ROTHAMSTED RESEARCH

Report for 1937

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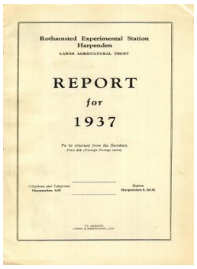

Experiments at Outside Centres

Rothamsted Research

Rothamsted Research (1938) *Experiments at Outside Centres ;* Report For 1937, pp 197 - 222 **- DOI: https://doi.org/10.23637/ERADOC-1-69**

EXPERIMENTS AT OUTSIDE CENTRES

Barley. Bracken Farm, Tunstall, Suffolk, 1937. A. W. Oldershaw, Esq., County Organiser

3 randomised blocks of 9 plots each. Plots 1/40 acre.

TREATMENTS : 3 × 3 factorial design.

No phosphate, superphosphate and slag (15.7% total P_2O_5) at the rate of 1.0 cwt. P_2O_5 per acre; no lime, limestone and dolomite at the rate of 2 tons per acre, all applied to the previous crop of sugar beet in 1936.

BASAL MANURING : Nil.

SOIL : Coarse sand. Manures applied : Limestone and dolomite : March 20, 1936. Artificials : April 21, 1936. Seed sown : March 26. Harvested : Aug. 19. Previous crop : Sugar beet. (See 1936 Report p.266).

SPECIAL NOTE : Total produce was weighed on the field. Two random samples per plot were taken from the swathes to determine the ratio of grain to total produce.

STANDARD ERROR PER PLOT : Grain : 0.799 cwt. per acre or 14.7%.

	None	Limestone	Dolomite	*Mean*	*Increase*
	GRAIN : cwt. per acre (±0.461. *Means : ±0.266. Increases : ±0.376*)				
None ..	6.0	5.6	5.0	*5.5*	
Super. ..	5.3	5.1	6.4	*5.6*	*+0.1*
Slag ..	5.1	6.0	4.5	*5.2*	*−0.3*
Mean ..	*5.5*	*5.6*	*5.3*	*5.4*	
Increase ..		*+0.1*	*−0.2*		
	STRAW : cwt. per acre				
None ..	8.8	9.0	7.6	*8.5*	
Super. ..	8.8	8.6	9.3	*8.9*	*+0.4*
Slag ..	8.1	8.7	8.3	*8.4*	*−0.1*
Mean ..	*8.6*	*8.8*	*8.4*	*8.6*	
Increase ..		*+0.2*	*−0.2*		

Conclusions

The yield was a poor one, and there were no significant residual effects of the 1936 treatments.

Barley. South-Eastern Agricultural College, Wye, Kent, 1937

6 × 6 Latin square. Plots : 1/120 acre.

TREATMENTS : 3 × 2 factorial design.

No nitrogen : Sulphate of ammonia or nitro-chalk, both at 0.2 cwt. N per acre.

Superphosphate : None, 0.4 cwt. P_2O_5 per acre.

BASAL MANURING : Nil.

SOIL : Loam. Variety : Plumage Archer. Manures applied : April 1. Seed Sown : April 1. Harvested : Aug. 13. Previous crop : Wheat.

SPECIAL NOTE : Total produce was weighed on the field. Two random samples (each 1 metre × 4 rows) per plot were taken from the standing crop to determine the ratio of grain to total produce.

STANDARD ERROR PER PLOT : Grain : 1.22 cwt. per acre or 8.30%.

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	None	Sulphate of ammonia	Nitro-chalk	*Mean* (±0.288)	*Increase* (±0.407)
	GRAIN : cwt. per acre (±0.498)				
None	9.8	16.1	17.7	*14.5*	
Super.	11.1	16.3	17.4	*14.9*	*+0.4*
Mean (±0.352) ..	*10.4*	*16.2*	*17.6*	*14.7*	
Increase (±0.498) ..		*+5.8*	*+7.2*		
	STRAW : cwt. per acre				
None	11.7	19.5	19.8	*17.0*	
Super.	12.7	17.7	20.9	*17.1*	*+0.1*
Mean	*12.2*	*18.6*	*20.4*	*17.1*	
Increase		*+6.4*	*+8.2*		

Conclusions

There was a significant response in grain to nitrogen, the response being significantly greater for nitro-chalk than for sulphate of ammonia. The response in grain to superphosphate was small and not significant. The effects on straw were similar.

Clover. Tunstall, Suffolk, 1937

A. W. Oldershaw, Esq., County Organiser

5 × 5 Latin square. Plots : 0.01784 acre.

TREATMENTS : Sixth year, no further chalk applied (see 1932 Report, p. 208, for first year's dressings).

BASAL MANURING : Nil.

SOIL : Poor sand. Variety : Broad red. Seed sown : Spring, 1936. Cut June 8, 1937. Previous crop : Barley.

STANDARD ERROR PER PLOT : 2.32 cwt. per acre or 7.81%.

Chalk tons per acre (1932)	HAY cwt. per acre	*Increase*
Mean	*29.7*	
0	5.0	
1	32.3	*+ 27.3*
2	34.9	*+ 2.6*
3	37.4	*+ 2.5*
4	38.8	*+ 1.4*
St. errors	±1.04	*± 1.47*

Conclusions

The plots receiving no chalk in 1932 gave very small yields. The higher dressings of chalk in 1932 continued to give significantly higher yields than the first dressing. There was a slight falling off in response at the highest dressing, though this was not statistically significant.

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Potatoes. W. E. Morton, Esq., Gores Farm, Thorney, 1937

3 randomised blocks of 9 plots each, certain second order interactions being confounded with block differences. Plots : 1/60 acre.

TREATMENTS : 3 × 3 × 3 factorial design.

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

Superphosphate : None, 0.75, 1.50 cwt. P_2O_5 per acre.

Sulphate of potash : None, 0.75, 1.50 cwt. K_2O per acre.

BASAL MANURING : Dung.

SOIL : Shallow black fen. Variety : Scotch King Edward. Manures applied : May 4. Potatoes planted : May 6. Lifted : Oct. 1. Previous crop : Wheat.

SPECIAL NOTE : 1 cwt. of potatoes from each plot was passed over a 1½ inch riddle to determine the percentage ware.

STANDARD ERRORS PER PLOT : Total produce : 1.20 tons per acre or 12.8%. Percentage ware : 5.41.

Main effects—Interactions of sulphate of ammonia with superphosphate and sulphate of potash

Sulphate of ammonia	Superphosphate (cwt. P_2O_5) 0.00	0.75	1.50	Sulphate of potash (cwt. K_2O) 0.00	0.75	1.50	*Mean*	*Increase*
TOTAL PRODUCE : tons per acre (±0.693. *Means : ±0.400. Increases : ±0.566*)								
0.0 cwt. N	8.62	7.55	8.40	7.20	8.10	9.28	*8.19*	
0.3 cwt. N	8.47	9.88	10.10	8.27	9.74	10.45	*9.49*	*+1.30*
0.6 cwt. N	9.35	10.82	10.63	9.49	9.71	11.60	*10.27*	*+0.78*
Mean	*8.81*	*9.42*	*9.71*	*8.32*	*9.18*	*10.44*	*9.32*	
Increase		*+0.61*	*+0.29*		*+0.86*	*+1.26*		
PERCENTAGE WARE : (±3.12. *Means : ±1.80. Increases : ±2.54*)								
0.0 cwt. N	76.2	75.6	68.7	68.4	73.2	78.8	*73.5*	
0.3 cwt. N	72.3	68.4	65.8	66.9	65.8	73.8	*68.8*	*−4.7*
0.6 cwt. N	79.2	74.1	71.1	69.1	76.5	78.9	*74.8*	*+6.0*
Mean	*75.9*	*72.7*	*68.5*	*68.1*	*71.8*	*77.2*	*72.4*	
Increase		*−3.2*	*−4.2*		*+3.7*	*+5.4*		

Interaction of sulphate of potash with superphosphate

Sulphate of potash	TOTAL PRODUCE : tons per acre (±0.693) Superphosphate (cwt. P_2O_5) 0.00	0.75	1.50	PERCENTAGE WARE (±3.12) Superphosphate (cwt. P_2O_5) 0.00	0.75	1.50
0.00 cwt. K_2O	8.16	8.62	8.17	73.5	64.9	66.1
0.75 cwt. K_2O	8.06	8.97	10.52	74.1	74.1	67.3
1.50 cwt. K_2O	10.21	10.66	10.45	80.0	79.2	72.3

Conclusions

All three fertilizers increased the yield of total produce, the increases to the double dressings being 2.1 tons per acre with sulphate of ammonia, 0.9 tons per acre with superphosphate and 2.1 tons per acre with sulphate of potash. The increase to superphosphate was not large enough to be significant. The slight drop in response at the higher level of application with sulphate of ammonia was not nearly significant and with sulphate of potash there was no sign of a falling off in response. The response to sulphate of ammonia was somewhat greater in presence of superphosphate than in its absence, but not significantly so.

Sulphate of potash gave a significant increase in percentage ware, while superphosphate gave a significant decrease. The increase due to sulphate of ammonia was not significant.

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Potatoes. W. E. Morton, Esq., Australia Farm, March, 1937

3 randomised blocks of 9 plots each, certain second order interactions being confounded with block differences. Plots : 1/60 acre.

TREATMENTS : 3 × 3× 3 factorial design.

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

Superphosphate : None, 0.75, 1.50 cwt. P_2O_5 per acre.

Sulphate of potash : None, 0.75, 1.50 cwt. K_2O per acre.

BASAL MANURING : Nil.

SOIL : Good quality Fenland near the clay. Variety : Scotch Majestic. Manures applied. May 4. Potatoes planted: May 7. Lifted : Oct. 26. Previous crop : Oats.

SPECIAL NOTE : 1 cwt of potatoes from each plot was passed over a $1\frac{5}{8}$ inch riddle to determine the percentage ware.

STANDARD ERRORS PER PLOT : Total produce : 0.704 tons per acre or 4.85%. Percentage ware : 3.69.

Main effects—Interactions of sulphate of ammonia with superphosphate and sulphate of potash

Sulphate of ammonia	Superphosphate (cwt. P_2O_5) 0.00	0.75	1.50	Sulphate of potash (cwt. K_2O) 0.00	0.75	1.50	*Mean*	*Increase*
TOTAL PRODUCE : tons per acre (±0.406. *Means : ±0.234. Increases : ±0.331*)								
0.0 cwt. N	12.60	13.87	13.90	13.62	12.96	13.79	*13.46*	
0.3 cwt. N	12.96	15.20	16.23	14.34	14.49	15.56	*14.80*	*+1.34*
0.6 cwt. N	13.07	15.62	17.23	14.96	15.55	15.41	*15.31*	*+0.51*
Mean	*12.88*	*14.90*	*15.79*	*14.31*	*14.33*	*14.92*	*14.52*	
Increase		*+2.02*	*+0.89*		*+0.02*	*+0.59*		
PERCENTAGE WARE : (±2.13. *Means : ±1.23. Increases : ±1.74*)								
0.0 cwt. N	88.1	88.1	85.9	85.9	88.4	87.8	*87.4*	
0.3 cwt. N	91.1	84.4	83.2	84.4	88.4	85.9	*86.2*	*−1.2*
0.6 cwt. N	89.9	83.5	82.9	85.0	85.0	86.2	*85.4*	*−0.8*
Mean	*89.7*	*85.3*	*84.0*	*85.1*	*87.3*	*86.6*	*86.3*	
Increase		*−4.4*	*−1.3*		*+2.2*	*−0.7*		

Interaction of sulphate of potash with superphosphate

Sulphate of potash	TOTAL PRODUCE : tons per acre (±0.406) Superphosphate (cwt. P_2O_5) 0.00	0.75	1.50	PERCENTAGE WARE (±2.13) Superphosphate (cwt. P_2O_5) 0.00	0.75	1.50
0.00 cwt. K_2O	12.63	14.53	15.77	89.0	85.3	81.0
0.75 cwt. K_2O	13.04	14.99	14.97	89.3	84.1	88.4
1.50 cwt. K_2O	12.96	15.18	16.62	90.8	86.6	82.6

Conclusions

The yields of total produce were excellent, the mean being 14.5 tons per acre. Sulphate of ammonia and superphosphate produced significant increases in total yield, the increases to the double dressing being 1.8 tons per acre and 2.9 tons per acre respectively. In both cases the responses fell off significantly at the higher level of application. There was also a significant positive interaction between the two effects, the increase to sulphate of ammonia being 0.5 tons per acre in the absence of superphosphate and 3.3 tons per acre with the double dressing of superphosphate. Sulphate of potash gave a small increase which was not significant.

Superphosphate produced a significant decrease in percentage ware of 5.7 to the double dressing. Sulphate of ammonia also produced a slight, though not significant decrease, while potash had little effect.

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Potatoes. F. G. Starling, Esq., Flanders Farm, Littleport, 1937

3 randomised blocks of 9 plots each, certain second order interactions being confounded with block differences.

PLOTS: 1/60 acre.

TREATMENTS: 3 × 3 × 3 factorial design.
Sulphate of ammonia: None, 0.3 cwt. N, 0.6 cwt. N per acre.
Superphosphate: None, 0.75 cwt. P_2O_5, 1.5 cwt. P_2O_5 per acre.
Sulphate of potash: None, 0.75 cwt. K_2O, 1.5 cwt. K_2O per acre.

BASAL MANURING: Light dressing of poor dung.

SOIL: Black Fen, clay subsoil. Variety: King Edward. Manures applied: April 14. Potatoes planted: April 14. Lifted: Oct. 12. Previous crop: Unknown (new farm).

SPECIAL NOTE: Potatoes passed over 1½ inch riddle to determine percentage ware.

STANDARD ERRORS PER PLOT: Total produce: 0.663 tons per acre or 4.70%. Percentage ware: 1.08.

Main effects—Interactions of sulphate of ammonia with superphosphate and sulphate of potash

Sulphate of ammonia	Superphosphate (cwt. P_2O_5) 0.00	0.75	1.50	Sulphate of Potash (cwt. K_2O) 0.00	0.75	1.50	*Mean*	*Increase*
TOTAL PRODUCE: tons per acre (±0.383. *Means:* ±*0.221. Increases:* ±*0.312*)								
0.0 cwt. N	13.07	12.77	12.36	11.91	12.66	13.62	*12.73*	
0.3 cwt. N	13.62	14.27	15.06	14.25	14.20	14.51	*14.32*	*+1.59*
0.6 cwt. N	14.12	15.40	16.36	14.31	15.35	16.21	*15.29*	*+0.97*
Mean	*13.60*	*14.15*	*14.59*	*13.49*	*14.07*	*14.78*	*14.11*	
Increase		*+0.55*	*+0.44*		*+0.58*	*+0.71*		
PERCENTAGE WARE: (±0.624. *Means:* ±*0.360. Increases:* ±*0.509*)								
0.0 cwt. N	93.6	92.5	93.7	92.7	93.7	93.5	*93.3*	
0.3 cwt. N	92.6	92.0	92.2	92.2	92.3	92.4	*92.3*	*−1.0*
0.6 cwt. N	90.8	90.0	91.6	92.1	90.3	90.0	*90.8*	*−1.5*
Mean	*92.3*	*91.5*	*92.5*	*92.3*	*92.1*	*92.0*	*92.1*	
Increase		*−0.8*	*+1.0*		*−0.2*	*−0.1*		

Interaction of sulphate of potash with superphosphate

Sulphate of potash	TOTAL PRODUCE tons per acre (±0.383) Superphosphate (cwt. P_2O_5) 0.00	0.75	1.50	PERCENTAGE WARE (±0.624) Superphosphate (cwt. P_2O_5) 0.00	0.75	1.50
0.00 cwt. K_2O	12.63	13.57	14.27	93.5	91.4	92.1
0.75 cwt. K_2O	13.74	13.91	14.55	91.7	91.5	93.1
1.50 cwt. K_2O	14.44	14.96	14.96	91.8	91.6	92.4

Conclusions

The yields of total produce were high, the mean being 14.1 tons per acre. Each of the three fertilizers produced significant increases, the increases per acre to the double dressings being 2.6 tons for sulphate of ammonia, 1.0 tons for superphosphate and 1.3 tons for sulphate of potash. With sulphate of ammonia there was a significant decrease in response at the higher level of application, but with superphosphate and sulphate of potash there was no indication of any such falling off in response.

There was also a significant positive interaction between the effects of sulphate of ammonia and superphosphate, the response to sulphate of ammonia being 1.0 tons per acre in the absence of superphosphate and 4.0 tons per acre with the double dressing of superphosphate.

The percentages of ware to total produce were also very high. Superphosphate and sulphate of potash had no appreciable effect on percentage ware, but sulphate of ammonia produced a significant decrease of 2.5 per cent. to the double dressing.

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Potatoes. Tunstall, Suffolk, 1937
A. W. Oldershaw, Esq., County Organiser

8 randomised blocks of 4 plots each.

PLOTS : 1/98 acre.

TREATMENTS : 2^4 factorial design.
Superphosphate : None, 1.0 cwt. P_2O_5 per acre.
Sulphate of potash : None, 1.70 cwt. K_2O per acre.
Magnesium sulphate : None, 4.46 cwt. per acre.
Dung : None, 10 tons per acre.

BASAL MANURING : Sulphate of ammonia at the rate of 0.6 cwt. N per acre.

SOIL : Coarse sand. Variety : Scotch Majestic. Manures applied : April 26. Potatoes: planted : May 6. Lifted : Oct. 13 and 14. Previous crop : Sugar beet.

SPECIAL NOTE : Dung was applied to blocks of four plots.

STANDARD ERRORS PER PLOT : Total produce : 0.834 tons per acre or 13.2%. Percentage ware : 3.90.

Responses to Fertilisers

Mean yields : Total produce : 6.30 *tons ; Percentage ware :* 68.2

	Mean response	Differential responses							
		Super. Absent	Super. Present	Sulph. pot. Absent	Sulph. pot. Present	Mag. sulph. Absent	Mag. sulph. Present	Dung Absent	Dung Present
	TOTAL PRODUCE : tons per acre (±0.417. *Means :* ±*0.295*).								
Superphosphate	*+0.50*	—	—	+0.44	+0.56	+0.56	+0.44	+0.64	+0.36
Sulphate of potash	*+0.84*	+0.78	+0.90	—	—	+0.87	+0.81	+0.77	+0.91
Magnesium sulphate	*+0.17*	+0.24	+0.11	+0.20	+0.14	—	—	+0.48	−0.13
	PERCENTAGE WARE (±1.95. *Means :* ±*1.38*)								
Superphosphate	*−0.2*	—	—	−1.8	+1.4	−1.0	+0.5	−1.2	+0.7
Sulphate of potash	*+2.9*	+1.3	+4.5	—	—	+3.4	+2.4	+3.7	+2.1
Magnesium sulphate	*−1.0*	−1.8	−0.2	−0.5	−1.5	—	—	0.0	−1.9

Conclusions

Sulphate of potash produced a significant increase both in total produce and in percentage ware. The responses to superphosphate and magnesium sulphate were not significant. The effects of dung, applied to blocks of four plots each, were small.

The experiment was damaged by torrential rains in May, when much soil was washed away.

Sugar Beet. H. King, Esq., Shenstone, nr. Kidderminster, 1937
Kidderminster Beet Sugar Factory

3 randomised blocks of 9 plots each. Plots : 0.01789 acre.

TREATMENTS : 3 × 3 × 3 factorial design.

Nitrogen : None, sulphate of ammonia, nitrate of soda at 0.6 cwt. N per acre.

Phosphate : None, superphosphate and slag at 1.0 cwt. P_2O_5 per acre.

Potash : None, muriate of potash at 0.6 cwt. and 1.2 cwt. K_2O per acre.

BASAL MANURING : Nil.

SOIL : Light sandy loam. Variety : Webb's No. 2. Manures applied : April 23 and May 6. Seed sown : May 7. Lifted : Nov. 12 and 13. Previous crop : Wheat.

STANDARD ERRORS PER PLOT : Total sugar : 5.04 cwt. per acre or 25.6%. Tops : 0.964 tons per acre or 18.6%. Mean dirt tare : 0.094.

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Nitrogen	Phosphate: None	Phosphate: Super.	Phosphate: Slag	Muriate of potash (cwt. K_2O): 0.0	Muriate of potash (cwt. K_2O): 0.6	Muriate of potash (cwt. K_2O): 1.2	*Mean*	*Increase*
TOTAL SUGAR: cwt. per acre (±2.91. *Means:* ±1.68. *Increases:* ±2.38)								
None	11.0	23.1	19.3	18.1	19.0	16.3	*17.8*	
Sulph. amm.	9.8	20.2	12.3	9.5	14.2	18.6	*14.1*	*−3.7*
Nitr. soda	25.8	28.7	27.2	22.1	33.3	26.3	*27.2*	*+9.4*
Mean	*15.5*	*24.0*	*19.6*	*16.6*	*22.2*	*20.4*	*19.7*	
Increase		*+8.5*	*+4.1*		*+5.6*	*−1.8*		
ROOTS (washed): tons per acre								
None	3.25	6.61	5.55	5.27	5.46	4.68	*5.14*	
Sulph. amm.	2.93	6.02	3.65	2.91	4.28	5.41	*4.20*	*−0.94*
Nitr. soda	7.43	8.34	7.83	6.60	9.49	7.51	*7.87*	*+2.73*
Mean	*4.54*	*6.99*	*5.68*	*4.93*	*6.41*	*5.87*	*5.74*	
Increase		*+2.45*	*+1.14*		*+1.48*	*−0.54*		
TOPS: tons per acre (±0.557. *Means:* ±0.322. *Increases:* ±0.455)								
None	3.12	4.40	4.08	3.83	4.20	3.57	*3.87*	
Sulph. amm.	3.18	5.52	4.49	3.26	4.62	5.32	*4.40*	*+0.53*
Nitr. soda	6.55	7.69	7.57	6.65	7.61	7.55	*7.27*	*+3.40*
Mean	*4.28*	*5.87*	*5.38*	*4.58*	*5.48*	*5.48*	*5.18*	
Increase		*+1.59*	*+1.10*		*+0.90*	*0.00*		
SUGAR PERCENTAGE								
None	16.90	17.50	17.33	17.17	17.43	17.13	*17.24*	
Sulph. amm.	16.67	16.63	16.73	16.20	16.63	17.20	*16.68*	*−0.56*
Nitr. soda	17.37	17.20	17.30	16.80	17.53	17.53	*17.29*	*+0.05*
Mean	*16.98*	*17.11*	*17.12*	*16.72*	*17.20*	*17.29*	*17.07*	
Increase		*+0.13*	*+0.14*		*+0.48*	*+0.09*		
PLANT NUMBER: thousands per acre								
None	22.8	20.6	25.0	22.8	21.3	24.4	*22.8*	
Sulph. amm.	10.1	26.6	14.6	16.8	18.1	16.5	*17.1*	*−5.7*
Nitr. soda	23.1	30.7	23.4	24.4	27.9	25.0	*25.8*	*+3.0*
Mean	*18.7*	*26.0*	*21.0*	*21.3*	*22.4*	*22.0*	*21.9*	
Increase		*+7.3*	*+2.3*		*+1.1*	*−0.4*		
PERCENTAGE PURITY								
None	88.4	88.5	88.6	88.4	88.8	88.2	*88.5*	
Sulph. amm.	88.8	88.3	88.1	88.2	88.2	88.9	*88.4*	*−0.1*
Nitr. soda	88.1	88.0	88.5	88.0	88.5	88.2	*88.2*	*−0.3*
Mean	*88.4*	*88.3*	*88.4*	*88.2*	*88.5*	*88.4*	*88.4*	
Increase		*−0 1*	*0.0*		*+0.3*	*−0.1*		

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Muriate of potash (cwt. K_2O)	None	Super.	Slag	None	Super.	Slag
	TOTAL SUGAR : cwt. per acre (±2.91)			ROOTS (washed) : tons per acre		
0.0	15.3	19.1	15.3	4.53	5.70	4.56
0.6	15.9	30.0	20.7	4.58	8.73	5.92
1.2	15.5	23.0	22.7	4.50	6.54	6.55
	TOPS: tons per acre (±0.557)			SUGAR PERCENTAGE		
0.0	4.53	4.38	4.82	16.73	16.67	16.77
0.6	3.98	6.99	5.46	17.20	17.10	17.30
1.2	4.33	6.25	5.86	17.00	17.57	17.30
	PLANT NUMBER : thousands per acre			PERCENTAGE PURITY		
0.0	20.6	26.2	17.1	88.3	87.6	88.7
0.6	17.4	24.7	25.0	88.6	88.6	88.3
1.2	18.1	26.9	20.9	88.4	88.7	88.3

Conclusions

The soil was acid (Ph4.6). The yields were low and the standard errors high. Sulphate of ammonia depressed the plant number and the yield of total sugar. Nitrate of soda increased the total sugar significantly by 9.4 cwt. per acre.

Superphosphate increased total sugar by 8.5 cwt. per acre and basic slag by 4.1 cwt. per acre, the last response not being significant.

The single dressing of muriate of potash produced a significant increase of 5.6 cwt. per acre in total sugar, but there was no further response to the double dressing.

The effects on tops were similar, except that sulphate of ammonia produced a slight, though not significant, increase.

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EXPERIMENTS CARRIED OUT BY LOCAL WORKERS

Hay. 2nd Season. Redericks Farm, Harlow, 1937

H. W. Gardner, Esq., Hertfordshire Farm Institute, St. Albans

6 randomised blocks of 6 plots each. Certain interactions partially confounded with block differences. Plots: 1/50 acre.

TREATMENTS: 3×3×2 factorial design.
Phosphate: High soluble slag, superphosphate and mineral phosphate at the rate of 0, 0.75 and 1.50 cwt. P_2O_5 per acre.
Muriate of potash: None, 0.5 cwt. K_2O per acre.

BASAL MANURING: Nil.

SOIL: Heavy loam. Manures applied: Dec. 18, 1935. Hay cut: June 24.

STANDARD ERROR PER PLOT: 4.86 cwt. per acre or 15.2%.

Summary of results, cwt. per acre: (±2.43*)

Cwt. P_2O_5	Slag	Super.	Mineral phosphate	*Mean* (±1.40)	*Increase* (±1.98)
0.00 ..		30.0[1]		*30.0*	
0.75 ..	34.4	33.6	29.8	*32.6*	*+2.6*
1.50 ..	29.6	34.8	35.0	*33.1*	*+0.5*
Mean (±1.72)	*32.0*	*34.2*	*32.4*	*31.9*	

Standard error: (1) ±1.40.

*This standard error applies to comparisons that are not confounded.

Muriate of potash (±1.98)	Phosphate (cwt. P_2O_5) 0.00	0.75	1.50	Slag	Super.	Mineral phosphate	*Mean* (±1.14)	*Increase* (±1.61)
None	29.9	36.0	31.0	28.8	34.4	33.8	*32.3*	
0.5 cwt. K_2O per acre	30.1	29.1	35.2	31.8	32.5	30.1	*31.5*	*−0.8*

Conclusions

The response to phosphate applied in December 1935 was not significant. There was no apparent response to muriate of potash applied in 1935.

Hay. 1st. Season. Burford Grammar School, Burford, Oxfordshire, 1937

5×5 Latin square. Plots: 1/160 acre.

TREATMENTS: No slag, slag at the rate of 1/3 cwt. and 1 cwt. P_2O_5 per acre. The object of this experiment is to compare annual dressings of 1/3 cwt. P_2O_5 with dressings of 1 cwt. every third year.

BASAL MANURING: Nil.

SOIL: Stone brash. Phosphate applied: April 22-28. Hay cut: June 16-18.

STANDARD ERROR PER PLOT: 3.52 cwt. per acre or 5.09%.

Superphosphate	Cwt.	*Increase*
Mean	*69.2*	
None	69.1[1]	
One-third dressing	68.3	*−0.8*
Full dressing	70.6	*+2.3*
St. errors	±1.57	*±2.22*

(1) ±0.909.

Conclusions

No significant effects.

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Hay. 7th Season. Lady Manner's School, Bakewell, 1937

3 randomised blocks of 8 plots each. Plots : 1/138 acre.

TREATMENTS : 2^3 factorial design.
Nitrate of soda : None, 2 cwt. per acre.
Superphosphate 13.7% : None, 3 cwt. per acre.
Potash salt 30% : None, 1 cwt. per acre.

BASAL MANURING : Nil.

SOIL : Limestone. Manures applied : April 7 and 8. Hay cut : June 23 and 24.

STANDARD ERROR PER PLOT : 7.79 cwt. per acre or 14.6%.

Responses to fertilisers : cwt. per acre
Mean yield : 53.2 cwt.

	Mean response (±*3.18*)	Differential responses (±4.50)					
		Nitrate of soda		Superphosphate		Potash salt	
		Absent	Present	Absent	Present	Absent	Present
Nitrate of soda	*+16.5*	—	—	+15.6	+17.3	+15.4	+17.6
Superphosphate	*+ 5.7*	+4.9	+6.6	—	—	+0.7	+10.8
Potash salt	*+ 4.7*	+3.6	+5.8	−0.4	+9.7	—	—

Conclusions

There was a large response to nitrate of soda. Superphosphate and potash salt each gave a significant response in presence of the other, but no response in its absence.

Meadow Hay. 6th Season. Lady Manner's School, Bakewell, 1937

4 randomised blocks of 9 plots each. Plots : 1/202 acre.

TREATMENTS : 3 × 3 factorial design.
No manure, 8 tons compost, mixed artificials applied in 1933, 1935 and 1937, or in 1932, 1934 and 1936.
Mixed artificials consisted of 2 cwt. nitrate of soda, 3 cwt. superphosphate and 1 cwt. 30% potash salt per acre.

BASAL MANURING : Nil.

SOIL : Limestone. Manures applied : April 8. Hay cut : July 5.

STANDARD ERROR PER PLOT : 5.16 cwt. per acre or 7.33%.

Summary of results, cwt. per acre (±2.58)

1933, 1935 and 1937 treatments	1932, 1934 and 1936 treatments			*Mean* (±*1.49*)	*Increase* (±*2.11*)
	Nil	NPK	Compost		
Nil	53.6	56.8	67.0	*59.1*	
NPK	80.8	82.3	80.5	*81.2*	*+22.1*
Compost	74.3	69.1	70.0	*71.1*	*+12.0*
Mean (±*1.49*)	*69.6*	*69.4*	*72.5*	*70.5*	
Increase (±*2.11*) ..		*−0.2*	*+2.9*		

Conclusions

Complete artificials applied in 1937 increased the yield of hay by 22.1 cwt. per acre, while compost applied in 1937 gave an average increase of 12.0 cwt. per acre. The extra increase due to artificials was significant. Where no manuring was given in 1937, compost applied in 1936 increased the yield by 13.4 cwt. and artificials applied in 1936 by 3.2 cwt., the residual effect of compost on these plots being significantly greater than the residual effect of artificials. On the plots which received manures in 1937 there was little indication of a residual effect either of compost or artificials.

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Hay. 4th Season. Rowley Green Farm, Arkeley, Barnet, Herts, 1937
H. W. Gardner, Esq., Hertfordshire Farm Institute, St. Albans

6 randomised blocks of 6 plots each Certain interactions partially confounded with block differences. Plots : 1/50 acre.

TREATMENTS : 3×2^2 factorial design.
Phosphate : None, high soluble slag and gafsa phosphate at the rate of 1 cwt. P_2O_5 per acre.
30% Potash salt : None, 0.5 cwt. K_2O per acre.
Chalk : None, 75 cwt. per acre.

BASAL MANURING : Nil.

SOIL : Acid clay. Chalk applied : Jan. 30, 1934. Minerals applied : Feb. 6, 1934. Hay cut July 3.

STANDARD ERROR PER PLOT : 2.76 cwt. per acre or 10.7%.

Responses to fertilisers : cwt. per acre
Mean yield : 25.7 cwt.

	Mean response	Differential responses: Chalk Absent	Chalk Present	Potash Absent	Potash Present	No phosphate	Slag	Safsa phosphate
Chalk	*+5.9*[1]	—	—	+6.3[3]	+5.5[3]	+4.8[4]	+5.0[4]	+7.9[4]
Potash	*+1.2*[1]	+1.6[3]	+0.8[3]	—	—	+1.1[4]	+0.5[4]	+2.0[4]
Slag	*+0.7*[2]	+0.6[4]	+0.8[4]	+1.0[4]	+0.4[4]	—	—	—
Mineral phosphate	*−1.0*[2]	−2.5[4]	+0.6[4]	−1.4[4]	−0.6[4]	—	—	—

Standard errors : [1] ±0.918, [2] ±1.12, [3] ±1.38, [4] ±1.59.

Conclusions

There was a significant response of 5.9 cwt. per acre to chalk applied in 1934. There were no other significant effects.

Potatoes. Midland Agricultural College, Loughborough, 1937

4 × 4 Latin square. Plots : 0.0208 acre.

TREATMENTS : Increasing levels of a mixed fertiliser containing 3 cwt. superphosphate, 2 cwt. sulphate of potash and 2 cwt. sulphate of ammonia as shown below.

BASAL MANURING : 16 tons of farmyard manure per acre.

SOIL : Light loam. Variety : Arran Consul. Manures applied : April 29. Potatoes planted : April 30 and May 1. Lifted : Oct. 6-13. Previous crop : Seeds.

SPECIAL NOTE : Potatoes passed over a 1⅝ inch riddle to determine percentage ware.

STANDARD ERRORS PER PLOT : Total produce : 0.937 tons per acre or 7.75%. Percentage ware : 1.83.

Artificials cwt. per acre	TOTAL PRODUCE tons per acre	*Increase for each dressing*	PERCENTAGE WARE	*Increase for each dressing*
Mean	*12.10*		*85.0*	
0	11.02		84.4	
4	12.61	*+1.59*	86.8	*+2.4*
8	12.39	*−0.22*	85.4	*−1.4*
12	12.36	*−0.03*	83.6	*−1.8*
St. errors	±0.468	*±0.662*	±0.916	*±1.30*

Conclusions

There was a significant increase in total produce to the first dressing (4 cwt. per acre) of mixed artificials, but no further increase to the higher dressings. The first dressing also gave the highest percentage ware.

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Potatoes. H. Daulton, Esq., Ingham, Lincoln, 1937
Lindsey County Council, Education Committee

5 × 5 Latin square (Incomplete, 1 column not being recorded). Plots : 1/80 acre.

TREATMENTS : Increasing levels of a mixed fertiliser consisting of 6 parts sulphate of ammonia, 6 parts superphosphate (18% P_2O_5), 5 parts sulphate of potash and 1 part steamed bone flour as shown below.

BASAL MANURING : Nil.

SOIL : Cliff limestone. Variety : King Edward VII. Manures applied : April 1. Potatoes planted: April 4. Lifted : Oct. 8. Previous crop : Seeds.

SPECIAL NOTE : Potatoes passed over 1⅝ inch riddle to determine percentage ware.

STANDARD ERRORS PER PLOT : Total produce : 0.624 tons per acre or 6.61%. Percentage ware 1.50.

Artificials cwt. per acre	TOTAL PRODUCE tons per acre	*Increase for each dressing*	PERCENTAGE WARE	*Increase for each dressing*
Mean	*9.45*		*82.5*	
0	7.51		82.0	
4	8.33	*+0.82*	80.6	*−1.4*
8	10.07	*+1.74*	82.3	*+1.7*
12	10.81	*+0.74*	83.0	*+0.7*
16	10.51	*−0.30*	84.5	*+1.5*
St. Errors	±0.312	*±0.441*	±0.752	*±1.06*

Conclusions

Mixed artificials produced a significant increase in total produce. The effectiveness of the artificials, however, decreased significantly with the higher dressings, there being no further increase in yield after the dressing of 12 cwt. per acre. Mixed artificials also produced a significant increase in percentage ware.

Potatoes. Messrs. Herring Bros., Welton, Lincoln, 1937
Lindsey County Council, Education Committee

5 × 5 Latin square. Plots : 1/80 acre.

TREATMENTS : Increasing levels of a mixed fertiliser consisting of 6 parts sulphate of ammonia, 6 parts 18% superphosphate, 5 parts sulphate of potash and 1 part of steamed bone flour as shown below.

BASAL MANURING : Nil.

SOIL : Limestone loam. Variety : King Edward VII. Manures applied : April 8. Potatoes planted : April 8. Lifted : Oct. 15. Previous crop : Seeds.

STANDARD ERRORS PER PLOT : Total produce : 0.475 tons per acre or 7.75%. Percentage ware : 2.04.

Artificials cwt. per acre	TOTAL PRODUCE tons per acre	*Increase for each dressing*	PERCEN-TAGE WARE	*Increase for each dressing*
Mean	*6.13*		*84.7*	
0	3.80		82.6	
4	5.15	*+1.35*	82.9	+0.3
8	6.36	*+1.21*	85.1	*+2.2*
12	7.29	*+0.93*	84.7	*−0.4*
16	8.04	*+0.75*	88.2	*+3.5*
St. Errors	±0.212	*±0.300*	±0.910	*±1.29*

Conclusions

Mixed artificials produced significant increases in both total produce and percentage ware. The successive increases in total produce decreased steadily as the level of manuring increased.

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Sugar Beet. W. L. Wilson, Esq., Market Rasen, Lindsey County Council, 1937

Brigg Beet Sugar Factory

3 randomised blocks of 8 plots each, the plots being split for sulphate of ammonia at the rate of 3 cwt. per acre (April 16). Sub-plots : 1/100 acre.

TREATMENTS : No minerals, 5 cwt. 14% superphosphate and 3 cwt. 30% potash salt ploughed in (Feb. 4), broadcast after ploughing (March 22), broadcast in spring (April 16). No dung, 10 tons dung per acre (Feb. 3).

BASAL MANURING : Nil.

SOIL : Sandy loam. Variety : Kleinwanzleben E. Seed sown : April 26. Lifted : Oct. 16. Previous crop : Wheat.

STANDARD ERRORS : Total sugar : per whole plot : 2.58 cwt. per acre or 6.64% ; per sub-plot : 5.21 cwt. per acre or 13.4%. Tops : per whole plot : 0.385 tons per acre or 5.62% ; per sub-plot : 0.715 tons per acre or 10.4%. Mean dirt tare : 0.062.

	Minerals					Minerals				
	None	Pl.† in	Broadcast March	Broadcast April	*Mean*	*Increase*	None	Pl.† in	Broadcast March	Broadcast April	*Mean*	*Increase*
	TOTAL SUGAR : cwt. per acre (±1.49[1], ±2.13*)						ROOTS (washed) : tons per acre					
No Dung ..	32.8[1]	41.2[1]	41.9[1]	42.4[1]	*39.6*[4]		9.04	11.28	11.40	11.40	*10.78*	
Dung ..	35.8[1]	37.7[1]	39.6[1]	39.4[1]	*38.1*[4]	*−1.5*[2]	9.97	10.55	10.76	10.64	*10.48*	*−0.30*
No sulph. amm.	29.4	34.6	36.6	34.6	*33.8*[5]		8.20	9.74	9.86	9.44	*9.31*	
Sulph. amm.	39.1	44.2	44.9	47.2	*43.8*[5]	*+10.0*[6]	10.81	12.09	12.30	12.60	*11.95*	*+2.64*
Mean ..	*34.3*[2]	*39.4*[2]	*40.8*[2]	*40.9*[2]	*38.8*		*9.50*	*10.92*	*11.08*	*11.02*	*10.63*	
Increase ..		*+5.1*[3]	*+6.5*[3]	*+6.6*[3]				*+1.42*	*+1.58*	*+1.52*		
St. errors (²) ±1.05, (³) ±1.49, (⁴) ±0.745, (⁵) ±1.06, (⁶) ±1.50.												
	TOPS : tons per acre (±0.222[1], ±0.292*)						SUGAR PERCENTAGE					
No dung ..	6.53[1]	7.08[1]	7.20[1]	7.02[1]	*6.96*[4]		18.11	18.22	18.39	18.58	*18.32*	
Dung ..	6.70[1]	6.74[1]	6.72[1]	6.88[1]	*6.76*[4]	*−0.20*[2]	17.92	17.83	18.42	18.44	*18.15*	*−0.17*
No sulph. amm.	5.36	6.10	6.06	6.04	*5.89*[5]		17.96	17.79	18.58	18.30	*18.16*	
Sulph. amm.	7.88	7.71	7.86	7.85	*7.82*[5]	*+1.93*[6]	18.06	18.26	18.24	18.72	*18.32*	*+0.16*
Mean ..	*6.62*[2]	*6.91*[2]	*6.96*[2]	*6.95*[2]	*6.86*		*18.02*	*18.02*	*18.41*	*18.51*	*18.24*	
Increase ..		*+0.29*[3]	*+0.34*[3]	*+0.33*[3]				*0.00*	*+0.39*	*+0.49*		
St. errors (²) ±0.157, (³) ±0.222, (⁴) ±0.111, (⁵) ±0.146, (⁶) ±0.206.												

PLANT NUMBER : thousands per acre

	Minerals				
	None	Pl.† in	Broadcast March	Broadcast April	*Mean Increase*
No dung ..	20.2	22.9	23.2	23.4	*22.4*
Dung ..	21.2	20.0	19.8	21.0	*20.5* *−1.9*
No sulph. amm.	19.8	20.7	21.2	21.4	*20.8*
Sulph. amm.	21.6	22.2	21.9	23.0	*22.2* *+1.4*
Mean ..	*20.7*	*21.4*	*21.6*	*22.2*	*21.5*
Increase ..		*+0.7*	*+0.9*	*+1.5*	

† Pl. = Ploughed.

* For comparisons involving the difference of sulphate of ammonia and no sulphate of ammonia.

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	No dung	Dung	No dung	Dung
	TOTAL SUGAR : cwt. per acre (±1.50*)		ROOTS (washed) : tons per acre	
No sulph. amm. ..	34.0	33.6	9.28	9.34
Sulph. amm. ..	45.1	42.6	12.28	11.62
	TOPS : tons per acre (±0.206*)		SUGAR PERCENTAGE	
No sulph. amm. ..	5.80	5.97	18.31	18.00
Sulph. amm. ..	8.10	7.55	18.34	18.30

PLANT NUMBER : thousands per acre

	No dung	Dung
No sulph. amm. ..	21.7	19.8
Sulph. amm. ..	23.2	21.1

Conclusions.

Minerals produced an average increase of 6.1 cwt. per acre in total sugar and 0.3 tons per acre in tops, the increase being significant in sugar but not quite significant in tops. There were no significant differences between the effects of different methods of applying the minerals. The response to minerals in sugar was significantly greater in the absence of dung than in its presence.

Dung increased the yield of total sugar in the absence of minerals, but in presence of minerals dung produced a significant decrease of 2.9 cwt. per acre. The effects of dung on tops were similar in direction, but very small.

Sulphate of ammonia gave significant increases of 10$_0$ cwt. per acre in sugar and 1.9 to nsper acre in tops.

Sugar Beet. G. A. Kilmister, Esq., Wragby, Lindsey County Council, 1937

Bardney Beet Sugar Factory

3 randomised blocks of 8 plots each, the plots being split for sulphate of ammonia at the rate of 3 cwt. per acre (May 4). Sub-plots : 0.01002 acre.

TREATMENTS : No minerals, 5 cwt. 14% superphosphate and 3 cwt. 30% potash salt, ploughed in (April 1), broadcast after winter ploughing (April 5), broadcast in spring (May 4). No dung, 10 tons dung per acre (Jan. 13 and 14).

BASAL MANURING : Nil.

SOIL : Heavy loam. Variety : Kleinwanzleben E. Seed sown : May 8. Lifted : Nov. 8. Previous crop : Wheat.

STANDARD ERRORS : Total sugar : per whole plot : 2.71 cwt. per acre or 5.60% ; per sub-plot : 4.58 cwt. per acre or 9.46%. Tops : per whole plot : 0.375 tons per acre or 5.73% ; per sub-plot : 1.10 tons per acre or 16.8%. Mean dirt tare : 0.307.

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	None	Pl.† in	Minerals Broadcast April	Broadcast May	*Mean*	*Increase*
TOTAL SUGAR : cwt. per acre ($\pm$1.56[1], $\pm$1.87*)						
No dung ..	43.6[1]	49.8[1]	50.5[1]	45.3[1]	*47.3*[4]	
Dung ..	45.5[1]	50.8[1]	48.8[1]	52.8[1]	*49.5*[4]	*+2.2*[2]
No sulph. amm.	42.1	49.0	46.8	46.5	*46.1*[5]	
Sulph. amm.	47.0	51.6	52.4	51.6	*50.6*[5]	*+4.5*[6]
Mean ..	*44.6*[2]	*50.3*[2]	*49.6*[2]	*49.0*[2]	*48.4*	
Increase ..		*+5.7*[3]	*+5.0*[3]	*+4.4*[3]		

St. errors ([2]) $\pm$1.10, ([3]) $\pm$1.56, ([4]) $\pm$0.780, ([5]) $\pm$0. 935, ([6]) $\pm$1.32.

	None	Pl.† in.	Minerals Broadcast April	Broadcast May	*Mean*	*Increase*
ROOTS (washed) : tons per acre						
	12.10	13.69	14.01	12.54	*13.08*	
	12.84	14.27	13.48	14.68	*13.82*	*+0.74*
	11.69	13.62	13.09	12.83	*12.81*	
	13.25	14.34	14.40	14.38	*14.09*	*+1.28*
	12.47	*13.98*	*13.74*	*13.61*	*13.45*	
		+1.51	*+1.27*	*+1.14*		

	TOPS : tons per acre ($\pm$0.216[1], $\pm$0.449*)					
No dung ..	5.43[1]	6.26[1]	6.62[1]	6.40[1]	*6.18*[4]	
Dung ..	6.22[1]	6.90[1]	6.86[1]	7.66[1]	*6.91*[4]	*+0.73*[2]
No sulph. amm.	5.12	5.91	5.92	6.00	*5.74*[5]	
Sulph. amm.	6.52	7.26	7.55	8.06	*7.35*[5]	*+1.61*[6]
Mean ..	*5.82*[2]	*6.58*[2]	*6.74*[2]	*7.03*[2]	*6.54*	
Increase ..		*+0.76*[3]	*+0.92*[3]	*+1.21*[3]		

St. errors ([2]) $\pm$0.153, ([3]) $\pm$0.216, ([4]) $\pm$0.108, ([5]) $\pm$0.224, ([6]) $\pm$0.317.

	None	Pl.† in.	Minerals Broadcast April	Broadcast May	*Mean*	*Increase*
SUGAR PERCENTAGE						
	18.03	18.18	17.98	18.05	*18.06*	
	17.70	17.80	18.07	17.98	*17.89*	*−0.17*
	18.00	18.02	17.85	18.12	*18.00*	
	17.73	17.96	18.20	17.92	*17.95*	*−0.05*
	17.86	*17.99*	*18.02*	*18.02*	*17.97*	
		+0.13	*+0.16*	*+0.16*		

† Pl. = Ploughed.

* For comparisons involving the difference of sulphate of ammonia and no sulphate of ammonia.

PLANT NUMBER : thousands per acre

	None	Pl.† in	Minerals Broadcast April	Broadcast May	*Mean*	*Increase*
No dung ..	23.4	23.8	23.8	24.3	*23.8*	
Dung	23.8	23.8	23.8	24.4	*24.0*	*+0.2*
No sulph. amm. ..	23.2	23.7	23.9	23.9	*23.7*	
Sulph. amm. ..	24.0	23.9	23.6	24.8	*24.1*	*+0.4*
Mean	*23.6*	*23.8*	*23.8*	*24.4*	*23.9*	
Increase		*+0.2*	*+0.2*	*+0.8*		

	No dung	Dung	No dung	Dung
	TOTAL SUGAR : cwt. per acre ($\pm$1.32*)		ROOTS (washed) : tons per acre	
No sulph. amm. ..	43.7	48.5	12.14	13.48
Sulph. amm. ..	50.9	50.4	14.03	14.16
	TOPS : tons per acre ($\pm$0.317*)		SUGAR PERCENTAGE	
No sulph. amm ...	5.18	6.31	18.00	17.99
Sulph. amm. ..	7.18	7.51	18.12	17.78

* For comparisons involving the difference of sulphate of ammonia and no sulphate of ammonia.

PLANT NUMBER : thousands per acre

	No dung	Dung
No sulph. amm.	23.8	23.6
Sulph. amm. ..	23.8	24.3

Conclusions

Minerals increased the yield of total sugar by 5.0 cwt. per acre and of tops by 1.0 tons per acre, both increases being significant. The differences produced by different ways of applying the minerals were not significant.

Sulphate of ammonia gave significant increases in total sugar and tops. Dung gave a significant increase in tops, but increased the yield of sugar only in the absence of sulphate of ammonia, the interaction between sulphate of ammonia and dung being almost significant.

https://doi.org/10.23637/ERADOC-1-69

Sugar Beet. C. Coupland, Esq., East Kirkby, Lindsey County Council, 1937
Bardney Beet Sugar Factory
A. McVicar, Esq., County Organiser

3 randomised blocks of 8 plots each, the plots being split for sulphate of ammonia at the rate of 3 cwt. per acre (April 29). Sub-plots : 0.01002 acre.

TREATMENTS : No minerals, 5 cwt. 14 % superphosphate and 3 cwt. 30% potash salt, ploughed in (Jan 11), broadcast after winter ploughing (Jan. 20), broadcast in spring (April 29). Ploughed 7 or 11 inches deep.

BASAL MANURING : Nil.

SOIL : Sandy loam. Variety : Kleinwanzleben E. Seed sown : May 5. Lifted : Nov. 16 and 17. Previous crop : Tares.

STANDARD ERRORS : Total sugar : per whole plot : 3.00 cwt. per acre or 6.61% ; per sub-plot : 3.27 cwt. per acre or 7.21%. Tops : per whole plot : 0.558 tons per acre or 7.39% ; per sub-plot : 0.920 tons per acre or 12.2%. Mean dirt tare : 0.100.

	None	Pl.† in	Minerals Broadcast Jan.	Minerals Broadcast April	*Mean*	*Increase*
	TOTAL SUGAR : cwt. per acre ($\pm 1.73^1$, ± 1.34*)					
Shallow ..	38.6[1]	47.8[1]	48.2[1]	42.8[1]	*44.4*[4]	
Deep	38.8[1]	49.6[1]	49.5[1]	47.4[1]	*46.3*[4]	*+1.9*[2]
No sulph. amm.	38.0	44.4	42.4	41.8	*41.6*[5]	
Sulph. amm.	39.4	53.0	55.2	48.2	*49.0*[5]	*+7.4*[6]
Mean ..	*38.7*[2]	*48.7*[2]	*48.8*[2]	*45.0*[2]	*45.3*	
Increase ..		*+10.0*[3]	*+10.1*[3]	*+6.3*[3]		
	ROOTS (washed) : tons per acre					
	10.82	13.40	13.42	11.74	*12.34*	
	11.23	13.90	13.77	12.94	*12.96*	*+0.62*
	10.78	12.40	11.68	11.24	*11.52*	
	11.27	14.90	15.50	13.44	*13.78*	*+2.26*
	11.02	*13.65*	*13.59*	*12.34*	*12.65*	
		+2.63	*+2.57*	*+1.32*		

St. errors (2) ± 1.22, (3) ± 1.73, (4) ± 0.865, (5) ± 0.667, (6) ± 0.944.

	None	Pl.† in	Minerals Broadcast Jan.	Minerals Broadcast April	*Mean*	*Increase*
	TOPS : tons per acre ($\pm 0.322^1$, ± 0.376*)					
Shallow ..	7.23[1]	7.33[1]	7.53[1]	7.11[1]	*7.30*[4]	
Deep	7.85[1]	8.25[1]	7.45[1]	7.70[1]	*7.81*[4]	*+0.51*[2]
No sulph. amm.	6.20	6.60	5.60	6.02	*6.10*[5]	
Sulph. amm.	8.88	8.98	9.38	8.80	*9.01*[5]	*+2.91*[6]
Mean ..	*7.54*[2]	*7.79*[2]	*7.49*[2]	*7.41*[2]	*7.56*	
Increase ..		*+0.25*[3]	*−0.05*[3]	*−0.13*[3]		
	SUGAR PERCENTAGE					
	17.82	17.85	17.96	18.18	*17.95*	
	17.28	17.84	17.96	18.28	*17.84*	*−0.11*
	17.62	17.88	18.12	18.55	*18.04*	
	17.48	17.80	17.82	17.92	*17.76*	*−0.28*
	17.55	*17.84*	*17.96*	*18.24*	*17.90*	
		+0.29	*+0.41*	*+0.69*		

St. errors (2) ± 0.228, (3) ± 0.322, (4) ± 0.161, (5) ± 0.188, (6) ± 0.266.

PLANT NUMBER : thousands per acre

	None	Pl.† in	Minerals Broadcast Jan.	Minerals Broadcast April	*Mean*	*Increase*
Shallow ..	30.0	30.8	30.0	30.3	*30.3*	
Deep	29.7	30.0	31.3	30.4	*30.4*	*+0.1*
No sulph. amm.	29.0	30.0	30.6	30.0	*29.9*	
Sulph. amm.	30.8	30.8	30.8	30.6	*30.8*	*+0.9*
Mean ..	*29.9*	*30.4*	*30.7*	*30.4*	*30.4*	
Increase ..		*+0.5*	*+0.8*	*+0.5*		

† Pl. = Ploughed.

* For comparisons involving the difference of sulphate of ammonia and no sulphate of ammonia.

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	Shallow	Deep	Shallow	Deep
	TOTAL SUGAR : cwt. per acre (±0.944)		ROOTS (washed) : tons per acre	
No sulph. amm. ..	40.9	42.4	11.26	11.80
Sulph. amm. ..	47.8	50.2	13.44	14.12
	TOPS : tons per acre (±0.266)		SUGAR PERCENTAGE	
No sulph. amm. ..	5.89	6.32	18.14	17.94
Sulph. amm. ..	8.71	9.30	17.77	17.74

PLANT NUMBER : thousands per acre

	Shallow	Deep
No sulph. amm. ..	30.2	29.6
Sulph. amm. ..	30.4	31.1

Conclusions

Minerals gave an average increase of 8.8 cwt. of sugar per acre, but had little effect on tops. The response in sugar to minerals was significantly greater with the January applications than with the April application, while ploughing in in January and broadcasting in January gave almost identical results. The response was also significantly greater in presence of sulphate of ammonia than in its absence.

Deep ploughing increased the yield of sugar by 1.9 cwt. per acre and that of tops by 0.5 tons per acre, the latter response being significant but not the former.

Sulphate of ammonia produced an average response of 7.4 cwt. per acre in sugar and 2.9 tons per acre in tops.

Sugar Beet. J. Chappell, Esq., Blyborough, Lindsey County Council, 1937

Brigg Beet Sugar Factory

3 randomised blocks of 8 plots each, the plots being split for sulphate of ammonia at the rate of 3 cwt. per acre (April 27). Sub-plots : 1/100 acre.

TREATMENTS : No minerals, 5 cwt. 14% superphosphate and 3 cwt. 30% potash salt, ploughed in (Jan. 27), broadcast after winter ploughing (Feb. 1), broadcast in spring (April 27). Ploughed 7 or 11 inches deep.

BASAL MANURING : Nil.

SOIL : Medium loam. Variety : Kleinwanzleben E. Seed sown : April 30. Lifted : Nov. 15. Previous crop : Wheat.

STANDARD ERRORS : Total sugar : per whole plot : 3.58 cwt. per acre or 6.87% ; per sub-plot : 5.44 cwt. per acre or 10.4%. Tops : per whole plot : 0.534 tons per acre or 8.37% ; per sub-plot : 0.608 tons per acre or 9.53%. Mean dirt tare : 0.105.

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Ploughing	None	Pl.† in	Minerals Broadcast Feb.	Minerals Broadcast April	*Mean*	*Increase*
	TOTAL SUGAR : cwt. per acre ($\pm 2.07^1$, ± 2.22*)					
Shallow	49.2[1]	52.9[1]	52.7[1]	50.2[1]	*51.2*[4]	
Deep	50.2[1]	55.0[1]	54.6[1]	52.6[1]	*53.1*[4] *+ 1.9*[2]	
No sul. amm.	43.2	47.6	47.8	46.0	*46.2*[5]	
Sulph. amm.	56.2	60.3	59.4	56.6	*58.1*[5] *+ 11.9*[6]	
Mean	*49.7*[2]	*54.0*[2]	*53.6*[2]	*51.3*[2]	*52.1*	
Increase		*+ 4.3*[3]	*+ 3.9*[3]	*+ 1.6*[3]		
St. errors (2) ±1.46, (3) ±2.07, (4) ±1.04, (5) ±1.11, (6) ±1.57.						
	TOPS : tons per acre ($\pm 0.308^1$, ± 0.248*)					
Shallow	5.98[1]	6.34[1]	6.40[1]	6.38[1]	*6.28*[4]	
Deep	6.05[1]	6.50[1]	6.70[1]	6.68[1]	*6.48*[4] *+ 0.20*[2]	
No sul. amm.	4.82	5.28	5.40	5.21	*5.18*[5]	
Sulph. amm.	7.22	7.56	7.72	7.84	*7.58*[5] *+ 2.40*[6]	
Mean	*6.02*[2]	*6.42*[2]	*6.55*[2]	*6.53*[2]	*6.38*	
Increase		*+ 0.40*[3]	*+ 0.53*[3]	*+ 0.51*[3]		
St. errors (2) ±0.218, (3) ±0.308, (4) ±0.154, (5) ±0.124, (6) ±0.176.						

Ploughing	None	Pl.† in	Minerals Broadcast Feb.	Minerals Broadcast April	*Mean*	*Increase*
	ROOTS (washed) : tons per acre					
Shallow	14.12	14.88	15.08	14.19	*14.57*	
Deep	14.28	15.52	15.38	14.83	*15.00 + 0.43*	
No sul. amm.	12.34	13.36	13.64	12.94	*13.07*	
Sulph. amm.	16.06	17.04	16.82	16.08	*16.50 + 3.43*	
Mean	*14.20*	*15.20*	*15.23*	*14.51*	*14.78*	
Increase		*+ 1.00*	*+ 1.03*	*+ 0.31*		
	SUGAR PERCENTAGE					
Shallow	17.45	17.76	17.46	17.67	*17.58*	
Deep	17.56	17.70	17.72	17.72	*17.68 + 0.10*	
No sul. amm.	17.49	17.78	17.54	17.78	*17.65*	
Sulph. amm.	17.52	17.68	17.64	17.60	*17.61 − 0.04*	
Mean	*17.50*	*17.73*	*17.59*	*17.70*	*17.63*	
Increase		*+ 0.23*	*+ 0.09*	*+ 0.20*		

† Pl. = ploughed

* For comparisons involving the difference of sulphate of ammonia and no sulphate of ammonia

PLANT NUMBER : thousands per acre

Ploughing	None	Pl.† in	Minerals Broadcast Feb.	Minerals Broadcast April	*Mean*	*Increase*
Shallow ..	31.6	31.8	31.1	30.8	*31.3*	
Deep ..	30.1	32.3	31.4	31.1	*31.2*	*−0.1*
No sulph. amm.	30.2	31.2	31.0	30.9	*30.8*	
Sulph. amm.	31.4	32.9	31.4	31.0	*31.7*	*+0.9*
Mean ..	*30.8*	*32.0*	*31.2*	*31.0*	*31.2*	
Increase ..		*+1.2*	*+0.4*	*+0.2*		

	Shallow	Deep	Shallow	Deep
	TOTAL SUGAR : cwt. per acre (±1.57*)		ROOTS (washed) : tons per acre	
No sulph. amm. ..	46.3	46.0	13.12	13.02
Sulph. amm. ..	56.2	60.1	16.02	16.98
	TOPS : tons per acre (±0.176*)		SUGAR PERCENTAGE	
No sulph. amm. ..	5.15	5.20	17.64	17.66
Sulph. amm. ..	7.40	7.77	17.54	17.69

* For comparisons involving the difference of sulphate of ammonia and no sulphate of ammonia.

PLANT NUMBER : thousands per acre

	Shallow	Deep
No sulph. amm. ..	31.0	30.6
Sulph. amm. ..	31.6	31.8

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Conclusions

Minerals produced an average increase of 3.3 cwt. per acre in total sugar and 0.5 tons per acre in tops, the increase in sugar being significant while that in tops was almost significant. The response in sugar to minerals was greater with the early applications than with the April application, but not significantly so.

The increases in total sugar and tops to deep ploughing over shallow ploughing were not significant.

Sulphate of ammonia increased total sugar by 11.9 cwt. per acre and tops by 2.4 tons per acre.

Sugar Beet. A. G. Revill, Esq., Pyewipe, Blyton, 1937
Brigg Beet Sugar Factory

R. Hull, Esq., Midland Agricultural College

6 randomised blocks of 6 plots each. Certain interactions partially confounded with block differences. Plots: 1/65 acre.

TREATMENTS: 3×2^2 factorial design.
No borax, 20, 40 lb. borax per acre applied before seeding or later in the season, without artificials or with artificials.
The artificials consisted of 3 cwt. nitrate of soda, 4 cwt. superphosphate and 2 cwt. muriate of potash per acre.

BASAL MANURING: Nil.

SOIL: Black sand. Variety: Kleinwanzleben E. Manures applied: April 8. Seed sown: April 23. Lifted: Nov. 8 and 9. Previous crop: Wheat.

SPECIAL NOTE: The intention was to apply the late dressing of borax when Heart Rot appeared but as none developed, the late dressing was not applied.

STANDARD ERRORS PER PLOT: Total sugar: 2.30 cwt. per acre or 4.72%. Tops: 1.05 tons per acre or 12.4%. Mean dirt tare: 0.023.

	TOTAL SUGAR		ROOTS (washed)		TOPS		SUGAR PERCENTAGE		PLANT NUMBER	
	Cwt.	*Incr.*	Tons	*Incr.*	Tons	*Incr.*		*Incr.*	Thous.	*Incr.*
Mean	*48.7*		*13.68*		*8.48*		*17.83*		*31.8*	
No artificials	42.1[1]		11.77		5.95[4]		17.89		31.6	
Artificials	55.4[1]	*+13.3*[7]	15.60	*+3.83*	11.01[4]	*+5.06*[10]	17.77	*−0.12*	31.9	*+0.3*
No Borax	48.3[2]		13.60		8.44[5]		17.76		31.8	
20 lb. Borax	48.9[3]	*+0.6*[8]	13.74	*+0.14*	8.37[6]	*−0.07*[11]	17.80	*+0.04*	31.5	*−0.3*
40 lb. Borax	50.4[3]	*+1.5*[9]	13.93	*+0.19*	8.78[6]	*+0.41*[12]	18.10	*+0.30*	31.8	*+0.3*

Standard errors: [1] ±0.542, [2] ±0.469, [3] ±0.939, [4] ±0.247, [5] ±0.214, [6] ±0.429. [7] ±0.766, [8] ±1.05, [9] ±1.33, [10] ±0,.349 [11] ±0.479, [12] ±0.607.

Interactions of Borax with Artificials

TOTAL SUGAR: cwt. per acre

	Borax (lb. per acre)		
	None	20	40
None	43.2	42.9	41.9
Artificials	54.3	54.6	55.6

Conclusions

Artificials produced large responses in sugar per acre and tops. The response to the double dressing of borax was almost significant in sugar per acre, but borax had little effect on tops.

Neither artificials nor borax appeared to influence plant numbers.

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Sugar Beet. C. Bee, Esq., Digby Fen, 1937
R. Hull, Esq., Midland Agricultural College and Bardney Beet Sugar Factory

4 randomised blocks of 6 plots each. Plots 1/65 acre.

TREATMENTS: 3×2 factorial design.

Manganese sulphate: None, 50 lb., 150 lb. per acre.

Nitrate of soda: None, 2 cwt. per acre.

BASAL MANURING: 4½ cwt. artificials consisting of 5 parts superphosphate and 2 parts muriate of potash.

SOIL: Black Fen. Variety: Johnsons. Manures applied: April 7. Seed sown: April 27. Lifted: Oct. 8-11. Previous crop: Barley.

STANDARD ERRORS PER PLOT: Total sugar: 2.54 cwt. per acre or 7.74%. Tops: 0.871 tons per acre or 9.61%.

Nitrate of soda	Manganese sulphate None	50 lb.	150 lb.	*Mean*	*Increase*	Manganese sulphate None	50 lb.	150 lb.	*Mean*	*Increase*
	TOTAL SUGAR: cwt. per acre (±1.27)					ROOTS (washed): tons per acre				
None ..	28.4	31.4	35.9	*31.9*[1]		7.73	8.54	9.08	*8.45*	
2 cwt. ..	28.3	35.4	37.1	*33.6*[1]	*+1.7*[3]	7.44	8.99	9.60	*8.68*	*+0.23*
Mean ..	*28.4*[2]	*33.4*[2]	*36.5*[2]	*32.8*		*7.58*	*8.76*	*9.34*	*8.56*	
Increase ..		*+5.0*[4]	*+3.1*[4]				*+1.18*	*+0.58*		
	TOPS: tons per acre (±0.436)					SUGAR PERCENTAGE				
None ..	8.57	8.93	9.32	*8.94*[5]		18.30	18.40	19.78	*18.83*	
2 cwt. ..	8.57	9.46	9.52	*9.18*[5]	*+0.24*[7]	19.05	19.70	19.32	*19.36*	*+0.53*
Mean ..	*8.57*[6]	*9.20*[6]	*9.42*[6]	*9.06*		*18.68*	*19.05*	*19.55*	*19.10*	
Increase ..		*+0.63*[8]	*+0.22*[8]				*+0.37*	*+0.50*		

Standard errors: (1) ±0.733, (2) ±0.898, (3) ±1.04, (4) ±1.27, (5) ±0.252, (6) ±0.308, (7) ±0.356, (8) ±0.436.

Nitrate of soda	Manganese sulphate None	50 lb.	150 lb.	*Mean*	*Increase*
	PLANT NUMBER: thousands per acre				
None ..	30.3	28.0	29.3	*29.2*	
2 cwt. ..	26.8	28.2	28.2	*27.7*	*−1.5*
Mean ..	*28.6*	*28.1*	*28.8*	*28.5*	
Increase ..		*−0.5*	*+0.7*		

Conclusions

Manganese sulphate produced a significant increase in total sugar of 5.0 cwt. per acre to the 50 lb. dressing and 8.1 cwt. to the 150 lb. dressing. The response per unit of manganese sulphate was significantly less at the higher level of dressing than at the lower level. Manganese sulphate also produced a significant increase in tops, but had little effect on plant number.

The average responses in total sugar and tops to nitrate of soda were not significant, there being no response in the absence of manganese sulphate.

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Sugar Beet. G. R. Taylor, Esq., Brough, 1937
Newark Beet Sugar Factory

4×4 Latin square. Plots : 0.02043 acre.

TREATMENTS : Increasing levels of a mixed fertiliser containing 5.1% phosphoric acid, 6.6% nitrogen and 10.0% potash as shown below.

BASAL MANURING : Nil.

SOIL : Sandy gravel. Variety : Kleinwanzleben E. Manures applied : April, 26. Seed sown : May 1. Lifted : November 8. Previous crop : Wheat.

STANDARD ERRORS PER PLOT : Total sugar : 2.97 cwt. per acre or 4.76%. Tops : 0.933 tons per acre or 11.0 %. Mean dirt tare : 0.118.

Artificials cwt. per acre	TOTAL SUGAR Cwt.	*Increase*	ROOTS (washed) Tons	*Increase*	TOPS Tons	*Increase*	SUGAR PERCENTAGE	*Increase*	PLANT NUMBER Thous.	*Increase*
Mean	*62.4*		*16.47*		*8.46*		*18.96*		*37.5*	
0	51.0		13.40		5.53		19.00		36.9	
4	58.4	*+7.4*	15.26	*+1.86*	7.51	*+1.98*	19.15	*+0.15*	37.0	*+0.1*
8	69.2	*+10.8*	18.24	*+2.98*	8.95	*+1.44*	18.98	*−0.17*	37.8	*+0.8*
12	71.0	*+1.8*	18.99	*+0.75*	11.87	*+2.92*	18.70	*−0.28*	38.3	*+0.5*
St. errors	±1.48	*±2.09*			±0.466	*±0.659*				

Conclusions

The yields were high. There was a significant increase to mixed artificials in both total sugar and tops. The falling off in response at the highest level of application with sugar was not significant, and there was no sign of a falling off in response with tops.

Sugar Beet. W. Arden, Esq., Newton on Trent, 1937
Newark Beet Sugar Factory

4×4 Latin square. Plots : 0.02066 acre.

TREATMENTS : Increasing levels of a mixed fertiliser containing 5.1% phosphoric acid, 6.6% nitrogen and 10.0% potash as shown below.

BASAL MANURING : 12 loads farmyard manure per acre.

SOIL : Sand. Variety : Kleinwanzleben E. Manures applied : April 27. Seed sown : April 29. Lifted : Oct. 27. Previous crop : Carrots.

STANDARD ERRORS PER PLOT : Total sugar : 4.11 cwt. per acre or 5.60%. Tops : 2.45 tons per acre or 17.3%. Mean dirt tare : 0.122.

Artificials cwt. per acre	TOTAL SUGAR Cwt.	*Increase*	ROOTS (washed) Tons	*Increase*	TOPS Tons	*Increase*	SUGAR PERCENTAGE	*Increase*	PLANT NUMBER Thous.	*Increase*
Mean	*73.4*		*19.07*		*14.15*		*19.25*		*31.3*	
0	66.5		17.25		11.66		19.30		31.8	
4	74.4	*+7.9*	19.36	*+2.11*	13.46	*+1.80*	19.20	*−0.10*	31.7	*−0.1*
8	72.4	*−2.0*	18.77	*−0.59*	15.09	*+1.63*	19.32	*+0.12*	30.6	*−1.1*
12	80.1	*+7.7*	20.90	*+2.13*	16.39	*+1.30*	19.18	*−0.14*	31.0	*+0.4*
St. errors	±2.06	*±2.91*			±1.22	*±1.73*				

Conclusions

The yields were high. There was a significant response to mixed artificials in both total sugar and tops. The apparent falling off in response with the higher dressings was not significant in either case.

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Sugar Beet. W. Bourne, Esq., North Muskham, 1937
Newark Beet Sugar Factory

4 × 4 Latin square. Plots : 0.02066 acre.

TREATMENTS : Increasing levels of a mixed fertiliser containing 5.1% phosphoric acid, 6.6% nitrogen and 10.0% potash as shown below.

BASAL MANURING : 10 loads of farmyard manure per acre.

SOIL : Sandy loam. Variety : Dippe. Manures applied : April 26. Seed sown : May 17. Lifted : Nov. 16. Previous crop : Peas.

STANDARD ERRORS PER PLOT : Total sugar : 2.48 cwt. per acre or 4.95%. Tops : 0.783 tons per acre or 10.0%. Mean dirt tare : 0.126.

Artificials cwt. per acre	TOTAL SUGAR Cwt.	*Increase*	ROOTS (washed) Tons	*Increase*	TOPS Tons	*Increase*	SUGAR PERCENTAGE	*Increase*	PLANT NUMBER Thous.	*Increase*
Mean	*50.0*		*13.38*		*7.79*		*18.67*		*44.4*	
0	42.3		11.30		5.91		18.70		44.4	
4	51.5	*+9.2*	13.64	*+2.34*	7.84	*+1.93*	18.87	*+0.17*	45.0	*+0.6*
8	50.4	*−1.1*	13.50	*−0.14*	7.65	*−0.19*	18.65	*−0.22*	44.1	*−0.9*
12	55.7	*+5.3*	15.09	*+1.59*	9.77	*+2.12*	18.45	*−0.20*	43.9	*−0.2*
St. errors	±1.24	*±1.75*			±0.392	*±0.554*				

Conclusions

Significant response to mixed artificials in both total sugar and tops, with some indication of a decrease in the responsiveness at the higher levels of application.

Sugar Beet. Messrs. Moore Brothers, Crowle, 1937
Brigg Beet Sugar Factory

4 randomised blocks of 8 plots each. Certain interactions partially confounded with block differences. Plots : 1/44 acre.

TREATMENTS : 4×2^2 factorial design.
Mixed artificials : None, 4 cwt., 8 cwt., 12 cwt., per acre.
Nitrate of soda : None, 1 cwt. per acre applied as top dressing on June 29.
Time of lifting : Early (Nov. 5 and 6), Late (Dec. 17).
The mixed artificials consisted of 3½ parts sulphate of ammonia, 3 parts nitrate of soda, 6½ parts superphosphate, 4 parts muriate of potash and 1 part steamed bone flour.

BASAL MANURING : Nil.

SOIL : Dark sand. Variety : Kleinwanzleben E. Manures applied : May 4. Seed sown : May 20. Previous crop : Oats.

STANDARD ERRORS PER PLOT : Total sugar : 3.45 cwt. per acre or 8.60%. Tops : 0.952 tons per acre or 7.57%.

Mean dirt tare : first lifting: 0.124, second lifting : 0.210.

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Nitrate of soda	Early	Late	*Mean*	*Increase*	Early	Late	*Mean*	*Increase*	Early	Late	*Mean*	*Increase*
	TOTAL SUGAR : cwt.				ROOTS (washed) : tons				TOPS : tons			
None ..	40.8[1]	38.5[1]	*39.6*[2]		12.14	12.25	*12.20*		13.26[1]	11.17[1]	*12.22*[2]	
1 cwt. ..	41.0[1]	40.0[1]	*40.5*[2]	*+0.9*[1]	12.24	12.78	*12.51*	*+0.31*	13.76[1]	12.15[1]	*12.96*[2]	*+0.74*[1]
Mean ..	*40.9*[2]	*39.2*[2]	*40.0*		*12.19*	*12.52*	*12.36*		*13.51*[2]	*11.66*[2]	*12.59*	
Increase		*−1.7*[1]				*+0.33*				*−1.85*[1]		
Standard errors (1) ±1.22, (2) ±0.863									(1) ±0.337, (2) ±0.238.			
	SUGAR PERCENTAGE				PLANT NUMBER : thous.							
None ..	16.82	15.74	*16.28*		30.0	28.7	*29.4*					
1 cwt. ..	16.74	15.64	*16.19*	*−0.09*	30.8	27.4	*29.1*	*−0.3*				
Mean ..	*16.78*	*15.69*	*16.24*		*30.4*	*28.0*	*29.2*					
Increase		*−1.09*				*−2.4*						

	Mixed artificials : cwt. per acre 0	4	8	12	Mixed artificials : cwt. per acre 0	4	8	12
	TOTAL SUGAR : cwt. per acre (±1.72)				ROOTS (washed) : tons per acre			
No nitrate of soda ..	34.5	40.7	42.0	41.6	10.68	12.43	13.04	12.64
Nitrate of soda ..	35.0	41.5	43.3	42.0	10.98	12.82	13.30	12.92
Early	35.3	41.2	42.0	45.2	10.76	12.13	12.49	13.36
Late	34.2	41.0	43.3	38.5	10.89	13.12	13.85	12.19
Mean	*34.8*[1]	*41.1*[1]	*42.6*[1]	*41.8*[1]	*10.83*	*12.62*	*13.17*	*12.78*
Increase		*+6.3*[2]	*+1.5*[2]	*−0.8*[2]		*+1.79*	*+0.55*	*−0.39*
Standard errors	(1) ±1.22, (2) ±1.72.							
	TOPS : tons per acre (±0.476)				SUGAR PERCENTAGE			
No nitrate of soda ..	9.64	10.78	14.12	14.32	16.20	16.41	16.08	16.44
Nitrate of soda ..	10.08	12.38	13.78	15.58	15.94	16.20	16.34	16.27
Early	10.07	12.46	14.70	16.81	16.42	17.01	16.78	16.90
Late	9.65	10.70	13.20	13.10	15.72	15.60	15.64	15.81
Mean	*9.86*[1]	*11.58*[1]	*13.95*[1]	*14.95*[1]	*16.07*	*16.30*	*16.21*	*16.36*
Increase		*+1.72*[2]	*+2.37*[2]	*+1.00*[2]		*+0.23*	*−0.09*	*+0.15*
Standard errors	(1) ±0.337, (2) ±0.476							
	PLANT NUMBER : thous. per acre							
No nitrate of soda ..	28.2	29.2	28.0	32.0				
Nitrate of soda ..	29.2	29.8	29.3	28.0				
Early	30.4	30.5	30.0	30.8				
Late	27.0	28.4	27.4	29.2				
Mean	*28.7*	*29.5*	*28.7*	*30.0*				
Increase		*+0.8*	*−0.8*	*+1.3*				

Conclusions

Mixed artificials produced significant increases in both total sugar and tops. The response fell off significantly at the higher levels of application with sugar, there being no further response after 8 cwt. per acre. With tops, however, there was little indication of a falling off in response.

The responses to mixed artificials were somewhat greater with early lifting (Nov. 5 and 6) than with late lifting (Dec. 17), the difference being definitely significant in the tops, though not significant in sugar.

The yield of sugar was decreased by 1.7 cwt. per acre and that of tops by 1.8 tons per acre at the later lifting, the decrease being significant in tops but not in sugar.

The response to nitrate of soda was significant in tops but not in sugar.

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Sugar Beet. W. R. Smith, Esq., Holton-le-Moor, 1937
Brigg Beet Sugar Factory

4×4 Latin square. Plots: 1/40 acre.

TREATMENTS: Singled to exactly 11 inches (A), selection of strongest plant within 3 inches of exact distance (11 inches) (B), selection of weakest plant within 3 inches of exact distance (11 inches) (C), singled to 11 inches seven days later (D).

BASAL MANURING: 8 cwt. compound fertiliser and 10 loads of dung.

SOIL: Sand. Variety: Kleinwanzleben E. Seed sown: May 24. Singled: June 12 and 19. Lifted: Oct. 20 and 21. Previous crop: Barley.

STANDARD ERRORS PER PLOT: Total sugar: 1.40 cwt. per acre or 3.26%. Tops: 0.789 tons per acre or 5.07%. Mean dirt tare: 0.086.

	TOTAL SUGAR Cwt.	*Increase*	ROOTS (washed) Tons	*Increase*	TOPS Tons	*Increase*	SUGAR PERCENTAGE	*Increase*	PLANT NUMBER Thous.	*Increase*
Mean	*43.0*		*12.17*		*15.55*		*17.69*		*27.8*	
A	44.0		12.39		15.37		17.74		28.6	
B	44.3	*+0.3*	12.53	*+0.14*	15.50	*+0.13*	17.69	*−0.05*	28.8	*+0.2*
C	41.8	*−2.2*	11.92	*−0.47*	15.90	*+0.53*	17.54	*−0.20*	27.2	*−1.4*
D	42.1	*−1.9*	11.84	*−0.55*	15.42	*+0.05*	17.78	*+0.04*	26.7	*−1.9*
St. errors	±0.700	*±0.990*			±0.394	*±0.557*				

Conclusions

The effects of the different methods of singling on the yields of sugar per acre and on tops were not significantly different. It may be noted, however, that as in the 1936 experiments, the selection of the weakest plants gave the lowest yield of sugar.

Sugar Beet. J. W. Auckland, Esq., Thornton, 1937
Bardney Beet Sugar Factory

4×4 Latin square. Plots: 1/80 acre.

TREATMENTS: Singled to exactly 11 inches (A), selection of strongest plant within 3 inches of exact distance (11 inches) (B), selection of weakest plant, within 3 inches of exact distance (11 inches) (C), singled to 11 inches seven days later (D).

BASAL MANURING: 10 cwt. compound fertiliser per acre, and 10 loads of dung.

SOIL: Sand. Variety: Dippe E. Seed sown: May 10. Singled: June 8 and 15. Lifted: Nov. 4. Previous crop: Barley.

STANDARD ERRORS PER PLOT: Total sugar: 2.21 cwt. per acre or 4.00 %. Tops: 1.04 tons per acre or 10.7%. Mean dirt tare: 0.138.

	TOTAL SUGAR Cwt.	*Increase*	ROOTS (washed) Tons	*Increase*	TOPS Tons	*Increase*	SUGAR PERCENTAGE	*Increase*	PLANT NUMBER Thous.	*Increase*
Mean	*55.2*		*14.99*		*9.68*		*18.41*		*27.2*	
A	56.6		15.25		9.35		18.55		26.9	
B	57.3	*+0.7*	15.60	*+0.35*	9.95	*+0.60*	18.38	*−0.17*	27.4	*+0.5*
C	53.9	*−2.7*	14.55	*−0.70*	10.02	*+0.67*	18.52	*−0.03*	29.1	*+2.2*
D	52.9	*−3.7*	14.55	*−0.70*	9.42	*+0.07*	18.18	*−0.37*	25.2	*−1.7*
St. errors	±1.10	*±1.56*			±0.520	*±0.735*				

Conclusions

The differences in yield of total sugar produced by the different methods of singling were not significant. There is, however, some indication that the selection of the weakest plant reduced the yield, while late singling also gave a reduced yield.

There were no significant differences in the yields of tops.

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Sugar Beet. C. J. Neale, Esq., Newark, Kneeton, Notts., 1937
Kelham Beet Sugar Factory

4 randomised blocks of 12 plots each. Plots : 0.01613 acre.

TREATMENTS : 4 × 3 factorial design.

Nitrogen : None, cyanamide, nitrochalk and sulphate of ammonia at the rate of 0.6 cwt. N per acre.

Phosphate : None, superphosphate and slag at the rate of 1.0 cwt. P_2O_5 per acre.

BASAL MANURING : Muriate of potash at the rate of 1.0 cwt. K_2O per acre.

SOIL : Light loam. Variety : Kleinwanzleben E. Manures applied : April 7. Seed sown : May 19. Lifted : Dec. 11. Previous crop : Wheat.

STANDARD ERROR PER PLOT : Total sugar : 3.76 cwt. per acre or 11.8%. Mean dirt tare : 0.390.

	None	Cyanamide	Nitrochalk	Sulph. amm.	*Mean* (±0.940)	*Increase* (±1.33)
			TOTAL SUGAR : cwt. per acre (±1.88)			
None ..	29.0	28.4	34.8	30.9	*30.8*	
Super. ..	29.8	31.5	36.4	36.9	*33.6*	*+2.8*
Slag ..	23.8	33.0	34.2	33.5	*31.1*	*+0.3*
Mean (±1.09)	*27.5*	*31.0*	*35.1*	*33.8*	*31.8*	
Increase (±1.54)		*+3.5*	*+7.6*	*+6.3*		
			ROOTS (washed) : tons per acre			
None ..	9.24	9.09	11.01	9.89	*9.81*	
Super. ..	9.53	10.08	11.64	11.60	*10.71*	*+0.90*
Slag ..	7.60	10.26	10.80	10.79	*9.86*	*+0.05*
Mean ..	*8.79*	*9.81*	*11.15*	*10.76*	*10.13*	
Increase ..		*+1.02*	*+2.36*	*+1.97*		
			SUGAR PERCENTAGE			
None ..	15.68	15.60	15.80	15.58	*15.66*	
Super. ..	15.62	15.62	15.65	15.90	*15.70*	*+0.04*
Slag ..	15.62	16.08	15.82	14.48	*15.50*	*−0.16*
Mean ..	*15.64*	*15.77*	*15.76*	*15.32*	*15.62*	
Increase ..		*+0.13*	*+0.12*	*−0.32*		
			PLANT NUMBER : thousands per acre			
None ..	33.5	32.1	32.6	32.9	*32.8*	
Super. ..	32.9	33.7	32.1	33.8	*33.1*	*+0.3*
Slag ..	30.1	33.7	31.1	32.0	*31.7*	*−1.1*
Mean ..	*32.2*	*33.2*	*31.9*	*32.9*	*32.5*	
Increase ..		*+1.0*	*−0.3*	*+0.7*		

Conclusions

There were significant responses in total sugar to all three forms of nitrogenous fertilizer. The responses to nitrochalk and sulphate of ammonia were not significantly different, but the response to cyanamide was significantly less than that to nitrochalk and somewhat less than that to sulphate of ammonia. There are also indications of a positive interaction between the effects of nitrogen and phosphate, though this was not significant.

The average response to superphosphate was just significant at the five per cent. level. In the absence of nitrogen, slag produced an apparent depression of yield, which was, however, not significant. In presence of nitrogen, slag produced a small but not significant increase in yield.

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Kale. Midland Agricultural College, Loughborough, 1937

4 randomised blocks of 6 plots each. Plots: 1/40 acre.

TREATMENTS: 3 × 2 factorial design.
Nitrate of soda: None, 2 and 4 cwt. per acre as top dressing. Unthinned and thinned.

BASAL MANURING: 15 tons farmyard manure, 8 cwt. slag, 2 cwt. 30% potash salt, 1 cwt. nitrate of soda.

SOIL: Light loam. Variety: Marrowstem. Seed sown: April 26-27. Nitrate of soda applied: May 20-25. Harvested: Oct. 26-Nov. 4. Previous crop: Wheat.

SPECIAL NOTE: The thinned plants were 6 inches apart.

STANDARD ERROR PER PLOT: 2.49 tons per acre or 10.5%.

Tons per acre (±1.24)	Nitrate of Soda (cwt.) None	2	4	*Mean (±0.716)*	*Increase (±1.01)*
Unthinned	23.69	24.19	24.56	*24.15*	
Thinned	21.56	23.94	24.44	*23.31*	*−0.84*
Mean (±0.877)	*22.62*	*24.06*	*24.50*	*23.73*	
Increase (±1.24)		*+1.44*	*+0.44*		

Conclusions

The increase in yield due to nitrate of soda and the slight decrease due to thinning were not significant, though they agree in direction with the results found in previous years.

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