₂	Mean		P ₀	P ₁	P ₂
1	N ₀	15.7	21.8	22.8	17.0	21.3	22.0	20.1	K ₀	14.3	19.2	21.5
	N ₁	18.1	27.2	31.1	19.5	28.1	28.9	25.5	K ₁	21.8	28.7	30.4
	N ₂	21.6	27.4	28.5	18.6	31.5	27.3	25.8	K ₂	19.3	28.5	30.5
	Mean	18.4	25.5	27.5	18.3	27.0	26.1	23.8	±1.99. Means : ±1.15			
2	N ₀	27.9	24.9	25.2	22.0	25.4	30.5	26.0	K ₀	25.7	28.9	27.9
	N ₁	25.5	33.5	33.5	32.1	28.3	32.2	30.8	K ₁	26.1	29.6	31.8
	N ₂	32.6	36.8	35.1	28.4	33.8	42.3	34.8	K ₂	34.1	36.7	34.2
	Mean	28.7	31.7	31.3	27.5	29.2	35.0	30.6	±2.62. Means : ±1.51			
3	N ₀	20.9	25.3	28.9	24.6	20.3	30.3	25.0	K ₀	25.1	20.2	28.6
	N ₁	30.8	30.9	30.9	24.2	34.5	33.7	30.8	K ₁	25.8	30.3	27.2
	N ₂	27.4	29.4	31.3	25.1	28.5	34.5	29.4	K ₂	28.1	35.0	35.3
	Mean	26.3	28.5	30.4	24.6	27.8	32.8	28.4	±2.78. Means : ±1.60			
4	N ₀	27.7	28.8	24.3	26.2	30.6	24.1	26.9	K ₀	38.4	30.7	38.1
	N ₁	35.5	35.9	36.5	37.1	36.3	34.5	36.0	K ₁	35.2	40.1	32.8
	N ₂	41.3	36.9	41.8	43.9	41.3	34.7	40.0	K ₂	30.8	30.8	31.7
	Mean	34.8	33.9	34.2	35.7	36.1	31.1	34.3	±3.14. Means : ±1.81			
5	N ₀	33.3	30.5	37.3	34.1	31.7	35.2	33.7	K ₀	41.6	44.0	48.3
	N ₁	43.1	43.6	50.8	47.9	44.2	45.5	45.9	K ₁	39.9	40.6	49.8
	N ₂	51.3	53.4	57.1	52.0	54.4	55.5	53.9	K ₂	46.2	42.9	47.1
	Mean	42.6	42.5	48.4	44.7	43.4	45.4	44.5	±2.67. Means : ±1.54			
6	N ₀	33.0	43.0	43.9	41.8	36.7	41.5	40.0	K ₀	46.3	50.6	54.4
	N ₁	53.4	50.3	53.5	52.5	53.0	51.7	52.4	K ₁	43.7	49.6	53.1
	N ₂	57.1	57.7	57.9	57.0	56.8	58.8	57.6	K ₂	53.5	50.8	47.7
	Mean	47.8	50.3	51.8	50.4	48.8	50.7	50.0	±2.86. Means : ±1.65			
7	N ₀	17.5	20.9	23.0	19.8	19.9	21.8	20.5	K ₀	19.4	22.6	24.6
	N ₁	23.8	24.1	27.5	22.1	25.2	28.2	25.1	K ₁	19.9	26.3	25.3
	N ₂	24.3	27.8	27.6	24.7	26.5	28.5	26.6	K ₂	26.4	23.9	28.2
	Mean	21.9	24.3	26.0	22.2	23.8	26.2	24.1	±1.73. Means : ±0.999			
8	N ₀	13.2	16.8	16.5	13.7	15.9	17.0	15.5	K ₀	14.6	17.9	17.3
	N ₁	14.6	20.1	18.2	16.5	16.8	19.5	17.6	K ₁	14.5	18.8	19.5
	N ₂	19.6	19.5	22.2	19.7	20.1	21.5	20.4	K ₂	18.3	19.6	20.0
	Mean	15.8	18.8	18.9	16.6	17.6	19.3	17.8	±1.36. Means : ±0.785			
9	N ₀	38.5	36.3	44.2	38.7	39.5	40.7	39.6	K ₀	48.4	36.8	41.2
	N ₁	49.5	40.3	50.2	45.1	48.2	46.6	46.6	K ₁	40.2	43.6	50.6
	N ₂	43.1	49.6	48.4	42.6	46.6	51.9	47.0	K ₂	42.5	45.8	51.0
	Mean	43.7	42.1	47.6	42.1	44.8	46.4	44.4	±5.08. Means : ±2.93			

		P ₀	P ₁	P ₂	K ₀	K ₁	K ₂	Mean		P ₀	P ₁	P ₂
10	N ₀	38.7	37.9	39.7	37.4	38.5	40.4	38.8	K ₀	41.4	42.9	43.0
	N ₁	44.0	47.6	47.6	44.7	48.4	46.0	46.4	K ₁	44.2	45.9	46.7
	N ₂	49.3	47.9	48.7	45.3	49.8	50.8	48.6	K ₂	46.4	44.5	46.3
	Mean	44.0	44.5	45.3	42.4	45.6	45.7	44.6	±1.70. Means : ±0.982			
11	N ₀	21.6	23.4	21.5	17.2	23.6	25.7	22.2	K ₀	17.1	22.1	16.9
	N ₁	19.8	26.3	22.6	19.2	22.4	27.1	22.9	K ₁	23.2	23.0	24.1
	N ₂	23.8	22.1	24.8	19.6	24.4	26.7	23.6	K ₂	24.8	26.7	27.9
	Mean	21.7	23.9	23.0	18.7	23.4	26.5	22.9	±1.80. Means : ±1.04			
12	N ₀	26.5	27.8	28.5	27.1	28.4	27.2	27.6	K ₀	29.4	30.6	32.4
	N ₁	30.8	34.9	32.3	29.3	33.4	35.4	32.7	K ₁	32.9	34.1	33.2
	N ₂	35.8	37.4	41.1	36.0	38.4	39.9	38.1	K ₂	30.8	35.4	36.3
	Mean	31.0	33.4	34.0	30.8	33.4	34.2	32.8	±1.47. Means : ±0.849			
13	N ₀	11.4	14.3	14.4	13.0	11.8	15.2	13.4	K ₀	9.4	16.3	20.2
	N ₁	11.4	14.7	22.9	18.7	13.7	16.6	16.3	K ₁	9.3	14.7	12.1
	N ₂	8.4	14.6	20.0	14.1	10.6	18.3	14.3	K ₂	12.6	12.5	25.1
	Mean	10.4	14.5	19.1	15.3	12.0	16.7	14.7	±3.46. Means : ±2.00			
14	N ₀	51.3	56.6	59.6	51.8	54.8	60.9	55.8	K ₀	45.2	52.7	57.3
	N ₁	50.9	60.9	55.9	52.5	55.5	59.6	55.9	K ₁	53.1	57.6	55.3
	N ₂	50.2	55.6	57.3	50.9	55.7	56.5	54.4	K ₂	54.0	62.8	60.2
	Mean	50.8	57.7	57.6	51.7	55.3	59.0	55.4	±2.44. Means : ±1.41			
15	N ₀	53.3	50.0	50.7	51.8	51.7	50.5	51.3	K ₀	53.7	53.7	52.9
	N ₁	53.1	53.0	53.9	52.7	53.4	53.9	53.3	K ₁	52.8	52.7	52.8
	N ₂	53.7	55.0	54.6	55.7	53.3	54.3	54.4	K ₂	53.6	51.6	53.6
	Mean	53.4	52.7	53.0	53.4	52.8	52.9	53.0	±1.31. Means : ±0.756			
16	N ₀	38.4	37.1	39.7	37.7	38.3	39.2	38.4	K ₀	45.7	44.6	45.2
	N ₁	42.2	46.6	44.1	46.6	43.1	43.2	44.3	K ₁	41.7	46.3	44.3
	N ₂	49.3	50.0	51.2	51.2	50.8	48.5	50.2	K ₂	42.5	42.8	45.5
	Mean	43.3	44.6	45.0	45.2	44.1	43.6	44.3	±1.98. Means : ±1.14			
17	N ₀	41.3	44.1	43.0	44.5	45.1	38.8	42.8	K ₀	47.1	50.8	47.9
	N ₁	48.3	53.4	49.8	51.4	50.8	49.3	50.5	K ₁	48.5	49.5	49.4
	N ₂	48.9	52.9	53.7	50.0	51.4	54.0	51.8	K ₂	42.9	50.1	49.1
	Mean	46.2	50.1	48.8	48.6	49.1	47.4	48.4	±1.71. Means : ±0.987			
18	N ₀	36.7	41.4	36.1	40.5	37.0	36.7	38.1	K ₀	40.1	43.4	44.2
	N ₁	41.2	41.0	40.7	40.4	42.7	39.9	41.0	K ₁	40.8	43.8	39.0
	N ₂	42.0	44.8	47.1	46.8	43.9	43.2	44.6	K ₂	39.1	40.1	40.7
	Mean	40.0	42.4	41.3	42.9	41.2	39.9	41.2	±2.74. Means : ±1.58			

		P ₀	P ₁	P ₂	K ₀	K ₁	K ₂	Mean		P ₀	P ₁	P ₂
19	N ₀	32.0	33.2	31.3	30.5	34.0	31.9	32.1	K ₀	38.6	39.8	40.9
	N ₁	38.3	40.7	41.1	40.3	43.0	36.9	40.0		42.1	43.2	41.7
	N ₂	49.1	49.1	48.2	48.5	49.9	48.0	48.8		38.9	40.0	38.0
	Mean	39.8	41.0	40.2	39.8	42.3	38.9	40.3		±1.45. Means : ±0.837		
20	N ₀	36.0	32.4	35.4	35.5	38.2	30.2	34.6	K ₀	39.6	40.0	41.9
	N ₁	40.1	41.4	39.2	41.0	38.6	41.0	40.2		42.6	37.9	38.6
	N ₂	43.9	43.0	47.5	45.0	42.3	47.2	44.8		37.7	39.0	41.7
	Mean	40.0	38.9	40.7	40.5	39.7	39.5	39.9		±3.20. Means : ±1.85		
21	N ₀	18.0	22.2	22.2	20.6	21.2	20.6	20.8	K ₀	22.1	21.0	24.6
	N ₁	25.0	21.9	24.8	25.7	25.9	20.0	23.9		22.8	23.0	24.9
	N ₂	23.4	22.1	26.9	21.4	23.6	27.5	24.1		21.5	22.2	24.4
	Mean	22.1	22.1	24.6	22.6	23.6	22.7	22.9		±2.11. Means : ±1.22		
22	N ₀	22.3	27.8	31.0	26.5	26.7	27.9	27.0	K ₀	32.1	36.9	40.9
	N ₁	34.8	38.2	41.8	39.6	41.2	34.0	38.3		33.8	36.2	40.6
	N ₂	37.7	42.5	46.5	43.9	42.7	40.1	42.2		28.9	35.3	37.8
	Mean	31.6	36.1	39.8	36.6	36.9	34.0	35.8		±1.50. Means : ±0.866		
23	N ₀	47.0	47.0	46.4	49.8	46.5	44.1	46.8	K ₀	54.0	54.3	58.3
	N ₁	53.3	52.4	58.9	56.4	54.5	53.7	54.9		52.7	52.9	53.2
	N ₂	57.7	60.5	59.3	60.4	57.8	59.3	59.2		51.1	52.7	53.2
	Mean	52.7	53.3	54.9	55.5	52.9	52.4	53.6		±1.50. Means : ±0.866		
24	N ₀	19.2	21.5	19.5	19.1	21.3	19.9	20.1	K ₀	17.3	21.3	21.7
	N ₁	20.2	21.4	23.9	21.5	22.2	21.8	21.8		20.1	23.2	23.7
	N ₂	19.6	23.8	23.3	19.7	23.6	23.4	22.2		21.5	22.3	21.3
	Mean	19.7	22.2	22.2	20.1	22.4	21.7	21.4		±1.05. Means : ±0.606		
25	N ₀	41.7	42.6	38.2	36.7	41.9	44.0	40.8	K ₀	41.5	38.3	36.1
	N ₁	43.3	43.1	42.1	42.5	41.6	44.4	42.8		41.8	42.6	40.5
	N ₂	42.3	41.6	38.9	36.6	41.4	44.8	40.9		44.0	46.5	42.7
	Mean	42.4	42.4	39.7	38.6	41.6	44.4	41.5		±2.32. Means : ±1.34		
26	N ₀	36.3	39.1	41.2	37.1	41.0	38.4	38.8	K ₀	37.7	40.9	39.9
	N ₁	42.2	42.4	44.5	42.6	41.5	45.0	43.0		39.2	40.5	42.5
	N ₂	38.3	42.3	40.5	38.9	39.7	42.5	40.4		39.8	42.3	43.8
	Mean	38.9	41.2	42.1	39.5	40.7	42.0	40.7		±1.73. Means : ±0.999		

Roots (washed) : tons per acre

		P ₀	P ₁	P ₂	K ₀	K ₁	K ₂	Mean		P ₀	P ₁	P ₂
1	N ₀	4.57	6.26	6.59	5.07	6.16	6.18	5.80	K ₀	4.29	5.75	6.36
	N ₁	5.41	7.85	8.81	5.69	8.12	8.26	7.36	K ₁	6.39	8.21	8.79
	N ₂	6.39	8.19	8.30	5.63	9.11	8.14	7.62	K ₂	5.70	8.34	8.55
	Mean	5.46	7.43	7.90	5.46	7.79	7.53	6.93				
2	N ₀	7.61	7.04	7.04	6.07	6.99	8.62	7.23	K ₀	7.04	8.07	7.84
	N ₁	7.06	9.37	9.11	8.89	7.83	8.83	8.51	K ₁	7.19	8.30	8.79
	N ₂	8.89	10.22	9.92	8.00	9.47	11.56	9.68	K ₂	9.33	10.25	9.43
	Mean	7.85	8.87	8.69	7.65	8.09	9.67	8.47				
3	N ₀	6.04	7.30	8.30	7.18	5.82	8.64	7.21	K ₀	7.42	5.93	8.47
	N ₁	8.83	8.85	8.96	7.15	9.88	9.60	8.88	K ₁	7.51	8.82	7.84
	N ₂	8.14	8.67	9.17	7.49	8.47	10.02	8.66	K ₂	8.07	10.07	10.12
	Mean	7.67	8.27	8.81	7.27	8.06	9.42	8.25				
4	N ₀	7.71	7.93	6.82	7.30	8.40	6.75	7.49	K ₀	10.61	8.55	10.61
	N ₁	9.70	10.03	10.22	10.30	10.07	9.59	9.99	K ₁	9.80	11.02	9.18
	N ₂	11.59	10.14	11.61	12.16	11.53	9.64	11.11	K ₂	8.60	8.53	8.85
	Mean	9.67	9.37	9.55	9.92	10.00	8.66	9.53				
5	N ₀	9.29	8.53	10.43	9.61	8.94	9.70	9.42	K ₀	11.65	12.44	13.55
	N ₁	12.27	12.08	14.18	13.13	12.44	12.96	12.84	K ₁	11.39	11.21	13.73
	N ₂	14.15	15.01	15.86	14.92	14.96	15.14	15.01	K ₂	12.65	11.96	13.19
	Mean	11.90	11.87	13.49	12.55	12.11	12.60	12.42				
6	N ₀	9.71	12.21	12.90	12.11	10.73	11.97	11.60	K ₀	13.51	14.42	15.93
	N ₁	15.16	14.72	15.60	15.39	15.28	14.81	15.16	K ₁	12.65	14.56	15.47
	N ₂	16.61	16.51	16.91	16.36	16.67	17.01	16.68	K ₂	15.32	14.47	14.01
	Mean	13.83	14.48	15.14	14.62	14.23	14.60	14.48				
7	N ₀	4.85	5.91	6.35	5.55	5.63	5.93	5.70	K ₀	5.44	6.37	6.95
	N ₁	6.52	6.58	7.64	6.24	6.93	7.57	6.91	K ₁	5.52	7.40	7.14
	N ₂	6.77	7.73	7.81	6.97	7.50	7.84	7.44	K ₂	7.18	6.45	7.71
	Mean	6.05	6.74	7.27	6.25	6.69	7.11	6.68				
8	N ₀	3.82	4.87	4.76	3.93	4.63	4.90	4.48	K ₀	4.23	5.35	5.06
	N ₁	4.38	5.90	5.35	4.99	4.95	5.69	5.21	K ₁	4.33	5.42	5.65
	N ₂	5.63	5.59	6.35	5.72	5.82	6.03	5.86	K ₂	5.27	5.60	5.75
	Mean	4.61	5.45	5.49	4.88	5.13	5.54	5.18				
9	N ₀	11.49	10.87	13.03	11.59	11.64	12.17	11.80	K ₀	14.33	11.40	12.41
	N ₁	14.43	12.31	15.15	13.56	14.43	13.90	13.96	K ₁	11.78	13.13	15.15
	N ₂	13.13	15.00	14.33	12.99	13.99	15.48	14.15	K ₂	12.94	13.66	14.95
	Mean	13.02	12.73	14.17	12.71	13.35	13.85	13.30				

		P ₀	P ₁	P ₂	K ₀	K ₁	K ₂	Mean		P ₀	P ₁	P ₂
10	N ₀	11.28	10.99	11.43	10.85	11.00	11.85	11.23	K ₀	12.33	12.79	12.75
	N ₁	12.70	14.06	13.92	13.42	13.95	13.30	13.56	K ₁	12.92	13.35	13.47
	N ₂	14.85	14.30	14.39	13.59	14.78	15.18	14.51	K ₂	13.58	13.22	13.52
	Mean	12.94	13.12	13.25	12.62	13.25	13.44	13.10				
11	N ₀	6.58	7.18	6.61	5.43	7.15	7.78	6.79	K ₀	5.48	6.84	5.42
	N ₁	6.11	7.92	6.98	6.00	6.84	8.17	7.00	K ₁	7.01	7.05	7.39
	N ₂	7.37	6.84	7.63	6.30	7.47	8.06	7.28	K ₂	7.57	8.05	8.40
	Mean	6.69	7.31	7.07	5.91	7.15	8.00	7.02				
12	N ₀	7.96	8.19	8.34	8.07	8.35	8.07	8.16	K ₀	8.84	9.14	9.63
	N ₁	9.19	10.46	9.53	8.83	10.02	10.33	9.73	K ₁	9.71	10.14	9.80
	N ₂	10.57	11.03	12.16	10.72	11.28	11.76	11.25	K ₂	9.16	10.40	10.60
	Mean	9.24	9.89	10.01	9.20	9.88	10.05	9.71				
13	N ₀	3.55	4.36	4.30	3.95	3.64	4.62	4.07	K ₀	2.90	4.98	6.01
	N ₁	3.55	4.47	6.83	5.68	4.16	5.01	4.95	K ₁	2.85	4.55	3.65
	N ₂	2.61	4.50	6.04	4.27	3.25	5.62	4.38	K ₂	3.95	3.79	7.51
	Mean	3.23	4.44	5.72	4.63	3.68	5.08	4.46				
14	N ₀	16.37	17.79	18.58	16.54	17.00	19.21	17.58	K ₀	14.58	16.96	18.04
	N ₁	16.21	19.00	17.37	16.29	17.46	18.83	17.53	K ₁	16.58	18.04	17.62
	N ₂	16.04	17.83	18.83	16.75	17.79	18.16	17.57	K ₂	17.46	19.62	19.12
	Mean	16.21	18.21	18.26	16.53	17.42	18.73	17.56				
15	N ₀	16.35	15.34	15.50	15.86	15.75	15.59	15.73	K ₀	16.30	16.35	16.06
	N ₁	16.45	16.09	16.39	16.04	16.47	16.43	16.31	K ₁	16.44	16.01	16.00
	N ₂	16.24	16.68	16.52	16.81	16.22	16.41	16.48	K ₂	16.31	15.76	16.36
	Mean	16.35	16.04	16.14	16.24	16.15	16.14	16.18				
16	N ₀	10.23	9.86	9.99	10.22	9.75	10.11	10.03	K ₀	11.97	11.70	11.49
	N ₁	11.20	11.92	11.55	12.03	11.53	11.12	11.56	K ₁	11.19	11.89	11.22
	N ₂	12.80	12.93	12.70	12.90	13.03	12.50	12.81	K ₂	11.07	11.12	11.53
	Mean	11.41	11.57	11.41	11.72	11.43	11.24	11.46				
17	N ₀	11.18	12.00	11.44	12.15	12.00	10.47	11.54	K ₀	12.86	13.82	13.32
	N ₁	13.12	14.35	13.64	14.32	13.79	13.01	13.70	K ₁	13.35	13.48	13.09
	N ₂	13.41	14.30	14.50	13.53	14.14	14.54	14.07	K ₂	11.49	13.35	13.17
	Mean	12.57	13.55	13.19	13.33	13.31	12.67	13.10				
18	N ₀	10.92	12.25	10.91	12.29	11.43	10.37	11.36	K ₀	12.42	13.51	12.94
	N ₁	11.90	11.88	12.01	11.84	12.45	11.54	11.94	K ₁	12.33	12.78	12.00
	N ₂	13.18	13.71	14.16	14.74	13.24	13.07	13.68	K ₂	11.28	11.55	12.14
	Mean	12.01	12.61	12.36	12.96	12.37	11.66	12.33				

		P ₀	P ₁	P ₂	K ₀	K ₁	K ₂	Mean		P ₀	P ₁	P ₂
19	N ₀	8.98	9.19	8.75	8.60	9.51	8.82	8.98	K ₀	10.95	11.00	11.48
	N ₁	10.80	11.21	11.48	11.31	12.01	10.17	11.16	K ₁	11.65	12.02	11.68
	N ₂	13.66	13.65	13.53	13.52	13.83	13.49	13.61	K ₂	10.84	11.03	10.61
	Mean	11.15	11.35	11.25	11.14	11.78	10.83	11.25				
20	N ₀	9.13	8.31	8.99	8.98	9.78	7.67	8.81	K ₀	10.20	10.18	10.69
	N ₁	10.35	10.61	10.01	10.52	9.89	10.57	10.33	K ₁	10.95	9.71	9.93
	N ₂	11.28	11.01	12.27	11.56	10.92	12.07	11.52	K ₂	9.61	10.04	10.65
	Mean	10.25	9.98	10.42	10.36	10.20	10.10	10.22				
21	N ₀	5.03	6.32	6.21	5.76	5.95	5.85	5.85	K ₀	6.41	6.07	7.11
	N ₁	7.12	6.25	7.11	7.33	7.37	5.77	6.83	K ₁	6.43	6.61	7.15
	N ₂	6.87	6.49	8.02	6.50	6.87	8.02	7.13	K ₂	6.18	6.39	7.07
	Mean	6.34	6.35	7.11	6.53	6.73	6.55	6.60				
22	N ₀	5.57	6.95	7.63	6.59	6.63	6.93	6.72	K ₀	8.13	9.49	10.33
	N ₁	8.82	9.77	10.46	10.00	10.49	8.57	9.68	K ₁	8.66	9.10	10.22
	N ₂	9.69	10.67	11.97	11.36	10.87	10.09	10.77	K ₂	7.28	8.80	9.52
	Mean	8.03	9.13	10.02	9.32	9.33	8.53	9.06				
23	N ₀	12.21	12.30	12.11	12.95	12.26	11.41	12.21	K ₀	13.83	14.24	15.25
	N ₁	13.45	13.70	15.33	14.64	14.05	13.79	14.16	K ₁	13.61	13.64	13.86
	N ₂	14.94	15.57	15.48	15.72	14.82	15.45	15.33	K ₂	13.16	13.69	13.81
	Mean	13.53	13.86	14.31	14.44	13.71	13.55	13.90				
24	N ₀	5.71	6.47	5.80	5.76	6.32	5.89	5.99	K ₀	5.45	6.45	6.50
	N ₁	6.25	6.41	7.06	6.61	6.59	6.52	6.57	K ₁	6.01	6.95	7.08
	N ₂	5.99	7.27	7.07	6.03	7.13	7.18	6.78	K ₂	6.48	6.75	6.36
	Mean	5.98	6.72	6.65	6.14	6.68	6.53	6.45				
25	N ₀	12.08	12.20	11.27	10.89	11.95	12.71	11.85	K ₀	13.04	11.11	10.86
	N ₁	13.19	12.52	13.40	12.90	13.12	13.10	13.04	K ₁	12.37	12.57	12.43
	N ₂	13.12	12.41	11.60	11.22	12.31	13.59	12.37	K ₂	12.97	13.46	12.97
	Mean	12.79	12.38	12.09	11.67	12.46	13.13	12.42				
26	N ₀	9.47	10.38	10.63	9.77	10.71	9.99	10.16	K ₀	10.06	10.80	10.66
	N ₁	10.99	11.20	11.89	11.32	11.02	11.73	11.36	K ₁	10.37	10.82	11.43
	N ₂	10.52	11.31	10.89	10.42	10.88	11.41	10.90	K ₂	10.55	11.26	11.33
	Mean	10.33	10.96	11.14	10.50	10.87	11.05	10.81				

Tops: tons per acre

		P ₀	P ₁	P ₂	K ₀	K ₁	K ₂	Mean		P ₀	P ₁	P ₂
1	N ₀	5.07	7.01	6.95	6.65	6.22	6.15	6.34	K ₀	6.54	6.98	8.60
	N ₁	6.77	8.51	8.31	6.98	8.04	8.57	7.86	K ₁	6.81	8.57	7.96
	N ₂	7.66	9.63	9.87	8.49	9.07	9.61	9.05	K ₂	6.16	9.61	8.57
	Mean	6.50	8.38	8.38	7.37	7.78	7.78	7.76	±0.699. Means: ±0.404			
2	N ₀	4.13	4.39	3.99	3.99	3.82	4.70	4.17	K ₀	4.94	5.94	5.45
	N ₁	4.83	5.65	5.52	6.12	5.04	4.84	5.33	K ₁	4.68	5.04	5.46
	N ₂	6.32	6.83	5.97	6.22	6.33	6.57	6.37	K ₂	5.66	5.89	4.57
	Mean	5.09	5.62	5.16	5.44	5.06	5.37	5.29	±0.464. Means: ±0.268			
3	N ₀	5.99	6.84	7.84	6.46	5.86	8.35	6.89	K ₀	8.54	6.72	9.61
	N ₁	9.48	8.92	10.51	7.68	10.57	10.66	9.64	K ₁	9.18	10.46	9.41
	N ₂	11.91	13.40	12.47	10.73	12.62	14.43	12.59	K ₂	9.66	11.98	11.80
	Mean	9.13	9.72	10.27	8.29	9.68	11.15	9.71	±1.10. Means: ±0.635			
4	N ₀	3.57	3.33	3.96	4.11	3.42	3.33	3.62	K ₀	4.55	4.20	5.18
	N ₁	4.49	4.50	5.26	4.76	5.24	4.25	4.75	K ₁	4.49	4.38	5.30
	N ₂	5.03	4.70	5.33	5.06	5.51	4.50	5.02	K ₂	4.05	3.96	4.08
	Mean	4.36	4.18	4.85	4.64	4.72	4.03	4.46	±0.473. Means: ±0.273			
5	N ₀	3.50	3.81	4.03	3.60	3.78	3.97	3.78	K ₀	4.81	6.16	6.13
	N ₁	5.81	5.53	5.75	5.44	6.06	5.59	5.70	K ₁	5.63	5.28	6.16
	N ₂	6.75	8.22	7.59	8.06	7.22	7.28	7.52	K ₂	5.63	6.13	5.09
	Mean	5.36	5.86	5.79	5.70	5.69	5.62	5.67	±0.472. Means: ±0.272			
6	N ₀	7.62	8.12	9.96	8.57	8.83	8.30	8.57	K ₀	10.00	12.52	12.80
	N ₁	11.41	12.16	12.60	12.53	12.08	11.56	12.06	K ₁	12.30	11.16	13.41
	N ₂	16.62	15.16	15.76	14.23	15.97	17.34	15.85	K ₂	13.35	11.76	12.10
	Mean	11.88	11.81	12.77	11.78	12.29	12.40	12.16	±0.727. Means: ±0.420			
7	N ₀	3.79	4.91	4.73	4.37	4.99	4.08	4.48	K ₀	5.60	6.52	6.22
	N ₁	5.32	5.76	6.77	5.22	6.57	6.05	5.95	K ₁	6.08	7.40	7.10
	N ₂	8.65	9.12	9.05	8.75	9.02	9.05	8.94	K ₂	6.08	5.87	7.23
	Mean	5.92	6.60	6.85	6.11	6.86	6.39	6.46	±0.635. Means: ±0.367			
10	N ₀	10.89	11.32	11.45	10.61	11.70	11.35	11.22	K ₀	13.92	12.19	14.23
	N ₁	14.08	14.22	12.08	14.46	12.57	13.34	13.46	K ₁	13.71	13.80	13.37
	N ₂	16.20	15.27	16.96	15.27	16.62	16.54	16.14	K ₂	13.54	14.81	12.88
	Mean	13.72	13.60	13.50	13.45	13.63	13.74	13.61	±0.982. Means: ±0.567			
12	N ₀	5.31	4.47	5.29	5.09	4.80	5.17	5.02	K ₀	6.25	7.69	6.70
	N ₁	6.81	7.95	5.37	6.30	7.04	6.79	6.71	K ₁	7.15	6.42	6.44
	N ₂	7.75	9.73	8.88	9.25	8.17	8.93	8.79	K ₂	6.47	8.03	6.39
	Mean	6.62	7.38	6.51	6.88	6.67	6.96	6.84	±0.756. Means: ±0.436			

		P ₀	P ₁	P ₂	K ₀	K ₁	K ₂	Mean		P ₀	P ₁	P ₂
13	N ₀	5.62	6.20	5.36	5.68	5.46	6.04	5.73	K ₀	5.35	7.28	8.35
	N ₁	6.27	7.06	8.37	7.95	6.29	7.46	7.23		5.09	7.18	5.16
	N ₂	4.78	7.47	8.49	7.35	5.68	7.71	6.91		6.23	6.27	8.71
	Mean	5.56	6.91	7.41	6.99	5.81	7.07	6.62		±1.02. Means: ±0.589		
16	N ₀	7.63	7.53	6.67	7.31	6.93	7.60	7.28	K ₀	9.11	9.61	8.79
	N ₁	9.02	9.77	8.68	9.33	8.87	9.27	9.16		9.09	10.07	8.48
	N ₂	10.79	12.05	11.25	10.86	11.84	11.39	11.36		9.24	9.68	9.34
	Mean	9.15	9.79	8.87	9.17	9.21	9.42	9.27		±0.390. Means: ±0.225		
18	N ₀	8.02	9.52	11.83	9.77	10.69	8.91	9.79	K ₀	10.58	10.51	9.95
	N ₁	8.29	8.61	10.18	8.70	8.67	9.69	9.02		9.50	11.30	14.55
	N ₂	12.64	12.28	13.99	12.56	15.97	10.37	12.97		8.87	8.59	11.51
	Mean	9.65	10.13	12.00	10.31	11.78	9.65	10.60		±1.47. Means: ±0.849		
20	N ₀	3.76	3.16	4.01	4.01	4.01	2.92	3.65	K ₀	4.43	4.80	4.62
	N ₁	4.07	3.83	4.31	4.74	3.58	3.89	4.07		4.07	4.86	4.68
	N ₂	4.62	5.41	5.16	5.10	6.01	4.07	5.06		3.95	2.73	4.19
	Mean	4.15	4.13	4.50	4.62	4.54	3.62	4.26		±0.545. Means: ±0.315		
22	N ₀	3.43	3.27	3.50	3.02	3.87	3.31	3.40	K ₀	5.45	5.23	5.80
	N ₁	6.58	6.81	6.17	6.65	6.82	6.10	6.52		7.10	6.27	6.16
	N ₂	7.77	8.19	7.37	6.80	8.85	7.69	7.78		5.25	6.77	5.08
	Mean	5.93	6.09	5.68	5.49	6.51	5.70	5.90		±0.814. Means: ±0.470		
23	N ₀	6.41	4.78	5.98	6.02	6.41	4.74	5.72	K ₀	7.02	7.27	8.10
	N ₁	7.33	8.67	8.25	7.88	8.05	8.32	8.08		8.38	7.87	9.09
	N ₂	8.19	9.43	10.03	8.48	10.88	8.28	9.21		6.53	7.74	7.08
	Mean	7.31	7.63	8.09	7.46	8.45	7.11	7.67		±0.681. Means: ±0.393		
24	N ₀	5.92	6.42	5.88	5.99	6.41	5.81	6.07	K ₀	5.74	6.94	7.10
	N ₁	6.18	6.96	7.44	7.06	7.03	6.48	6.85		6.33	7.10	7.45
	N ₂	6.60	7.77	7.67	6.72	7.44	7.87	7.34		6.63	7.11	6.44
	Mean	6.23	7.05	6.99	6.59	6.96	6.72	6.76		±0.368. Means: ±0.212		
25	N ₀	13.76	14.37	13.29	14.50	13.82	13.10	13.81	K ₀	19.11	13.31	16.27
	N ₁	16.03	14.75	21.63	15.86	22.17	14.39	17.47		16.84	16.60	17.14
	N ₂	19.30	16.29	17.44	18.33	14.60	20.10	17.68		13.14	15.50	18.95
	Mean	16.36	15.14	17.45	16.23	16.86	15.86	16.32		±2.41. Means: ±1.39		
26	N ₀	9.70	9.46	9.02	10.24	10.50	7.44	9.39	K ₀	9.91	10.89	12.86
	N ₁	11.10	12.38	13.30	12.53	11.51	12.74	12.26		11.49	11.25	11.49
	N ₂	11.19	12.14	11.91	10.89	12.20	12.14	11.74		10.60	11.84	9.88
	Mean	10.66	11.33	11.41	11.22	11.40	10.77	11.13		±1.05. Means: ±0.606		

Responses to Fertilisers

*5 per cent significance.

**1 per cent significance.

Station	Mean yield	Linear Response (response to the double dressing)			St. error	Curvature (excess of extra response to second dressing over response to first dressing)			St. error
		N	P	K		N	P	K	
TOTAL SUGAR : cwt. per acre									
COARSE SANDS									
1 Allscott II ..	23.8	+5.7**	+9.1**	+7.8**	±1.63	-5.1	-5.1	-9.6*	±2.81
2 Bardney I ..	30.6	+8.8**	+2.6	+7.5**	±2.14	-0.8	-3.4	+4.1	±3.70
3 Brigg I ..	28.4	+4.4	+4.1	+8.2**	±2.27	-7.2	-0.3	+1.8	±3.93
4 King's Lynn I ..	34.3	+13.1**	-0.6	-4.6	±2.56	-5.1	+1.2	-5.4	±4.44
5 King's Lynn II ..	44.5	+20.2**	+5.8*	+0.7	±2.18	-4.2	+6.0	+3.3	±3.78
6 Newark ..	50.0	+17.6**	+4.0	+0.3	±2.34	-7.2	-1.0	+3.5	±4.04
Mean ..	35.3	+11.6	+4.2	+3.3		-4.9	-0.4	-0.4	
FINE SANDS									
7 Bury I ..	24.1	+6.1**	+4.1*	+4.0*	±1.41	-3.1	-0.7	+0.8	±2.45
8 Bury II ..	17.8	+4.9**	+3.1*	+2.7*	±1.11	+0.7	-2.9	+0.7	±1.92
9 Cantley I ..	44.4	+7.4	+3.9	+4.3	±4.15	-6.6	+7.1	-1.1	±7.18
10 Kidderminster ..	44.6	+9.8**	+1.3	+3.3*	±1.39	-5.4*	+0.3	-3.1	±2.40
11 Wissington I ..	22.9	+1.4	+1.3	+7.8**	±1.47	0.0	-3.1	-1.6	±2.54
Mean ..	30.8	+5.9	+2.7	+4.4		-2.9	+0.1	-0.9	
LIGHT LOAMS									
12 Allscott I ..	32.8	+10.5**	+3.0*	+3.4*	±1.20	+0.3	-1.8	-1.8	±2.08
13 Brigg II ..	14.7	+0.9	+8.7**	+1.4	±2.82	-4.9	+0.5	+8.0	±4.89
14 Cantley II ..	55.4	-1.4	+6.8**	+7.3**	±1.99	-1.6	-7.0	+0.1	±3.45
15 Colwick ..	53.0	+3.1*	-0.4	-0.5	±1.07	-0.9	+1.0	+0.7	±1.85
16 Selby ..	44.3	+11.8**	+1.7	-1.6	±1.62	0.0	-0.9	+0.6	±2.80
17 Wissington II ..	48.4	+9.0**	+2.6	-1.2	±1.40	-6.4*	-5.2*	-2.2	±2.42
Mean ..	41.4	+5.6	+3.7	+1.5		-2.2	-2.2	+0.9	
HEAVY LOAMS									
18 Bardney II ..	41.2	+6.5*	+1.3	-3.0	±2.23	+0.7	-3.5	+0.4	±3.87
19 Ipswich ..	40.3	+16.7**	+0.4	-0.9	±1.19	+0.9	-2.0	-5.9*	±2.05
20 Peterboro' I ..	39.9	+10.2**	+0.7	-1.0	±2.62	-1.0	+2.9	+0.6	±4.52
21 Poppleton ..	22.9	+3.3	+2.5	+0.1	±1.72	-2.9	+2.5	-1.9	±2.98
Mean ..	36.1	+9.2	+1.2	-1.2		-0.6	0.0	-1.7	
CLAY LOAMS									
22 Felstead I ..	35.8	15.2**	+8.2**	-2.6*	±1.22	-7.4**	-0.8	-3.2	±2.12
23 Felstead II ..	53.6	+12.4**	+2.2	-3.1*	±1.22	-3.8	+1.0	+2.1	±2.12
24 Felstead Area (Oaklands) ..	21.4	+2.1*	+2.5**	+1.6	±0.858	-1.3	-2.5	-3.0	±1.48
Mean ..	36.9	+9.9	+4.3	-1.4		-4.2	-0.8	-1.4	
FENS									
25 Ely ..	41.5	+0.1	-2.7	+5.8*	±1.89	-3.9	-2.7	-0.2	±3.28
26 Peterboro' II ..	40.7	+1.6	+3.2*	+2.5	±1.41	-6.8*	-1.4	+0.1	±2.45
Mean ..	41.1	+0.8	+0.2	+4.2		-5.4	-2.0	0.0	
Mean ..	36.6	+7.7	+3.0	+1.9		-3.2	-0.8	-0.5	

Station	Mean yield	Linear Response (response to the double dressing)			Curvature (Excess of extra response to second dressing over response to first dressing)			
		N	P	K	N	P	K	
ROOTS (washed) : tons per acre								
COARSE SANDS								
1 Allscott II	6.93	+1.82	+2.44	+2.07	-1.30	-1.50	-2.59	
2 Bardney I	8.47	+2.45	+0.84	+2.02	-0.11	-1.20	+1.14	
3 Brigg I	8.25	+1.45	+1.14	+2.15	-1.89	-0.06	+0.57	
4 King's Lynn I	9.53	+3.62	-0.12	-1.26	-1.38	+0.48	-1.42	
5 King's Lynn II	12.42	+5.59	+1.59	+0.05	-1.25	+1.65	+0.93	
6 Newark	14.48	+5.08	+1.31	-0.02	-2.04	+0.01	+0.76	
Mean	10.01	+3.34	+1.20	+0.84	-1.33	-0.10	-0.10	
FINE SANDS								
7 Bury I	6.68	+1.74	+1.22	+0.86	-0.68	-0.16	-0.02	
8 Bury II	5.18	+1.38	+0.88	+0.66	-0.08	-0.80	+0.16	
9 Cantley I	13.30	+2.35	+1.15	+1.14	-1.97	+1.73	-0.14	
10 Kidderminster	13.10	+3.28	+0.31	+0.82	-1.38	-0.05	-0.44	
11 Wissington I	7.02	+0.49	+0.38	+2.09	+0.07	-0.86	-0.39	
Mean	9.06	+1.85	+0.79	+1.11	-0.81	-0.03	-0.17	
LIGHT LOAMS								
12 Allscott I	9.71	+3.09	+0.77	+0.85	-0.05	-0.53	-0.51	
13 Brigg II	4.46	+0.31	+2.49	+0.45	-1.45	+0.07	+2.35	
14 Cantley II	17.56	-0.01	+2.05	+2.20	+0.09	-1.95	+0.42	
15 Colwick	16.18	+0.75	-0.21	-0.10	-0.41	+0.41	+0.08	
16 Selby	11.46	+2.78	0.00	-0.48	-0.28	-0.32	+0.10	
17 Wissington II	13.10	+2.53	+0.62	-0.66	-1.79	-1.34	-0.62	
Mean	12.08	+1.58	+0.95	+0.38	-0.65	-0.61	+0.30	
HEAVY LOAMS								
18 Bardney II	12.33	+2.32	+0.35	-1.30	+1.16	-0.85	-0.12	
19 Ipswich	11.25	+4.63	+0.10	-0.31	+0.27	-0.30	-1.59	
20 Peterboro' I	10.22	+2.71	+0.17	-0.26	-0.33	+0.71	+0.06	
21 Poppleton	6.60	+1.28	+0.77	+0.02	-0.68	+0.75	-0.38	
Mean	10.10	+2.74	+0.35	-0.46	+0.10	+0.08	-0.51	
CLAY LOAMS								
22 Felstead I	9.06	+4.05	+1.99	-0.79	-1.87	-0.21	-0.81	
23 Felstead II	13.90	+3.12	+0.78	-0.89	-0.78	+0.12	+0.57	
24 Felstead Area (Oaklands)	6.45	+0.79	+0.67	+0.39	-0.37	-0.81	-0.69	
Mean	9.80	+2.65	+1.15	-0.43	-1.01	-0.30	-0.31	
FENS								
25 Ely	12.42	+0.52	-0.70	+1.46	-1.86	+0.12	-0.12	
26 Peterboro' II	10.81	+0.74	+0.81	+0.55	-1.66	-0.45	-0.19	
Mean	11.62	+0.63	+0.06	+1.00	-1.76	-0.16	-0.16	
Mean	10.42	+2.26	+0.84	+0.45	-0.85	-0.20	-0.11	

Station	Mean yield	Linear Response (response to the double dressing)			St. error	Curvature (Excess of extra response to second dressing over response to first dressing)			St. error
		N	P	K		N	P	K	
TOPS : tons per acre									
COARSE SANDS									
1 Allscott II ..	7.76	+2.71**	+1.88**	+0.41	±0.570	-0.33	-1.88	-0.41	±0.988
2 Bardney I ..	5.29	+2.20**	+0.07	-0.07	±0.378	-0.12	-0.99	+0.69	±0.656
3 Brigg I ..	9.71	+5.70**	+1.14	+2.86**	±0.896	+0.20	-0.04	+0.08	±1.56
4 King's Lynn I	4.46	+1.40**	+0.49	-0.61	±0.387	-0.86	+0.85	-0.77	±0.669
5 King's Lynn II..	5.67	+3.74**	+0.43	-0.08	±0.385	-0.10	-0.57	-0.06	±0.667
6 Newark ..	12.16	+7.28**	+0.89	+0.62	±0.594	+0.30	+1.03	-0.40	±1.03
Mean ..	7.51	+3.84	+0.82	+0.52		-0.15	-0.27	-0.14	
FINE SANDS									
7 Bury I ..	6.46	+4.46**	+0.93	+0.28	±0.519	+1.52	-0.43	-1.22	±0.898
10 Kidderminster ..	13.61	+4.92**	-0.22	+0.29	±0.802	+0.44	+0.02	-0.07	±1.39
Mean ..	10.04	+4.69	+0.36	+0.28		+0.98	-0.20	-0.64	
LIGHT LOAMS									
12 Allscott I ..	6.84	+3.77**	-0.11	+0.08	±0.618	+0.39	-1.63	+0.50	±1.07
13 Brigg II ..	6.62	+1.18	+1.85*	+0.08	±0.834	-1.82	-0.85	+2.44	±1.44
16 Selby ..	9.27	+4.08**	-0.28	+0.25	±0.319	+0.32	-1.56*	+0.17	±0.551
Mean ..	7.58	+3.01	+0.49	+0.14		-0.37	-1.35	+1.04	
HEAVY LOAMS									
18 Bardney II ..	10.60	+3.18*	+2.35	-0.66	±1.20	+4.72*	+1.39	-3.60	±2.08
20 Peterboro' I ..	4.26	+1.41*	+0.35	-1.00*	±0.445	+0.57	+0.39	-0.84	±0.771
Mean ..	7.43	+2.30	+1.35	-0.83		+2.64	+0.89	-2.22	
CLAY LOAMS									
22 Felstead I ..	5.90	+4.38**	-0.25	+0.21	±0.665	-1.86	-0.57	-1.83	±1.15
23 Felstead II ..	7.67	+3.49**	+0.78	-0.35	±0.556	-1.23	+0.14	-2.33*	±0.963
24 Felstead Area (Oaklands) ..	6.76	+1.27**	+0.76*	+0.13	±0.301	-0.29	-0.88	-0.61	±0.520
Mean ..	6.78	+3.05	+0.43	0.00		-1.13	-0.44	-1.59	
FENS									
25 Ely ..	16.32	+3.87	+1.09	-0.37	±1.97	-3.45	+3.53	-1.63	±3.41
26 Peterboro' II ..	11.13	+2.35*	+0.75	-0.45	±0.858	-3.39*	-0.59	-0.81	±1.48
Mean ..	13.72	+3.11	+0.92	-0.41		-3.42	+1.47	-1.22	
Mean ..	8.36	+3.41	+0.72	+0.09		-0.28	-0.15	-0.59	

Station	Mean	Linear Response (response to the double dressing)			Curvature (excess of extra response to second dressing over response to first dressing).			
		N	P	K	N	P	K	
SUGAR PERCENTAGE								
COARSE SANDS								
1 Allscott II	17.12	-0.36	+0.38	+0.56	-0.34	+0.08	-0.52	
2 Bardney I	18.02	+0.04	-0.25	+0.10	-0.28	+0.45	-0.06	
3 Brigg I	17.17	-0.42	+0.08	+0.49	-0.44	-0.08	-0.11	
4 King's Lynn I	18.02	+0.02	-0.09	-0.09	-0.16	-0.19	-0.13	
5 King's Lynn II	17.91	+0.12	+0.08	+0.19	+0.22	+0.08	+0.13	
6 Newark	17.25	+0.06	-0.17	+0.09	-0.10	-0.39	+0.29	
Mean	17.58	-0.09	0.00	+0.22	-0.18	-0.01	-0.07	
FINE SANDS								
7 Bury I	17.99	-0.15	-0.10	+0.64	-0.45	-0.06	+0.42	
8 Bury II	17.20	+0.16	+0.18	+0.32	+0.96	-0.10	+0.26	
9 Cantley I	16.66	-0.21	+0.05	+0.22	-0.07	+0.51	-0.12	
10 Kidderminster	17.03	-0.49	+0.10	+0.18	-0.23	+0.22	-0.62	
11 Wissington I	16.25	-0.13	-0.03	+0.74	-0.09	-0.27	-0.44	
Mean	17.03	-0.16	+0.04	+0.42	+0.02	+0.06	-0.10	
LIGHT LOAMS								
12 Allscott I	16.87	+0.03	+0.20	+0.27	+0.25	+0.04	-0.11	
13 Brigg II	16.32	+0.04	+0.59	-0.07	-0.12	+0.09	+0.13	
14 Cantley II	15.76	-0.40	+0.13	+0.07	-0.54	-0.21	-0.39	
15 Colwick	16.39	+0.20	+0.12	-0.07	+0.16	-0.08	+0.15	
16 Selby	19.30	+0.45	+0.76	+0.20	+0.39	+0.24	+0.06	
17 Wissington II	18.47	-0.16	+0.11	+0.46	+0.06	-0.07	+0.02	
Mean	17.18	+0.03	+0.32	+0.14	+0.03	0.00	-0.02	
HEAVY LOAMS								
18 Bardney II	16.74	-0.47	-0.02	+0.70	-1.15	-0.32	+0.32	
19 Ipswich	17.93	+0.02	0.00	+0.16	-0.06	-0.42	-0.06	
20 Peterboro' I	19.53	-0.19	+0.03	-0.03	+0.15	+0.03	+0.17	
21 Poppleton	17.40	-0.85	-0.13	+0.07	-0.25	+0.15	-0.37	
Mean	17.90	-0.37	-0.03	+0.22	-0.33	-0.14	+0.02	
CLAY LOAMS								
22 Felstead I	19.83	-0.52	+0.15	+0.23	+0.22	+0.01	+0.07	
23 Felstead II	19.29	+0.12	-0.25	+0.05	-0.30	+0.15	-0.03	
24 Felstead Area (Oaklands)	16.57	-0.39	+0.29	+0.29	-0.05	+0.01	-0.47	
Mean	18.56	-0.26	+0.06	+0.19	-0.04	+0.06	-0.14	
FENS								
25 Ely	16.74	-0.71	-0.14	+0.32	+0.91	-1.24	+0.06	
26 Peterboro' II	18.86	-0.60	+0.03	+0.21	-0.26	+0.11	+0.35	
Mean	17.80	-0.66	-0.06	+0.26	+0.32	-0.56	+0.20	
Mean	17.56	-0.18	+0.08	+0.24	-0.06	-0.05	-0.04	

Station	Mean	Linear Response (response to the double dressing)			Curvature (excess of extra response to second dressing over response to first dressing)			
		N	P	K	N	P	K	
PLANT NUMBER : thousands per acre								
COARSE SANDS								
1 Allscott II	30.6	-0.8	+1.7	+2.0	-2.6	-7.9	+0.2	
2 Bardney I	31.0	+0.9	+0.5	+1.3	+0.5	+0.9	-0.1	
3 Brigg I	32.0	-1.3	+1.9	+2.3	-2.1	-2.3	+4.1	
4 King's Lynn I	20.7	+0.2	-1.0	-1.5	-1.4	-0.4	-0.9	
5 King's Lynn II	21.7	-0.3	-0.2	+0.2	+0.1	+0.4	+0.2	
6 Newark	27.9	+1.7	+0.9	-0.9	-0.5	+1.3	+0.1	
Mean	27.3	+0.1	+0.6	+0.6	-1.0	-1.3	+0.6	
FINE SANDS								
7 Bury I	22.5	+0.3	-0.4	+1.1	+2.3	+2.0	+2.3	
8 Bury II	17.1	-0.3	-0.2	-0.9	-0.3	+1.2	-0.3	
10 Kidderminster	26.1	-0.7	-0.1	+0.8	-0.1	+2.9	-3.4	
11 Wissington I	28.5	-0.9	+1.3	+1.0	-0.7	-0.7	-0.2	
Mean	23.6	-0.4	+0.2	+0.5	+0.3	+1.4	-0.4	
LIGHT LOAMS								
12 Allscott I	26.3	0.0	+1.8	+1.4	-0.4	+3.6	-3.0	
13 Brigg II	18.3	+0.5	+5.1	-0.8	-1.9	+0.7	+2.2	
15 Colwick	34.9	-0.1	-0.4	-0.1	-1.1	+1.2	-0.3	
16 Selby	24.4	+1.9	+0.5	-0.2	-0.3	-0.9	+2.4	
17 Wissington II	26.3	-1.0	-0.8	-0.1	+0.6	+0.2	+1.7	
Mean	26.0	+0.3	+1.2	0.0	-0.6	+1.0	+0.6	
HEAVY LOAMS								
18 Bardney II	22.2	+0.5	-0.7	-1.2	+2.9	-1.9	+2.0	
19 Ipswich	24.2	+1.0	+0.3	+0.1	+1.8	-1.9	-0.9	
20 Peterboro' I	29.0	+1.5	+0.3	0.0	-1.1	+0.5	-0.4	
21 Poppleton	20.2	-0.8	+0.9	0.0	-1.2	+2.7	-0.6	
Mean	23.9	+0.6	+0.2	-0.3	+0.6	-0.2	0.0	
CLAY LOAMS								
22 Felstead I	26.6	-0.8	+2.0	-1.7	-0.6	-1.8	-2.9	
23 Felstead II	27.6	+0.1	0.0	+2.1	+1.1	-1.0	+1.5	
24 Felstead Area (Oaklands)	23.1	-1.1	+0.7	+0.4	+1.5	-3.7	+0.8	
Mean	25.8	-0.6	+0.9	+0.3	+0.7	-2.2	-0.2	
FENS								
25 Ely	29.9	-0.6	-0.3	+1.7	0.0	+0.3	-1.5	
26 Peterboro' II	31.2	+0.8	+0.6	-0.1	-2.8	+0.2	-0.7	
Mean	30.6	+0.1	+0.2	+0.8	-1.4	+0.2	-1.1	
Mean	25.9	0.0	+0.6	+0.3	-0.3	-0.2	+0.1	

Station				Mean	Linear Response (response to the double dressing)			Curvature (excess of extra response to second dressing over response to first dressing)		
					N	P	K	N	P	K
					PERCENTAGE PURITY					
COARSE SANDS										
1	Allscott II	..	..	89.8	-0.5	+0.2	+0.6	+2.5	+0.2	+0.2
4	King's Lynn I	..	..	90.1	-0.3	+0.1	+0.3	-0.1	-0.1	+0.3
5	King's Lynn II	..	..	81.3	+1.7	-2.8	0.0	+2.9	+3.2	-0.4
6	Newark	..	..	92.0	+0.5	0.0	0.0	-0.3	-0.6	0.0
Mean				88.3	+0.4	-0.6	+0.2	+1.2	+0.7	0.0
FINE SANDS										
7	Bury I	..	..	89.3	+0.2	+0.4	+0.6	-0.4	+0.2	-0.4
8	Bury II	..	..	88.8	-0.5	+0.3	+0.7	+1.1	+1.1	-0.5
9	Cantley I	..	..	91.8	-0.2	-0.4	-0.7	+1.2	-0.4	+1.1
10	Kidderminster	..	..	88.5	+0.6	-0.8	+2.2	+1.0	+0.2	-1.4
11	Wissington I	..	..	87.2	-0.7	-0.5	+1.0	+1.3	-0.5	-0.8
Mean				89.1	-0.1	-0.2	+0.8	+0.8	+0.1	-0.4
LIGHT LOAMS										
12	Allscott I	..	..	88.8	-0.2	-0.4	0.0	-1.0	+0.2	+0.2
14	Cantley II	..	..	90.4	-0.3	+0.2	-0.2	-1.7	0.0	-1.2
15	Colwick	..	..	87.5	-0.6	0.0	-0.7	-0.4	+0.6	-0.1
16	Selby	..	..	89.0	+0.4	+0.8	+1.1	0.0	0.0	-0.1
17	Wissington II	..	..	89.7	-0.1	0.0	-0.1	-0.7	-0.8	+0.1
Mean				89.1	-0.2	+0.1	0.0	-0.8	0.0	-0.2
HEAVY LOAMS										
19	Ipswich	..	..	91.0	-0.6	-1.0	-0.3	-1.8	+0.6	-0.1
20	Peterboro' I	..	..	87.5	-0.6	+0.3	-0.2	+0.4	+0.1	+0.4
21	Poppleton	..	..	87.6	-1.1	-0.5	-0.3	+0.1	+0.7	-0.5
Mean				88.7	-0.8	-0.4	-0.3	-0.4	+0.5	-0.1
CLAY LOAMS										
22	Felstead I	..	..	87.4	+0.6	+0.7	+0.5	-1.2	-0.3	-0.5
23	Felstead II	..	..	88.4	+0.4	+0.1	-0.4	-0.6	-0.7	-0.6
Mean				87.9	+0.5	+0.4	0.0	-0.9	-0.5	-0.6
FENS										
25	Ely	..	..	86.2	-1.5	-1.1	+0.9	+0.1	-1.7	-1.7
26	Peterboro' II	..	..	86.9	+0.9	+0.3	-1.6	-2.7	+1.5	-6.6
Mean				86.6	-0.3	-0.4	-0.4	-1.3	-0.1	-4.2
Mean				88.5	-0.1	-0.2	+0.2	0.0	+0.2	-0.6

Interactions

Station	Interaction of linear responses (one half of the extra response to one fertiliser through the addition of a second)			St. error	Interaction of linear responses (one half of the extra response to one fertiliser through the addition of a second)		
	N×P	N×K	P×K		N×P	N×K	P×K
TOTAL SUGAR : cwt. per acre					ROOTS (washed): tons per acre		
COARSE SANDS							
1 Allscott II	-0.1	+1.8	+2.0	±1.99	-0.06	+0.70	+0.39
2 Bardney I	+2.6	+2.7	-1.0	±2.62	+0.80	+0.50	-0.35
3 Brigg I	-2.0	+1.8	+1.8	±2.78	-0.62	+0.54	+0.50
4 Kings Lynn I	+2.0	-3.6	+0.6	±3.14	+0.46	-0.98	+0.12
5 King's Lynn II	+0.9	+1.2	-2.9	±2.67	+0.28	+0.06	-0.68
6 Newark	-5.0	+1.0	-7.0*	±2.86	-1.44	+0.40	-1.86
Mean	-0.3	+0.8	-1.1		-0.10	+0.20	-0.31
FINE SANDS							
7 Bury I	-1.1	+0.9	-1.7	±1.73	-0.23	+0.24	-0.49
8 Bury II	-0.4	-0.8	-0.5	±1.36	-0.11	-0.33	-0.18
9 Cantley I	-0.2	+3.6	+7.8	±5.08	-0.17	+0.96	+1.96
10 Kidderminster	-0.8	+1.2	-0.8	±1.70	-0.30	+0.30	-0.24
11 Wissington I	+0.6	-0.7	+1.6	±1.80	+0.12	-0.30	+0.44
Mean	-0.4	+0.8	+1.3		-0.14	+0.17	+0.30
LIGHT LOAMS							
12 Allscott I	+1.6	+1.9	+1.2	±1.47	+0.60	+0.52	+0.32
13 Brigg II	+4.3	+1.0	+0.8	±3.46	+1.34	+0.34	+0.22
14 Cantley II	-0.6	-1.8	-3.0	±2.44	+0.29	-0.63	-0.90
15 Colwick	+1.8	0.0	+0.4	±1.31	+0.56	-0.06	+0.14
16 Selby	+0.3	-2.1	+1.8	±1.98	+0.07	-0.14	+0.47
17 Wissington II	+1.6	+4.8*	+2.7	±1.71	+0.42	+1.34	+0.61
Mean	+1.5	+0.6	+0.6		+0.55	+0.23	+0.14
HEAVY LOAMS							
18 Bardney II	+2.8	+0.1	-1.2	±2.74	+0.50	+0.12	+0.17
19 Ipswich	-0.1	-1.0	-1.6	±1.45	+0.05	-0.12	-0.38
20 Peterboro' I	+2.1	+3.8	+0.8	±3.20	+0.56	+0.91	+0.28
21 Poppleton	-0.4	+3.0	+0.2	±2.11	-0.02	+0.72	+0.10
Mean	+1.1	+1.5	-0.4		+0.27	+0.41	+0.04
CLAY LOAMS							
22 Felstead I	0.0	-2.6	0.0	±1.50	+0.11	-0.80	+0.02
23 Felstead II	+1.1	+2.3	-1.1	±1.50	+0.32	+0.64	-0.38
24 Felstead Area (Oaklands)	+1.7	+1.4	-2.3*	±1.05	+0.50	+0.51	-0.58
Mean	+0.9	+0.4	-1.1		+0.31	+0.12	-0.31
FENS							
25 Ely	0.0	+0.4	+2.0	±2.32	-0.36	+0.28	+1.09
26 Peterboro' II	-1.4	+1.2	+0.9	±1.73	-0.40	+0.38	+0.09
Mean	-0.7	+0.8	+1.4		-0.38	+0.33	+0.59
Mean	+0.4	+0.8	0.0		+0.12	+0.23	+0.03

Station	Interaction of linear responses (one half of the extra response to one fertiliser through the addition of a second)			St. error	Interaction of linear responses (one half of the extra response to one fertiliser through the addition of a second)		
	N×P	N×K	P×K		N×P	N×K	P×K
COARSE SANDS				TOPS: tons per acre			
1 Allscott II	+0.16	+0.81	+0.18	±0.699	+0.05	-0.34	+0.38
2 Bardney I	-0.10	-0.18	-0.80	±0.464	-0.08	+0.40	+0.24
3 Brigg I	-0.64	+0.90	+0.54	±1.10	0.00	+0.02	+0.06
4 King's Lynn I	-0.04	+0.11	-0.30	±0.473	+0.19	0.00	+0.06
5 King's Lynn II	+0.16	-0.58	-0.93	±0.472	-0.06	+0.24	-0.11
6 Newark	-1.60*	+1.69*	-2.02*	±0.727	-0.05	-0.08	-0.20
Mean	-0.34	+0.46	-0.56		+0.01	+0.04	+0.07
FINE SANDS				SUGAR PERCENTAGE			
7 Bury I	-0.27	+0.30	+0.26	±0.635	-0.10	+0.04	+0.10
8 Bury II	—	—	—	—	+0.04	+0.36	+0.08
9 Cantley I	—	—	—	—	+0.14	+0.15	+0.52
10 Kidderminster	+0.10	+0.26	-0.48	±0.982	+0.04	+0.12	-0.04
11 Wissington I	—	—	—	—	+0.10	+0.19	+0.12
Mean	-0.08	+0.28	-0.11		+0.04	+0.17	+0.16
LIGHT LOAMS							
12 Allscott I	+0.58	-0.20	-0.26	±0.756	-0.25	+0.05	+0.05
13 Brigg II	+1.98	0.00	-0.26	±1.02	-0.06	-0.24	+0.08
14 Cantley II	—	—	—	—	-0.36	+0.08	-0.08
15 Colwick	—	—	—	—	-0.03	+0.08	-0.04
16 Selby	+0.71	+0.12	+0.21	±0.390	-0.12	-0.74	-0.02
17 Wissington II	—	—	—	—	-0.03	-0.07	+0.15
Mean	+1.09	-0.03	-0.10		-0.14	-0.14	+0.02
HEAVY LOAMS							
18 Bardney II	-1.23	-0.66	+1.64	±1.47	+0.48	-0.28	-0.62
19 Ipswich	—	—	—	—	-0.10	-0.22	-0.14
20 Peterboro' I	+0.14	+0.03	+0.02	±0.545	-0.01	+0.07	-0.12
21 Poppleton	—	—	—	—	-0.16	+0.40	-0.16
Mean	-0.54	-0.32	+0.83		+0.05	-0.01	-0.26
CLAY LOAMS							
22 Felstead I	-0.24	+0.30	-0.26	±0.814	-0.17	+0.30	-0.05
23 Felstead II	+1.14	+0.54	-0.26	±0.681	-0.04	-0.06	+0.08
24 Felstead Area (Oaklands)	+0.56	+0.66	-0.78*	±0.368	+0.08	-0.12	-0.26
Mean	+0.49	+0.50	-0.43		-0.04	+0.04	-0.08
FENS							
25 Ely	-0.70	+1.58	+4.32	±2.41	+0.52	-0.16	-0.62
26 Peterboro' II	+0.70	+2.02	-1.84	±1.05	+0.13	-0.14	+0.16
Mean	0.00	+1.80	+1.24		+0.32	-0.15	-0.23
Mean	+0.08	+0.43	-0.06		0.00	0.00	-0.01

Station					Interaction of linear responses (one half of the extra response to one fertiliser through the addition of a second)			Interaction of linear responses (one half of the extra response to one fertiliser through the addition of a second)		
					N×P	N×K	P×K	N×P	N×K	P×K
					PLANT NUMBER : thousands per acre			PERCENTAGE PURITY		
COARSE SANDS										
1	Allscott II	..	..	..	-1.0	-0.2	+0.8	-1.6	-1.0	+1.9
2	Bardney I	..	..	..	-0.6	+1.1	-0.8	—	—	—
3	Brigg I	..	..	..	-3.5	-1.0	+2.4	—	—	—
4	King's Lynn I	..	..	..	-1.0	-0.4	-0.5	+0.2	-0.1	+0.1
5	King's Lynn II	..	..	..	-0.2	-0.4	+0.4	+0.4	+1.5	+1.0
6	Newark	..	..	..	0.0	+1.6	-0.3	0.0	-0.2	-0.4
Mean					-1.0	+0.1	+0.3	-0.2	0.0	+0.6
FINE SANDS										
7	Bury I	..	..	..	-0.8	+2.0	-2.0	-0.2	-0.2	+0.4
8	Bury II	..	..	..	-0.2	-0.4	-0.6	+0.4	-1.3	-0.8
9	Cantley I	..	..	..	—	—	—	-0.2	+0.8	-0.4
10	Kidderminster	..	..	..	+2.0	+0.3	-0.6	-0.4	+0.9	+1.7
11	Wissington I	..	..	..	+0.8	+0.2	+0.5	0.0	-0.1	0.0
Mean					+0.4	+0.5	-0.7	-0.1	0.0	+0.2
LIGHT LOAMS										
12	Allscott I	..	..	..	+3.2	+1.4	+1.1	+0.2	0.0	+0.2
13	Brigg II	..	..	..	+3.2	+1.0	+0.6	—	—	—
14	Cantley II	..	..	..	—	—	—	-1.0	-0.2	+0.6
15	Colwick	..	..	..	+0.2	+1.0	+0.2	-0.2	+0.2	-0.4
16	Selby	..	..	..	+0.2	0.0	+0.5	-0.2	+0.6	+0.2
17	Wissington II	..	..	..	-1.0	-0.5	+1.2	-0.4	+0.2	-0.1
Mean					+1.2	+0.6	+0.7	-0.3	+0.2	+0.1
HEAVY LOAMS										
18	Bardney II	..	..	..	+0.4	0.0	+0.4	—	—	—
19	Ipswich	..	..	..	+1.1	0.0	+1.4	+0.4	-0.4	0.0
20	Peterboro' I	..	..	..	+0.4	+0.4	0.0	-0.6	+0.4	0.0
21	Poppleton	..	..	..	+0.4	+1.2	-0.4	-0.2	+0.2	+0.4
Mean					+0.6	+0.4	+0.4	-0.1	+0.1	+0.1
CLAY LOAMS										
22	Felstead I	..	..	..	-0.1	+1.2	+1.4	-0.2	-0.1	+0.4
23	Felstead II	..	..	..	-0.4	-0.4	+0.1	0.0	+0.3	+0.1
24	Felstead Area (Oaklands)	..	..	..	-0.5	+1.9	-0.2	—	—	—
Mean					-0.3	+0.9	+0.4	-0.1	+0.1	+0.2
FENS										
25	Ely	..	..	..	+0.3	-1.0	+0.2	+0.2	0.0	-0.2
26	Peterboro' II	..	..	..	+0.6	+0.7	+0.9	-1.5	+0.5	-2.0
Mean					+0.4	-0.2	+0.6	-0.6	+0.2	-1.1
Mean					+0.1	+0.4	+0.3	-0.2	+0.1	+0.1

Conclusions

Effects of sulphate of ammonia

Sulphate of ammonia produced significant increases in total sugar at eighteen of the twenty-six centres. Of the remaining centres, all showed positive responses except Cantley II, which had the highest mean yield of all centres. The mean response over all centres was three and a half times the corresponding figure for the period 1933-5. The additional response to the second dressing was smaller than the response to the first dressing at twenty centres, the difference being significant at four centres. On both the fen soils, the double dressing gave a smaller yield than the single dressing, the average difference being, however, not quite significant.

Sixteen of the eighteen centres where tops were weighed gave significant increases. The remaining two both gave increases, one of them almost significant, and were centres at which the response in sugar was small and not significant.

The yields of tops showed in general no sign of falling-off in response at the higher level of application. At Bardney II there was a significant positive curvature and at Peterboro' II a significant negative curvature.

The differences in increase in sugar and tops at different centres were substantially greater than their standard errors, even among those stations showing clear responses. The responses showed, however, no apparent correlation with soil type or with mean yield.

The effects of sulphate of ammonia on roots were similar to those on total sugar. The depressing effect on sugar percentage was much less consistent than in previous years, eleven centres showing an increase to the double dressing. The effects on percentage purity and plant number were small.

Effects of superphosphate

Superphosphate increased the total sugar at twenty-three centres, the increase being significant at ten centres. The average increase to the double dressing was 3.0 cwt. per acre as compared with an average of 0.7 cwt. for the three preceding years. Most centres showed a falling-off in response at the higher level of dressing, the average curvature being significantly negative.

Tops showed an increase at fourteen centres out of eighteen, the increase being significant at three centres. There was some indication of a falling-off in response at the higher level of application at the three centres which gave a significant increase to superphosphate, the average curvature at these centres being almost significant.

The increases were significantly different at the different centres for sugar, but not for tops. The differences did not appear to be related to the soil types.

Roots showed the same effects as total sugar. There was little effect on sugar percentage, except possibly in the light loams, in all of which the percentage was increased by over 0.1. The effects on percentage purity were small. There was a large increase in plant number at Brigg II, and there were indications of an increase in plant number at some of the other centres which responded in total sugar.

Effects of muriate of potash

The response in total sugar to muriate of potash varied with the type of soil. The yield was increased on ten of the eleven sandy soils and on both the fen soils, eight of the increases being significant. Three of the six light loams gave an increase, two of them significant. On the heavy loams and clay loams, however, there was a depression to potash in five out of seven soils, the depression being significant on both the Felstead experiments, which were, however, on the same farm.

The falling-off in response at the higher level of dressing was significant on only one of the responsive centres and the average falling-off over the sands, light loams and fens was not significant.

Potash had little effect on tops except at Brigg I (coarse sand), where it produced a significant increase and at Peterboro' I (heavy loam) where it produced a significant decrease.

The effects on roots were similar to those on sugar. Sugar percentage was increased on all types of soil, only four soils failing to show an increase. The average increase to the double dressing was 0.24 as against a mean of 0.28 for the three previous years. The average effect on percentage purity and plant number was small.

Interactions

The average interaction between nitrogen and muriate of potash was positive and almost significant for total sugar and tops, the average effects being positive in sugar in all soil groups. The other interactions were small.