Report for 1935

Experiments at Outside Centres

Rothamsted Research

EXPERIMENTS AT OUTSIDE CENTRES

Barley. South Eastern Agricultural College, Wye, Kent, 1935

6 × 6 Latin square. Plots : 0.008287 acre.

TREATMENTS : Sulphate of ammonia and nitro-chalk at the rate of 0 and 0.2 cwt. N alone and with superphosphate at the rate of 0 and 0.4 cwt. P_2O_5 per acre.

BASAL MANURING : Nil.

SOIL : Light loam on chalk. Variety : Plumage Archer. Manures applied : March 8. Seed sown : March 8. Harvested : August 8. Previous crop : Barley.

SPECIAL NOTE : Harvested for grain and straw ratio by sampling method. Seven sampling units per plot each consisting of 4 half metre rows side by side. Rows spaced 7 ins. apart.

STANDARD ERRORS PER PLOT : Grain : 2.36 cwt. per acre or 11.8% ; straw : 2.45 cwt. per acre or 11.4% ; plant number : 8.34 thous. per acre or 31.6%.

Grain : cwt. per acre (±0.964)

Superphosphate per acre	Nitrogen (0.2 cwt. N. per acre) None	Sulph. amm.	Nitro-chalk	Mean (±0.556)	Increase (±0.786)
None	17.3	20.4	22.6	20.1	
0.4 cwt. P_2O_5 ..	16.8	20.0	23.3	20.0	−0.1
Mean (±0.682) ..	17.0	20.2	23.0	20.1	
Increase (±0.964) ..		+3.2	+6.0		

Straw : cwt. per acre (±1.00)

Superphosphate per acre	Nitrogen (0.2 cwt. N per acre) None	Sulph. amm.	Nitro-chalk	Mean (±0.577)	Increase (±0.816)
None	17.6	21.5	24.9	21.3	
0.4 cwt. P_2O_5	17.3	23.2	23.8	21.4	+0.1
Mean (±0.707) ..	17.4	22.4	24.4	21.4	
Increase (±1.00) ..		+5.0	+7.0		

Plant number (May 16) : thousands per acre (±3.40)

Superphosphate per acre	Nitrogen (0.2 cwt. N per acre) None	Sulph. amm.	Nitro-chalk	Mean (±1.96)	Increase (±2.77)
None	20.5	22.6	28.6	23.9	
0.4 cwt. P_2O_5 ..	21.9	33.5	31.3	28.9	+5.0
Mean (±2.40) ..	21.2	28.0	30.0	26.4	
Increase (±3.40) ..		+6.8	+8.8		

Conclusions

Sulphate of ammonia and nitro-chalk significantly increased the yields of grain and straw and the plant number, the increase in grain being significantly greater for nitro-chalk than for sulphate of ammonia. Superphosphate had no apparent effect on yields.

Potatoes—W. E. Morton, Esq., Gores Farm, Thorney, Peterborough, 1935

3 randomised blocks of 9 plots each, with two degrees of freedom, representing second order interactions, confounded with block differences. Error estimated from high order interactions.

PLOTS : 1/60 acre.

TREATMENTS : All combinations of :

$$\begin{matrix} \text{Sulph. Amm.} \\ \left\{ \begin{matrix} \text{None} \\ 0.3 \text{ cwt. N} \\ 0.6 \text{ cwt. N} \end{matrix} \right\} \end{matrix} \times \begin{matrix} \text{Super.} \\ \left\{ \begin{matrix} \text{None} \\ 0.75 \text{ cwt. P}_2\text{O}_5 \\ 1.50 \text{ cwt. P}_2\text{O}_5 \end{matrix} \right\} \end{matrix} \times \begin{matrix} \text{Sulph. pot.} \\ \left\{ \begin{matrix} \text{None} \\ 0.75 \text{ cwt. K}_2\text{O} \\ 1.50 \text{ cwt. K}_2\text{O} \end{matrix} \right\} \end{matrix}$$

BASAL MANURING : 12 loads dung.

SOIL : Light black land. Variety : Majestic. Manures applied : Apr. 2nd. Potatoes planted : Apr. 4th. Lifted : Oct. 7th. Previous crop : Oats.

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

STANDARD ERRORS PER PLOT : Total produce : 1.40 tons per acre or 16.6%. Percentage ware : 4.94.

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

Sulphate of Ammonia		Superphosphate (cwt. P$_2$O$_5$)			Sulphate of potash (cwt. K$_2$O)			Mean	Increase
		0.00	0.75	1.50	0.00	0.75	1.50		
Total produce : tons per acre (± 0.808. Means: ± 0.466. Increases: ± 0.659)									
0.0 cwt. N	..	7.62	6.99	9.34	7.68	7.49	8.78	7.98	
0.3 cwt. N	..	8.84	9.45	8.71	8.17	9.45	9.38	9.00	+1.02
0.6 cwt. N	..	7.70	8.04	8.95	7.74	8.55	8.40	8.23	−0.77
Mean ..	..	*8.05*	*8.16*	*9.00*	*7.86*	*8.50*	*8.85*	*8.40*	
Increase	..	+0.11	+0.84		+0.64	+0.35			
Percentage ware : (± 2.85. Means: ± 1.64. Increases: ± 2.32)									
0.0 cwt. N	..	82.7	85.6	90.4	87.8	87.2	83.6	86.2	
0.3 cwt. N	..	84.3	87.8	89.4	87.2	86.2	88.1	87.2	+1.0
0.6 cwt. N	..	84.3	83.3	84.6	86.5	81.7	84.0	84.1	−3.1
Mean ..	..	*83.8*	*85.6*	*88.1*	*87.2*	*85.0*	*85.2*	*85.8*	
Increase	..	+1.8	+2.5		−2.2	+0.2			

Interaction of sulphate of potash with superphosphate

Sulphate of Potash		Total produce : tons per acre (± 0.808)			Percentage ware (± 2.85)		
		Superphosphate (cwt. P$_2$O$_5$)			Superphosphate (cwt. P$_2$O$_5$)		
		0.00	0.75	1.50	0.00	0.75	1.50
0.00 cwt. K$_2$O	..	8.30	7.20	8.08	85.2	89.4	86.8
0.75 cwt. K$_2$O	..	8.74	7.37	9.38	84.9	80.1	90.1
1.50 cwt. K$_2$O	..	7.12	9.91	9.54	81.1	87.2	87.5

Conclusions

No significant effects.

Potatoes—A. S. Rickwood, Esq., Mepal, Isle of Ely, 1935

3 randomised blocks of 9 plots each, with two degrees of freedom, representing second order interactions, confounded with block differences. Error estimated from high order interactions.

PLOTS : 1/60 acre.

TREATMENTS : All combinations of :

Sulph. amm.		Super.		Sulph. pot.
{ None 0.3 cwt. N 0.6 cwt. N }	×	{ None 0.75 cwt. P_2O_5 1.50 cwt. P_2O_5 }	×	{ None 0.75 cwt. K_2O 1.50 cwt. K_2O }

BASAL MANURING : Nil.

SOIL : Deep light peaty fen. Variety : Scotch King Edward. Manures applied : Apr. 3rd. Potatoes planted : Apr. 17th. Lifted : Sept. 23rd. Previous crop : Wheat.

SPECIAL NOTE : Potatoes passed over $1\frac{5}{8}$ inch riddle to determine percentage ware.

STANDARD ERRORS PER PLOT : Total produce : 1.24 tons per acre or 13.1%. Percentage ware : 8.39.

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

Sulphate of ammonia	Superphosphate (cwt. P_2O_5)			Sulphate of potash (cwt. K_2O)			Mean	Increase
	0.00	0.75	1.50	0.00	0.75	1.50		
	Total produce: tons per acre (±0.718. Means: ±0.414. Increases: ±0.585)							
0.0 cwt. N ..	8.01	8.88	9.55	6.96	9.14	10.34	8.81	
0.3 cwt. N ..	8.99	10.37	9.27	7.57	9.09	11.97	9.54	+0.73
0.6 cwt. N ..	9.73	9.47	11.14	6.96	11.29	12.10	10.12	+0.58
Mean	8.91	9.57	9.99	7.16	9.84	11.47	9.49	
Increase ..	+0.66	+0.42		+2.68	+1.63			
	Percentage ware : (±4.85. Means: ±2.80. Increases: ±3.96)							
0.0 cwt. N ..	61.7	66.2	66.2	55.0	66.8	72.3	64.7	
0.3 cwt. N ..	58.9	66.3	60.4	53.1	57.8	74.8	61.9	−2.8
0.6 cwt. N ..	57.5	56.2	61.6	40.5	66.9	68.0	58.5	−3.4
Mean	59.4	62.9	62.7	49.5	63.8	71.7	61.7	
Increase ..	+3.5	−0.2		+14.3	+7.9			

Interaction of sulphate of potash with superphosphate

Sulphate of potash	Total produce : tons per acre (±0.718)			Percentage ware (±4.85)		
	Superphosphate (cwt. P_2O_5)			Superphosphate (cwt. P_2O_5)		
	0.00	0.75	1.50	0.00	0.75	1.50
0.00 cwt. K_2O ..	5.80	7.98	7.70	45.7	55.1	47.8
0.75 cwt. K_2O ..	9.30	9.96	10.26	61.2	64.5	65.7
1.50 cwt. K_2O ..	11.62	10.78	12.00	71.2	69.1	74.8

Conclusions

Sulphate of ammonia and sulphate of potash gave significant increases in yield, the increase to the double dressing of the latter being 4.3 tons per acre, or 45 per cent. of the mean yield of the experiment. The slight falling-off in response at the higher level of dressing was not significant in either case. Sulphate of potash also produced a large increase in percentage ware. There were no significant responses to superphosphate.

Potatoes—R. Starling, Esq., Little Downham, Ely, 1935

3 randomised blocks of 9 plots each, with two degrees of freedom, representing second order interactions, confounded with block differences. Error estimated from high order interactions.

PLOTS : 1/50 acre.

TREATMENTS : All combinations of :

Sulph. amm.
{ None
  0.5 cwt. N
  1.0 cwt. N }
×
Super.
{ None
  0.8 cwt. P_2O_5
  1.6 cwt. P_2O_5 }
×
Sulph. pot.
{ None
  0.5 cwt. K_2O
  1.0 cwt. K_2O }

BASAL MANURING : Nil.

SOIL : Black soil. Variety : Ninety-fold. Manures applied : Mar. 7th. Potatoes planted : Mar. 12th. Lifted : July 30th. Previous crop : Sugar beet.

STANDARD ERRORS PER PLOT : Total produce : 0.582 tons per acre or 11.6%. Plant number : 0.841 thousands per acre or 7.29%.

Note.—An exceptionally severe frost on May 17th completely killed the tops when they were about 10 inches high.

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

Sulphate of ammonia	Superphosphate (cwt. P_2O_5)			Sulphate of potash (cwt. K_2O)			Mean	Increase
	0.0	0.8	1.6	0.0	0.5	1.0		
Total produce : tons per acre (±0.336. Means : ±0.194. Increases : ±0.274)								
0.0 cwt. N	3.09	3.83	3.57	3.30	3.70	3.49	3.50	
0.5 cwt. N	3.85	5.30	5.94	4.50	5.04	5.54	5.03	+1.53
1.0 cwt. N	4.79	6.89	7.92	6.40	7.14	6.06	6.53	+1.50
Mean	3.91	5.34	5.81	4.73	5.29	5.03	5.02	
Increase ..	+1.43		+0.47	+0.56		−0.26		
Plant number : thousands per acre (±0.486. Means : ±0.281. Increases : ±0.397)								
0.0 cwt. N	10.8	11.2	9.9	10.5	11.2	10.1	10.6	
0.5 cwt. N	11.0	12.2	12.0	11.2	12.0	11.9	11.7	+1.1
1.0 cwt. N	11.0	12.2	13.7	12.1	12.7	12.1	12.3	+0.6
Mean	10.9	11.8	11.8	11.3	12.0	11.4	11.6	
Increase ..	+0.9		0.0	+0.7		−0.6		

Interaction of sulphate of potash with superphosphate

Sulphate of potash	Total produce : tons per acre (±0.336)			Plant number : thousands per acre (±0.486)		
	Superphosphate (cwt. P_2O_5)			Superphosphate (cwt. P_2O_5)		
	0.0	0.8	1.6	0.0	0.8	1.6
0.0 cwt. K_2O.. ..	3.77	5.20	5.22	10.1	12.5	11.3
0.5 cwt. K_2O.. ..	4.21	5.70	5.97	11.6	11.8	12.5
1.0 cwt. K_2O.. ..	3.74	5.13	6.23	11.1	11.3	11.8

Conclusions

Sulphate of ammonia gave a significant increase in yield, with no sign of deviation from proportionality of response to the amount of dressing. Superphosphate also gave a significant increase in yield, the falling off in response at the higher level of dressing not being significant. There was a positive interaction between the effects of sulphate of ammonia and superphosphate, the response to each being significantly greater with the double dressing of the other than with the zero dressing. The effects of potash were not significant.

The effects of the treatments on plant number were similar to those on yield. The effects on yield cannot, however, be considered simply as a reflection of those on plant number and persist after eliminating the effect of plant number on yield.

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Potatoes—W. E. Morton, Esq., Australia Farm, March, 1935

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

TREATMENTS : All combinations of :

Sulph. amm.		Super.		Sulph. pot.
$\left\{\begin{array}{l}\text{None}\\ \text{0.3 cwt. N}\\ \text{0.6 cwt. N}\end{array}\right\}$	$\times$	$\left\{\begin{array}{l}\text{None}\\ \text{0.75 cwt. } P_2O_5\\ \text{1.50 cwt. } P_2O_5\end{array}\right\}$	$\times$	$\left\{\begin{array}{l}\text{None}\\ \text{0.75 cwt. } K_2O\\ \text{1.50 cwt. } K_2O\end{array}\right\}$

BASAL MANURING : Nil.

SOIL : Good quality Fenland, near the clay. Variety : Majestic. Manures applied : Apr. 2. Potatoes planted : Apr. 18. Lifted : Nov. 13. Previous crop : Wheat.

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 : 0.941 tons per acre or 13.8%. Percentage ware : 4.27.

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

Sulphate of ammonia	Superphosphate (cwt. P_2O_5)			Sulphate of potash (cwt. K_2O)			Mean	Increase
	0.00	0.75	1.50	0.00	0.75	1.50		
Total produce : tons per acre (±0.543. Means: ±0.314. Increases: ±0.444.)								
0.0 cwt. N. ..	4.72	5.28	5.71	5.17	6.25	4.28	*5.23*	
0.3 cwt. N. ..	6.46	7.35	7.30	7.28	6.93	6.90	*7.04*	*+1.81*
0.6 cwt. N. ..	7.26	8.17	8.95	7.69	8.35	8.34	*8.13*	*+1.09*
Mean	*6.15*	*6.93*	*7.32*	*6.71*	*7.18*	*6.51*	*6.80*	
Increase ..	*+0.78*	*+0.39*		*+0.47*	*−0.67*			
Percentage ware (±2.46. Means: ±1.42. Increases: ±2.01).								
0.0 cwt. N. ..	79.5	79.6	78.9	79.6	82.4	76.1	*79.4*	
0.3 cwt. N. ..	83.3	81.8	83.7	85.5	79.9	83.4	*82.9*	*+3.5*
0.6 cwt. N. ..	84.3	83.4	86.8	84.0	84.3	86.2	*84.8*	*+1.9*
Mean	*82.4*	*81.6*	*83.1*	*83.0*	*82.2*	*81.9*	*82.4*	
Increase ..	*−0.8*	*+1.5*		*−0.8*	*−0.3*			

Interaction of superphosphate with sulphate of potash.

Sulphate of potash	Total produce : tons per acre (±0.543)			Percentage ware (±2.46)		
	Superphosphate (cwt. P_2O_5)			Superphosphate (cwt. P_2O_5)		
	0.00	0.75	1.50	0.00	0.75	1.50
0.00 cwt. K_2O ..	5.72	6.85	7.57	84.6	81.2	83.3
0.75 cwt. K_2O ..	6.35	7.92	7.27	80.8	83.7	82.1
1.50 cwt. K_2O ..	6.37	6.03	7.12	81.8	79.9	84.0

Conclusions

Sulphate of ammonia produced significant increases in both yield and percentage ware, the falling-off in response at the higher level of dressing not being significant. Superphosphate significantly increased the yield. There were no significant responses to potash.

Potatoes—G. Major, Esq., Newton Farm, Tydd, Wisbech, 1935

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

TREATMENTS : All combinations of :

Sulph. amm.		Super.		Sulph. pot.
None		None		None
0.4 cwt. N	×	0.7 cwt. P₂O₅	×	1.0 cwt. K₂O
0.8 cwt. N		1.4 cwt. P₂O₅		2.0 cwt. K₂O

BASAL MANURING : 10 loads dung per acre.

SOIL : Deep silt. Variety : King Edward. Manures applied : Mar. 19th. Potatoes planted : Apr. 6. Lifted : Oct. 30. Previous crop : Peas.

STANDARD ERROR PER PLOT : 1.04 tons per acre or 9.83%.

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

Sulphate of ammonia	Superphosphate (cwt. P_2O_5)			Sulphate of potash (cwt. K_2O)			Mean	Increase
	0.0	0.7	1.4	0.0	1.0	2.0		
	Total Produce : tons per acre (± 0.600. Means: ± 0.346. Increases: ± 0.489)							
0.0 cwt. N.	10.10	11.54	9.51	10.34	10.58	10.23	10.38	
0.4 cwt. N.	10.52	10.09	11.40	10.71	11.04	10.25	10.67	+0.29
0.8 cwt. N.	10.03	11.43	10.84	10.20	11.73	10.36	10.76	+0.09
Mean ..	10.22	11.02	10.58	10.42	11.12	10.28	10.60	
Increase ..	+0.80		−0.44	+0.70		−0.84		

Interaction of superphosphate with sulphate of potash.

Sulphate of potash	Total Produce : tons per acre (± 0.600)		
	Superphosphate (cwt. P_2O_5)		
	0.0	0.7	1.4
0.0 cwt. K₂O ..	9.90	11.12	10.24
1.0 cwt. K₂O ..	10.31	11.78	11.27
2.0 cwt. K₂O ..	10.43	10.17	10.24

Conclusions

No significant effects. Farmyard manure was sufficient in a year of unusual drought.

Potatoes. J. Morris, Esq., Honey Farm, Wimblington, Cambs., 1935

4 randomised blocks of 8 plots each. Third order interaction confounded.

PLOTS : 1/60 acre.

TREATMENTS : All combinations of :

Sulph. amm.		Super.		Sulph. Pot.		Dung
None	×	None	×	None	×	None
0.5 cwt. N		1.0 cwt.P₂O₅		1.25 cwt. K₂O		8½ tons

BASAL MANURING : Nil.

SOIL : Light fenland resting on peat. Variety : Majestic. Manures applied : April 23. Seed sown April 25. Potatoes lifted : October 29. Previous crop : Carrots.

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

STANDARD ERRORS PER PLOT : Total produce : 0.573 tons per acre or 8.02% ; percentage ware : 6.36.

Mean Yields : TOTAL PRODUCE, *7.14 tons :* PERCENTAGE WARE, *73.3.*

	Mean response	Differential responses							
		Sulph. Amm.		Super.		Sulph. Pot.		Dung	
		Absent	Present	Absent	Present	Absent	Present	Absent	Present
TOTAL PRODUCE ; tons per acre									
Sulph. Amm.	+0.95	—	—	+0.96	+0.95	+0.80	+1.10	+0.65	+1.26
Super.	+0.47	+0.47	+0.47	—	—	+0.40	+0.54	+0.49	+0.45
Sulph. Pot.	+1.20	+1.05	+1.36	+1.13	+1.28	—	—	+2.43	−0.03
Dung	+2.47	+2.16	+2.77	+2.49	+2.45	+3.70	+1.24	—	—
St. Errors	±0.202	±0.286							
PERCENTAGE WARE									
Sulph. Amm.	−0.4	—	—	−2.1	+1.3	−0.2	−0.6	+2.4	−3.2
Super.	+4.5	+2.8	+6.2	—	—	+1.4	+7.6	+4.5	+4.5
Sulph. Pot.	+9.1	+9.4	+8.9	+6.0	+12.2	—	—	+22.2	−3.9
Dung	+16.6	+19.5	+13.8	+16.6	+16.6	+29.7	+3.6	—	—
St. Errors	±2.25	±3.18							

Conclusions

All four treatments gave significant responses in yield and all except sulphate of ammonia significantly increased percentage ware. The increases to sulphate of potash, however, both in yield and percentage ware, occurred only in the absence of dung, the interactions between sulphate of potash and dung being significant.

Sugar Beet. Tunstall, Suffolk, 1935. A. W. Oldershaw, Esq., County Organiser

5 × 5 Latin Square. Plots : 1/56 acre.
TREATMENTS : Fourth year, no further chalk applied (see 1932 Report, p. 208, for first year's dressings.)
BASAL MANURING : 3 cwt. superphosphate, 3 cwt. potash salt and 3 cwt. nitrate of lime per acre.
SOIL : Poor sand. Variety : Kleinwanzleben E. Basal manures applied : Minerals, Apr. 16 ; Nitrogen, May 6. Seed sown : May 6. Harvested : Nov. 14. Previous crop : Sugar Beet.
STANDARD ERRORS PER PLOT : Roots (washed) 0.540 tons per acre or 3.49%. Tops : 0.416 tons per acre or 4.19%. Sugar percentage : 0.0824. Mean dirt tare : 0.1217.

Chalk tons per acre (1932)	ROOTS (washed)		TOPS		SUGAR PERCENTAGE		TOTAL SUGAR	
	Tons per acre.	*Increase*	Tons per acre.	*Increase*		*Increase*	Cwt. per acre.	*Increase*
Mean	*15.48*		*9.93*		*17.46*		*54.0*	
0*	Nil		Nil		—		Nil	
1	14.64		9.44		17.39		50.9	
2	15.90	+1.26	9.68	+0.24	17.56	+0.17	55.8	+4.9
3	15.43	−0.47	10.22	+0.54	17.52	−0.04	54.1	−1.7
4	15.97	+0.54	10.39	+0.17	17.36	−0.16	55.4	+1.3
St. errors	±0.242	±0.342	±0.186	±0.263	±0.0368	±0.0520		

* NOTE : The plots receiving no chalk in 1932 gave negligible yields.

Conclusions

There was a significant response in roots to the second (1932) dressing of lime over the first, but no further response to the higher dressings. In tops there was a significant response, which showed no sign of falling off at the higher dressings. The second and third dressings gave a significantly higher sugar percentage than the first and fourth dressings.

Celery. A. S. Rickwood, Esq., Mepal, Isle of Ely, 1935.

6 blocks of 4 plots each. Second order interaction confounded. Plots : 1/100 acre.

TREATMENTS : All combinations of :

Superphosphate.		Muriate of Potash.		Salt.
{ None 5 cwt. }	×	{ None 3 cwt. }	×	{ None 5 cwt. }

BASAL MANURING : 13 tons of dung.

SOIL : Light fen. Manures applied : May 30. Planted : 1st week in June, drills 4 ft. 6 ins. apart, plants 4 ins. apart in the rows. Harvested : March 18, 1936. Previous crop : Wheat.

SPECIAL NOTE : The celery was divided on the field into five grades, according to the number of heads which could be packed in a crate. The mean grade was determined by assigning values 2, 1, 0, −1, −2 to the five grades, 2 being the top grade.

STANDARD ERRORS PER PLOT : Total yield : 0.354 tons per acre or 4.26%. Mean grade : 0.0989.

	Sub-blocks A.				Sub-blocks B.				Mean	Standard Error
	None	Super and Salt	Super and Mur. Pot.	Mur. Pot. and Salt	Super	Mur. Pot.	Salt	Super Mur. Pot. Salt		
Yield—tons per acre	7.28	8.43	8.68	8.87	7.91	8.56	7.89	8.96	8.32	±0.204
Mean Grade ..	0.583	0.754	0.682	0.905	0.503	0.709	0.538	0.724	0.675	±0.0571

Responses to fertilisers

Treatment	Mean Response	Superphosphate		Muriate of Pot.		Salt	
		Absent	Present	Absent	Present	Absent	Present
TOTAL YIELD : tons per acre (±0.204. Means: ±0.144)							
Superphosphate ..	+0.34	—	—	+0.58	+0.10	+0.37	+0.32
Muriate of Potash ..	+0.89	+1.13	+0.65	—	—	+1.02	+0.76
Salt	+0.43	+0.46	+0.40	+0.56	+0.30	—	—
MEAN GRADE : (±0.0571. Means: ±0.0404)							
Superphosphate ..	−0.018	—	—	+0.068	−0.104	−0.054	+0.018
Muriate of Potash ..	+0.160	+0.246	+0.074	—	—	+0.152	+0.168
Salt	+0.111	+0.076	+0.146	+0.103	+0.119	—	—

Conclusions

All three fertilisers produced significant increases in the yield of heads. Muriate of potash and salt also produced significant increases in the size of heads, as measured by the mean grade, but superphosphate had no apparent effect on size.

EXPERIMENTS CARRIED OUT BY LOCAL WORKERS

Hay—3rd Season. H. W. Gardner, Esq., Hertfordshire Farm Institute, St. Albans, 1935

5 randomised blocks of 6 plots each. Plots : 1/50 acre.
TREATMENTS : All combinations of :

$$\left\{ \begin{array}{l} \text{No phosphate} \\ \text{Basic slag (15\% } P_2O_5\text{, 85\% citric solubility)} \\ \text{Gafsa phosphate (90\% through 120 sieve)} \end{array} \right\} \times \left\{ \begin{array}{l} \text{No potash} \\ \text{30\% potash salt (0.5 cwt. } K_2O\text{)} \end{array} \right\}$$

Phosphates at the rate of 1.0 cwt. P_2O_5 per acre. The manures were applied in 1933.
BASAL MANURING : Nil.
SOIL : Heavy flinty loam, well supplied with chalk.   Manures applied : Jan. 7th, 1933.   Cut : July 1st.
STANDARD ERROR PER PLOT : 1.41 cwt. per acre or 3.88%.

Cwt. per acre (± 0.631)	No phosphate	Basic slag	Mineral phosphate	*Mean* (± 0.364)	*Increase* (± 0.515)
No potash ..	34.2	37.1	37.2	*36.2*	
Potash.. ..	34.7	37.0	37.2	*36.3*	*+0.1*
Mean (± 0.446) *Incr.* (± 0.631)	34.4	*37.0* *+2.6*	*37.2* *+0.2*	*36.2*	

Conclusions

There was a significant response to phosphate (applied in 1933) of 2.7 cwt. per acre, but no sign of any difference between the two qualities of phosphate.   There was no sign of response to potash (also applied in 1933).

Hay—2nd Season.   Rowley Green Farm, Arkeley, Barnet, Herts, 1935 H. W. Gardner, Esq., Hertfordshire Farm Institute

6 randomised blocks of 6 plots each. Certain interactions partially confounded with block differences.
PLOTS : 1/50 acre.
TREATMENTS : All combinations of :

$$\left\{ \begin{array}{l} \text{None} \\ \text{High soluble slag (1 cwt. } P_2O_5\text{) per acre} \\ \text{Gafsa phosphate (1 cwt. } P_2O_5\text{) per acre} \end{array} \right\} \times \left\{ \begin{array}{l} \text{None} \\ \text{30\% potash salt (0.5 cwt. } K_2O\text{) per acre.} \end{array} \right\} \times \left\{ \begin{array}{l} \text{None} \\ \text{75 cwt. chalk} \end{array} \right\}$$

These treatments were applied in 1934.
BASAL MANURING : Nil.
SOIL : Acid clay. Chalk applied : Jan. 30th, 1934.   Minerals applied : Feb. 6th, 1934.   Hay cut : July 4th.
STANDARD ERROR PER PLOT : 2.33 cwt. per acre or 8.10%.

Responses to Fertilisers applied in 1934 : cwt. per acre.

Mean yield : 28.8 cwt.

	Mean response	Differential responses							
		Chalk		Potash		No phos.	Slag	Gafsa phos.
		Absent	Present	Absent	Present			
Chalk	*+5.4*[1]	—	—	*+5.2*[3]	*+5.6*[3]	*+6.2*[4]	*+3.8*[4]	*+6.1*[4]
Potash.. ..	*−0.4*[1]	*−0.6*[3]	*−0.2*[3]	—	—	*−0.1*[4]	*−1.1*[4]	*+0.1*[4]
Slag	*0.0*[2]	*+1.2*[4]	*−1.2*[4]	*+0.5*[4]	*−0.5*[4]	—	—	—
Gafsa phosphate	*−0.9*[2]	*−0.8*[4]	*−0.9*[4]	*−1.0*[4]	*−0.8*[4]	—	—	—

Standard errors : [1] ± 0.777, [2] ± 0.951, [3] ± 1.17, [4] ± 1.35.

Conclusions

There was a significant response to chalk applied in 1934.

Hay. 5th Season. Lady Manner's School, Bakewell, 1935

3 randomised blocks of 8 plots each.
PLOTS : 1/161 acre.
TREATMENTS : All combinations of :

$\left\{\begin{array}{l}\text{None}\\ \text{2 cwt. nitrate of soda}\end{array}\right\}$ × $\left\{\begin{array}{l}\text{None}\\ \text{3 cwt. superphosphate}\end{array}\right\}$ × $\left\{\begin{array}{l}\text{None}\\ \text{1 cwt. 30\% potash salt}\end{array}\right\}$

BASAL MANURING : Nil.
SOIL : Limestone. Manures applied : March 15-22. Hay cut : July 3-4.
STANDARD ERROR PER PLOT : 6.24 cwt. per acre, or 13.4%.

Yields of Individual Treatments: cwt. per acre.

O	N	P	K	NP	NK	PK	NPK	Mean
37.4	47.3	42.5	37.4	49.7	53.5	42.6	61.9	46.5

Responses to Fertilisers: cwt. per acre.

Fertiliser	Mean Response (± 2.55)	Differential Responses (± 3.60)					
		Nitrate of Soda		Superphosphate		Potash salt	
		Absent	Present	Absent	Present	Absent	Present
Nitrate of Soda ..	+13.1	—	—	+13.0	+13.2	+8.6	+17.7
Superphosphate ..	+5.3	+5.2	+5.4	—	—	+3.8	+6.8
Potash salt	+4.6	0.0	+9.2	+3.1	+6.2	—	—

Conclusions

There was a large response to nitrate of soda, and a significant response to potash salt in the presence of nitrate of soda. The response to superphosphate was not quite significant.

Meadow Hay. 4th Season. Lady Manner's School, Bakewell, 1935.

4 randomised blocks of 9 plots each.
PLOTS : 1/216 acre.
TREATMENTS : All combinations of :

$\left\{\begin{array}{l}\text{No manure}\\ \text{8 tons of Compost}\\ \text{Mixed Artificials}\end{array}\right\}$ Applied in 1933 and 1935 × $\left\{\begin{array}{l}\text{No manure}\\ \text{8 tons of Compost}\\ \text{Mixed Artificials}\end{array}\right\}$ Applied in 1932 and 1934

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 : March 22. Hay cut : July 11.
STANDARD ERROR PER PLOT : 4.84 cwt. per acre or 10.9%.

Summary; cwt. per acre (± 2.42)

1933 and 1935 treatments	1932 and 1934 treatments			Mean (± 1.40)	Increase (± 1.98)
	Nil	NPK	Compost		
Nil	31.4	34.2	41.1	35.6	
NPK	50.3	48.7	54.1	51.0	+15.4
Compost ..	45.6	40.9	52.2	46.2	+10.6
Mean (± 1.40) ..	42.4	41.3	49.1	44.3	
Increase (± 1.98)		−1.1	+6.7		

Conclusions

The 1935 treatments both gave large increases in yield, the increase to complete artificials being significantly greater than that to compost. Of the 1934 treatments, however, compost gave a significant increase, but complete artificials a small, though not significant, decrease.

Hay (3rd Season) Cavendish Lodge, Clipstone, Mansfield, 1935.

R. N. Dowling, Esq., County Organiser.

The experiment began in 1933 on Sugar Beet and was continued in 1934 on Oats.

6 randomised blocks of 9 plots each.

PLOTS : 1/160 acre.

TREATMENTS : All combinations of :

$$\begin{array}{c} \text{Mur. pot.} \\ \left\{\begin{array}{c} \text{None} \\ 1\frac{1}{2}\,\text{cwt.} \\ 3\ \ \text{cwt.} \end{array}\right\} \end{array} \times \begin{array}{c} \text{Limestone} \\ \left\{\begin{array}{c} \text{None} \\ 30\,\text{cwt.} \\ 60\,\text{cwt.} \end{array}\right\} \end{array}$$

BASAL MANURING : Nil.

SOIL : Sandy gravel from Bunter Drift; very acid. Manures applied : Potash : March 20, 1935, Limestone to sugar beet in April, 1933. Hay cut : July 1. Previous crop : Oats.

STANDARD ERROR PER PLOT : 1.32 cwt. per acre or 9.64%.

Hay: cwt. per acre (± 0.539)

Muriate of Potash	Limestone (cwt. per acre)			*Mean* (± 0.311)	*Increase* (± 0.440)
	None	30	60		
None ..	13.1	13.1	14.3	*13.5*	
$1\frac{1}{2}$ cwt. ..	12.6	13.1	14.8	*13.5*	*0.0*
3 cwt. ..	13.8	14.5	14.0	*14.1*	*+0.6*
Mean (± 0.311)	*13.2*	*13.6*	*14.4*	*13.7*	
Incr. (± 0.440)	*+0.4*	*+0.8*			

Conclusions

There was a significant increase to limestone. The increase to muriate of potash was not significant.

Hay—Lower Tidmore Green Farm, Stevenage, 1935

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

5×5 Latin square. Plots : 0.01443 acre.
TREATMENTS : Chalk at the rate of 0, 35, 70, 140, 210 cwt. per acre.
BASAL MANURING : Nil.
SOIL : Gravelly loam. Chalk applied : May 30th, 1933. Cut : June 24th. Previous crop : Winter oats.
STANDARD ERROR PER PLOT : 6.04 cwt. per acre or 11.4%.

Chalk cwt. per acre	Yield cwt. per acre	Increase for each dressing
Mean	*52.8*	
None	25.5	
35	46.0	+20.5
70	59.2	+13.2
140	66.0	+6.8
210	67.3	+1.3
St. error	± 2.70	± 3.82

Conclusions

There was a large response to liming, with a significant falling off in response at the higher levels, the additional responses to the two highest dressings not being individually significant.

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Wheat. H. W. Gardner, Esq., Hertfordshire Farm Institute, St. Albans, 1935.

3 randomised blocks of 9 plots each. Plots : 1/112 acre.
TREATMENTS : 0, 0.5 cwt. and 1.0 cwt. of P_2O_5 as superphosphate, basic slag and mineral phosphate.
BASAL MANURING : 2 cwt. Chilean potash nitrate per acre.
SOIL : Loamy. Variety : Victor. Seed sown : Nov. 5. Manures applied : Nov. 21. Harvested :
  Aug. 7. Previous crop : Potatoes.
STANDARD ERRORS PER PLOT : Grain : 2.43 cwt. per acre or 9.81%. Straw : 9.75 cwt. per acre or
  17.9%.

	GRAIN : cwt. per acre (± 1.40)					**STRAW** : cwt. per acre (± 5.63)				
	Super	Basic slag	Mineral phosphate	*Mean*	*Increase*	Super	Basic slag	Mineral phosphate	*Mean*	*Increase*
0.0 cwt. P_2O_5		26.3[1]		26.3[1]			54.5[5]		54.5[5]	
0.5 cwt. P_2O_5	21.5	22.3	24.8	22.9[1]	−3.4[3]	51.9	57.2	56.4	55.2[5]	+0.7[7]
1.0 cwt. P_2O_5	23.5	28.0	23.9	25.1[1]	+2.2[3]	50.6	51.7	59.3	53.9[5]	−1.3[7]
Mean Increase	22.5[2]	25.2[2] +2.7[4]	24.4[2] +1.9[4]	24.8		51.2[6]	54.4[6] +3.2[8]	57.8[6] +6.6[8]	54.5	

STANDARD ERRORS : ([1]) ± 0.808, ([2]) ± 0.990, ([3]) ± 1.14, ([4]) ± 1.40, ([5]) ± 3.25, ([6]) ± 3.98, ([7]) ± 4.60,
  ([8]) ± 5.63.

Conclusions

The mean yields of the separate treatments are more irregular than expectation but do not
lead to any consistent conclusions.

Potatoes. The Senior School, Cadishead, Lancs., 1935

5 randomised blocks of 3 plots each. Plots : 1/242 acre.
TREATMENTS : No phosphate, basic slag (11.8% P_2O_5, 78% citric solubility) and superphosphate
  both at the rate of 0.8 cwt. P_2O_5.
BASAL MANURING : Sulphate of ammonia at the rate of 0.6 cwt. N and sulphate of potash at the
  rate of 1.5 cwt. K_2O.
SOIL : Rather heavy, rich in organic matter. On the edge of Chat Moss. Variety : Arran Banner.
  Manures applied : March 15, May 3. Potatoes planted : May 10. Lifted : September 12-13.
  Previous crop : Potatoes.
SPECIAL NOTE : Potatoes sorted by hand.
STANDARD ERRORS PER PLOT : Total produce : 0.902 tons per acre or 22.8%. Percentage ware :
  7.60.

	Total Produce		Percentage Ware	
	Tons per acre	*Increase over no dressing*		*Increase over no dressing*
Mean	3.95		71.9	
None ..	3.63		63.3	
Basic slag	3.35	−0.28	70.8	+7.5
Super ..	4.88	+1.25	81.6	+18.3
St. Errors	± 0.403	± 0.570	± 3.40	± 4.81

Conclusions

Superphosphate gave a significant increase in yield and basic slag a small but not significant
decrease. Both treatments increased percentage ware, the increase due to superphosphate being
large and significantly greater than that due to basic slag, which was not itself significant.

Potatoes. Midland Agricultural College, Loughborough, 1935.

4 randomised blocks of 9 plots each.   Plots : 1/48.8 acre.

TREATMENTS : All combinations of :—

$$\left\{\begin{array}{l}\text{None}\\ 1\tfrac{1}{2}\text{ cwt. sulph. amm.}\\ 3\text{ cwt. sulph. amm.}\end{array}\right\} \times \left\{\begin{array}{l}\text{None}\\ 1\tfrac{1}{2}\text{ cwt. sulph. pot.}\\ 3\text{ cwt. sulph. pot.}\end{array}\right\}$$

BASAL MANURING : Superphosphate at the rate of 3 cwt. per acre and a dressing of lime and farmyard manure.

SOIL : Light loam.   Variety : King Edward.   Manures applied : April 11.   Potatoes planted : Apr. 23.   Lifted : Oct .14.   Previous crop : Seeds hay.

STANDARD ERRORS PER PLOT : Total produce : 0.967 tons per acre or 11.3%.   Percentage ware : 5.92.

Sulphate of Potash (cwt.)	Sulphate of Ammonia (cwt.)			Mean	Increase
	None	1½	3		
TOTAL PRODUCE : tons per acre (±0.484. Means : ±0.279. Increases : ±0.394)					
None	8.71	8.51	8.57	8.60	
1½ ..	8.34	7.89	8.48	8.24	—0.36
3 ..	8.87	8.72	8.77	8.79	+0.55
Mean ..	8.64	8.37	8.61	8.54	
Increase..	—0.27	+0.24			
PERCENTAGE WARE : (±2.96. Means : ±1.71. Increases : ±2.42).					
None ..	65.6	66.4	69.4	67.1	
1½ ..	69.7	68.3	72.3	70.1	+3.0
3 ..	69.0	71.3	71.7	70.7	+0.6
Mean ..	68.1	68.7	71.1	69.3	
Increase..	+0.6	+2.4			

Conclusions

No significant effects.

Potatoes. Midland Agricultural College, Loughborough, 1935.

4 × 4 Latin square. Plots : 1/48.8 acre.

TREATMENTS : 4 levels of a mixed fertiliser containing 1 part of sulphate of ammonia, 3 parts of superphosphate and 1 part of sulphate of potash.

BASAL MANURING : Farmyard manure.

SOIL : Light loam.   Variety : King Edward.   Manures applied : Apr. 12.   Potatoes planted : Apr. 23.   Lifted : Oct. 15.   Previous crop : Seeds hay.

STANDARD ERRORS PER PLOT : Total produce : 0.710 tons per acre or 9.00%.   Percentage ware 9.17.

Artificials	Yield tons per acre	Increase for each dressing	Percentage ware	Increase for each dressing
Mean ..	7.90		75.1	
None ..	7.83		76.6	
4 cwt. ..	8.02	+0.19	76.2	—0.4
8 cwt. ..	7.79	—0.23	73.1	—3.1
12 cwt. ..	7.94	+0.15	74.6	+1.5
St. Errors ..	±0.355	±0.502	±4.58	±6.48

Conclusions

No significant effects.

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Potatoes. Messrs. Cheeseman, Bros., Catchwater, Messingham, Lincs, 1935.
A. McVicar, Esq., County Organiser.

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

TREATMENTS : Increasing levels of a mixed fertiliser (6 parts sulphate of ammonia, 6 parts super-phosphate, 5 parts sulphate of potash, 1 part steamed bone flour) as shown.

BASAL MANURING : Farmyard manure.

SOIL : Sand. Variety : Majestic. Manures applied : April 8. Potatoes planted : April 9. Lifted : Oct. 25. Previous crop : permanent pasture.

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

STANDARD ERRORS PER PLOT : Total produce : 0.847 tons per acre or 10.5%. Percentage ware : 4.34.

Mixed Fertiliser cwt. per acre	Total produce tons per acre	*Increase*	Percentage ware	*Increase*
Mean	*8.08*		*76.3*	
0	5.26		72.5	
4	6.88	*+ 1.62*	76.6	*+ 4.1*
8	8.70	*+ 1.82*	77.6	*+ 1.0*
12	9.74	*+ 1.04*	78.7	*+ 1.1*
16	9.81	*+ 0.07*	76.3	*− 2.4*
St. Errors ..	±0.379	±0.536	±1.94	±2.74

Conclusions

There was a significant response in yield to the mixed fertiliser, with a significant drop in response at the higher levels. The effects on percentage ware were similar, but did not reach significance.

Potatoes. J. Wright, Esq., Grayingham, Lincs., 1935.
A. McVicar, Esq., County Organiser.

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

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

BASAL MANURING : Farmyard manure.

SOIL : Oolitic limestone. Variety : King Edward. Manures applied : April 6. Potatoes planted : April 8. Lifted : Oct. 22. Previous crop : Grazing seeds.

STANDARD ERROR PER PLOT : 0.885 tons per acre or 9.66%.

Mixed Fertiliser cwt. per acre	Total Produce Tons per acre	*Increase*
Mean	*9.16*	
0	8.47	
4	9.03	*+ 0.56*
8	9.33	*+ 0.30*
12	9.31	*− 0.02*
16	9.64	*+ 0.33*
St. Errors ..	±0.396	±0.560

Conclusions

The mixed fertiliser produced a significant increase in yield, the falling-off in response at the higher levels not being significant.

Potatoes. Messrs. Temperton Bros., Kelfield, Owston Ferry, Lincs., 1935.
A. McVicar, Esq., County Organiser.

4 × 4 Latin square. Plots : 1/80 acre.

TREATMENTS : Increasing levels of sulphate of potash as indicated in the table.

BASAL MANURING : Farmyard manure applied to wheat stubble, sulphate of ammonia at the rate of 4 cwt. per acre, superphosphate at the rate of 3 cwt. per acre.

SOIL : Warp. Variety : Majestic. Manures applied : April 1. Potatoes planted : April 2. Lifted : Oct. 30. Previous crop : Wheat.

STANDARD ERRORS PER PLOT : Total produce : 0.791 tons per acre or 7.43%. Percentage ware : 1.24.

Sulphate of potash Cwt. per acre	Total Produce Tons per acre	Increase	Percentage Ware	Increase
Mean	10.64		88.6	
0	9.14		86.7	
1	10.54	+1.40	89.6	+2.9
2	10.97	+0.43	88.4	—1.2
3	11.93	+0.96	89.6	+1.2
Standard Errors ..	±0.396	±0.560	±0.620	±0.877

Conclusions

There was a significant response in yield to sulphate of potash, the drop in response at the higher level of dressing not being significant. The first dressing produced a significant increase in percentage ware, but there was no further increase to the higher dressings.

Sugar Beet. A. E. Bird, Esq., Scotter, Gainsborough, 1935
Bardney and Brigg Sugar Factory
A. McVicar, Esq., County Organiser.

4 × 4 Latin square. Plots : 1/40 acre.

TREATMENTS : 4 widths of singling 6, 9, 12 and 15 inches.

BASAL MANURING : 10 cwt. per acre compound fertiliser.

SOIL : Light loam. Variety : Kleinwanzleben E. Seed sown : April 20. Lifted : October 25. Previous crop : Wheat.

STANDARD ERRORS PER PLOT : Roots (washed) : 0.541 tons per acre or 4.84%. Tops : 0.303 tons per acre or 4.65%. Mean dirt tare : 0.1010.

Singling Inches	ROOTS (washed) Tons	Increase	TOPS Tons	Increase	SUGAR PERCENTAGE	Increase	TOTAL SUGAR Cwt.	Increase	PLANT NUMBER Thousands	Increase
Mean ..	11.18		6.52		18.36		41.0		35.0	
6 ..	11.15		6.74		18.34		40.9		46.6	
9 ..	11.46	+0.31	6.50	—0.24	18.26	—0.08	41.8	+0.9	37.3	—9.3
12 ..	11.34	—0.12	6.64	+0.14	18.50	+0.24	42.0	+0.2	30.2	—7.1
15 ..	10.75	—0.59	6.20	—0.44	18.36	—0.14	39.5	—2.5	25.8	—4.4
St. Errors	±0.270	±0.382	±0.152	±0.215						

Conclusions

The effects on the yields of roots of varying the width of singling were not significant. The yield of tops, however, decreased significantly as the width of singling increased.

Sugar Beet. E. W. Bowser, Esq., Boston, 1935
Bardney and Brigg Sugar Factory
A. McVicar, Esq., County Organiser.

4×4 Latin square. Plots : 1/40 acre.

TREATMENTS : 4 widths of singling : 6, 9, 12 and 15 inches.

BASAL MANURING : Nil.

SOIL : Fen. Variety : Kuhn P. Seed sown : April 29. Lifted : October 31. Previous crop : Potatoes.

SPECIAL NOTE : Tops were weighed on 12 plots only.

STANDARD ERRORS PER PLOT : Roots (washed) : 0.713 tons per acre or 4.79% ; tops : 0.882 tons per acre or 3.70%. Mean dirt tare : 0.1897.

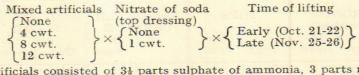| Inches	ROOTS (washed)		TOPS		SUGAR PERCENTAGE		TOTAL SUGAR		PLANT NUMBER	
	Tons	*Increase*	Tons	*Increase*		*Increase*	cwt.	*Increase*	Thous-ands	*Increase*
Mean	*14.88*		*23.81*		*13.73*		*40.8*		*31.0*	
6 ..	15.30		25.01		14.02		42.9		41.0	
9 ..	14.49	*—0.81*	23.91	*—1.10*	13.40	*—0.62*	38.8	*—4.1*	33.5	*—7.5*
12 ..	14.82	*+0.33*	23.15	*—0.76*	13.80	*+0.40*	40.9	*+2.1*	27.5	*—6.0*
15 ..	14.90	*+0.08*	23.18	*+0.03*	13.70	*—0.10*	40.8	*—0.1*	22.2	*—5.3*
St. Errors	*±0.356*	*±0.503*	*±0.180*	*±0.254*						

Conclusions

No significant effects on roots. The yield of tops decreased significantly from the 6 to the 9-inch singling and from the 9 to the 12-inch singling.

Sugar Beet. G. Wardell, Esq., Snitterby, 1935
Bardney and Brigg Sugar Factory
A. McVicar, Esq., County Organiser.

4 randomised blocks of 8 plots each. Certain interactions partially confounded with block differences. Plots : 1/40 acre.

TREATMENTS : All combinations of :

Mixed artificials	Nitrate of soda	Time of lifting
⎧ None ⎫ ⎨ 4 cwt. ⎬ ⎪ 8 cwt. ⎪ ⎩ 12 cwt. ⎭	(top dressing) × ⎰ None ⎱ ⎱ 1 cwt. ⎰	× ⎰ Early (Oct. 21-22) ⎱ ⎱ Late (Nov. 25-26) ⎰

The mixed artificials consisted of $3\frac{1}{2}$ parts sulphate of ammonia, 3 parts nitrate of soda, $6\frac{1}{2}$ parts granulated superphosphate (18% P_2O_5), 4 parts muriate of potash, and 1 part steamed bone flour.

BASAL MANURING : Nil.

SOIL : Limestone loam. Variety : Kleinwanzleben E. Manures applied : April 17. Seed sown : May 3. Previous crop : Wheat.

STANDARD ERRORS PER PLOT : Roots (washed) : 0.792 tons per acre or 6.77% ; tops : 0.781 tons per acre or 10.2% ; mean dirt tare : first lifting : 0.1971, second lifting : 0.2235.

Nitrate of Soda	ROOTS (washed) tons per acre				TOPS tons per acre				SUGAR PERCENTAGE			
	Early	Late	Mean	Incr.	Early	Late	Mean	Incr.	Early	Late	Mean	Incr.
None ..	10.85¹	11.60¹	11.22²		8.49¹	5.41¹	6.95²		18.00	17.04	17.52	
1 cwt.	11.80¹	12.55¹	12.18²	+0.96¹	10.27¹	6.40¹	8.34²	+1.39¹	17.75	16.67	17.21	−0.31
Mean ..	11.32²	12.08²	11.70		9.38²	5.90²	7.64		17.88	16.86	17.37	
Incr. ..	+0.76¹				−3.48¹				−1.02			
St. Errors	(¹) ±0.280	(²) ±0.198			(¹) ±0.276	(²) ±0.195						

	TOTAL SUGAR cwt. per acre				PLANT NUMBER thous. per acre				PERCENTAGE PURITY			
None ..	39.0	39.5	39.2		27.2	25.5	26.4		88.8	87.8	88.3	
1 cwt...	41.9	41.8	41.8	+2.6	27.5	25.5	26.5	+0.1	88.8	87.6	88.2	−0.1
Mean ..	40.4	40.6	40.5		27.4	25.5	26.4		88.8	87.7	88.2	
Incr. ..	+0.2				−1.9				−1.1			

	Mixed artificials : cwt. per acre				Mixed artificials : cwt. per acre			
	0	4	8	12	0	4	8	12
	ROOTS (washed) : tons per acre (±0.396)				TOPS : tons per acre (±0.390)			
No N/S ..	10.23	10.91	11.88	11.87	5.54	6.28	7.10	8.87
N/S	10.86	12.16	12.66	13.03	6.77	7.95	8.95	9.66
Early	10.65	10.72	11.80	12.12	7.69	8.47	10.00	11.36
Late	10.44	12.34	12.75	12.77	4.62	5.76	6.04	7.18
Mean ..	10.54¹	11.53¹	12.27¹	12.45¹	6.16¹	7.12¹	8.02¹	9.27¹
Increase ..	+0.99²	+0.74²	+0.18²		+0.96²	+0.90²	+1.25²	
St. Errors ..	(¹) ±0.280	(²) ±0.396			(¹) ±0.276	(²) ±0.390		
	SUGAR PERCENTAGE				TOTAL SUGAR : cwt. per acre			
No N/S ..	17.80	17.56	17.36	17.36	36.4	38.2	41.2	41.2
N/S	17.15	17.43	17.46	16.79	37.2	42.2	44.2	43.6
Early	17.84	18.02	18.03	17.60	37.9	38.6	42.5	42.7
Late	17.11	16.97	16.80	16.54	35.7	41.8	42.8	42.1
Mean ..	17.48	17.50	17.41	17.07	36.8	40.2	42.7	42.4
Increase ..	+0.02	−0.09	−0.34		+3.4	+2.5	−0.3	
	PLANT NUMBER : thous. per acre				PERCENTAGE PURITY			
No N/S ..	25.8	26.6	27.2	26.0	88.5	88.4	88.4	87.8
N/S	25.8	25.9	26.4	27.9	88.4	88.4	88.1	87.9
Early	27.4	26.8	27.4	28.0	89.0	89.0	88.8	88.4
Late	24.3	25.8	26.2	25.8	88.0	87.8	87.7	87.3
Mean ..	25.8	26.3	26.8	26.9	88.5	88.4	88.2	87.8
Increase ..	+0.5	+0.5	+0.1		−0.1	−0.2	−0.4	

Conclusions

Mixed artificials significantly increased the yields of roots and tops, the response falling off at the higher levels of dressing with roots, but not with tops. Nitrate of soda significantly increased the yields of roots and tops. Late lifting significantly increased the yield of roots and decreased the yield of tops. Late lifting also decreased the sugar percentage, and there was little difference between the yields of total sugar for the two times of lifting.

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Sugar Beet. R. J. Godfrey, Esq., Melton Ross, Barnetby, 1935
Bardney and Brigg Beet Sugar Factory.

4 × 4 Latin square.   Plots : 1/160 acre.

TREATMENTS : (A) No treatment, (B) woody bolters pulled, (C) woody bolters pulled, others cut in July, (D) all bolters cut in July. Some of the beet which were cut in July did not again bolt.

BASAL MANURING : 12 cwt. mixture of artificials.

SOIL : Wold.   Variety: Kleinwanzleben E.   Seed sown : 1st week of April. Lifted : October 21. Previous crop : Wheat.

STANDARD ERROR PER PLOT : Total sugar : 2.08 cwt. per acre or 4.79%.

	Normal Beet	Woody Beet	Non-woody Beet	Cut and not bolted	Standard Error
Average weight per beet, lb. ..	1.28	0.79	1.30	1.18[1]	±0.034
Sugar per cent. ..	17.71	17.02	17.11	17.23[2]	±0.074

Standard Error ([1]) ±0.151, ([2]) ±0.325.

PLANT NUMBER : thousands per acre

Treatments	Normal Beet	Woody Beet	Non-woody Beet	Cut and not Bolted
A	18.6	4.5	2.7	—
B	14.7	2.8	2.3	—
C	17.2	2.4	1.8	0.8
D	17.9	3.6	2.0	0.9

TOTAL SUGAR : cwt. per acre

A	B	C	D	Mean	St. Error
42.2	41.6	45.0	44.7	*43.4*	±1.04

Conclusions

About a quarter of the beet bolted. Woody bolters weighed about one-third less than normal beet and the sugar percentage was also slightly lower, with a resultant loss of 40 per cent, in sugar on each woody bolter. There was little loss on non-woody bolters. Cutting in July produced a significant increase in total sugar of 3.0 cwt. per acre.

Sugar Beet. H. Windley, Esq., Tumby Wood Side, 1935
Bardney and Brigg Sugar Factory
A. McVicar, Esq., County Organiser.

4 × 4 Latin square. Plots 1/40 acre.

TREATMENTS : All combinations of sulphate of ammonia and nitro-chalk at the rate of 0.4 cwt. N per acre with superphosphate and basic slag at the rate of 0.55 cwt. P_2O_5 per acre.

BASAL MANURING : 3 cwt. 30% potash salt per acre.

SOIL : Sand on sandy subsoil. Variety : Strube. Manures applied : April 18. Seed sown : April 22. Lifted : Nov. 4. Previous crop : Oats.

STANDARD ERRORS PER PLOT : Roots (washed) : 0.260 tons per acre or 3.65% ; tops 0.432 tons per acre or 4.92%. Mean dirt tare : 0.1574.

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	Sulph. amm.	Nitro-chalk	*Mean*	Sulph. amm.	Nitro-chalk	*Mean*
	ROOTS (washed) : tons per acre (± 0.130. *Means* : ± 0.0919)			TOPS : tons per acre : (± 0.216. *Means* : ± 0.153)		
Superphosphate ..	7.08	7.17	*7.12*	8.43	9.16	*8.80*
Basic Slag	7.06	7.22	*7.14*	8.85	8.69	*8.77*
Mean	7.07	7.20	7.13	8.64	8.92	8.78
	SUGAR PERCENTAGE			TOTAL SUGAR cwt. per acre		
Superphosphate ..	15.42	15.40	*15.41*	21.8	22.1	*22.0*
Basic Slag	15.50	15.38	*15.44*	21.9	22.2	*22.0*
Mean	*15.46*	*15.39*	*15.42*	*21.8*	*22.2*	*22.0*

PLANT NUMBER : thousands per acre

	Sulph. amm.	Nitro-chalk	*Mean*
Superphosphate	28.2	27.1	*27.6*
Basic Slag ..	27.5	28.2	*27.9*
Mean ..	*27.8*	*27.7*	*27.8*

Conclusions
No significant effects.

Sugar Beet. D. B. Sowerby, Esq., Kirmington, Ulceby, 1935
Bardney and Brigg Sugar Factory
A. McVicar, Esq., County Organiser.

5×5 Latin square. Plots : 1/40 acre.

TREATMENTS : No manure (A), 1 cwt. superphosphate (B), 4 cwt. superphosphate, 1½ cwt. muriate of potash (C), 2 cwt. superphosphate (D), and 1 cwt. muriate of potash (E) per acre.

BASAL MANURING : 1 cwt. sulphate of ammonia and 1½ cwt. nitrate of soda.

SOIL : : Sandy loam on clay. Variety : Dippe. Manures applied : April 18. Seed sown : April 25. Lifted : Nov. 6. Previous crop : Wheat.

STANDARD ERRORS PER PLOT : Roots (washed) : 0.491 tons per acre or 4.05% ; tops : 0.531 tons per acre or 5.58%. Mean dirt tare : 0.1082.

	ROOTS (washed) Tons	*Increase*	TOPS Tons	*Increase*	SUGAR PERCENTAGE	*Increase*	TOTAL SUGAR Cwt.	*Increase*	PLANT NUMBER Thous.	*Increase*
Mean	*12.12*		*9.52*		*17.37*		*42.1*		*28.3*	
A	11.57		9.19		17.21		39.8		27.2	
B	12.16	*+0.59*	9.32	*+0.13*	17.47	*+0.26*	42.5	*+2.7*	28.5	*+1.3*
C	12.08	*+0.51*	9.84	*+0.65*	17.37	*+0.16*	42.0	*+2.2*	28.4	*+1.2*
D	12.68	*+1.11*	9.76	*+0.57*	17.41	*+0.20*	44.2	*+4.4*	29.1	*+1.9*
E	12.11	*+0.54*	9.48	*+0.29*	17.38	*+0.17*	42.1	*+2.3*	28.4	*+1.2*
St. Errors	*±0.220*	*±0.311*	*±0.237*	*±0.335*						

Conclusions
Significant response in roots to superphosphate.

Sugar Beet. The Lincolnshire Sugar Co., Ltd., Bardney and Brigg, 1935
F. Wakerley, Esq., County Organiser.

5×5 Latin square. Plots : 1/40 acre.

TREATMENTS : No manure, 1 cwt. of nitrate of soda, and 1 cwt. of nitrate of potash applied at time of seeding and singling.

BASAL MANURING : Nil (after autumn-planted cabbages, receiving 1 ton of soot and 6 cwt. sulphate of ammonia per acre).

SOIL : Loam. Variety : Johnson's. Manures applied : May 20, July 5. Seed sown : June 3. Lifted : November 15-16. Previous crop : Cabbages.

STANDARD ERRORS PER PLOT : Roots (washed) : 0.479 tons per acre or 4.69% ; tops : 0.406 tons per acre or 3.86% ; mean dirt tare : 0.1782.

	ROOTS (washed) Tons per acre	TOPS Tons per acre	SUGAR PER-CENTAGE	TOTAL SUGAR Cwt. per acre	PLANT NUMBER Thous. per acre
Mean	10.21	10.54	11.86	24.2	28.3
No manure	10.42	10.79	11.96	24.9	28.5
1 cwt. of nitrate of soda at seeding	10.01	10.47	12.00	24.0	28.3
1 cwt. of nitrate of pot. at seeding	10.02	10.40	11.68	23.4	28.1
1 cwt. of nitrate of soda at singling	10.20	10.39	12.16	24.8	28.2
1 cwt. of nitrate of pot. at singling	10.40	10.65	11.48	23.9	28.4
Standard Errors	±0.214	±0.182			

Conclusions
No significant effects in roots or tops.

Sugar Beet. J. G. Johnson, Esq., Mattersey, Doncaster, 1935
Bardney and Brigg, Sugar Factory.

4×4 Latin square. Plots : 1/40 acre.

TREATMENTS : No manure, 5 cwt. salt and 3 cwt. muriate of potash per acre alone and in combination.

BASAL MANURING : 3 cwt. sulphate of ammonia, 5 cwt. superphosphate per acre.

SOIL : Sandy on sand. Variety : Kleinwanzleben E. Manures applied : March 29. Seed sown : April 24. Lifted : November 8. Previous crop : Rye.

STANDARD ERRORS PER PLOT : Roots (washed) : 0.509 tons per acre or 8.78 % ; tops : 0.748 tons per acre or 8.61%. Mean dirt tare : 0.1512.

	ROOTS (washed)		TOPS		SUGAR PER-CENTAGE		TOTAL SUGAR		PLANT NUMBER	
	Tons	*Increase*	Tons	*Increase*		*Increase*	Cwt.	*Increase*	Thous-ands	*Increase*
Mean ..	*5.80*		*8.68*		*15.84*		*18.4*		*24.8*	
None ..	4.55		7.17		15.38		14.0		21.9	
Salt ..	6.29	+1.74	9.94	+2.77	16.02	+0.64	20.2	+6.2	25.4	+3.5
Mur. pot. ..	5.43	+0.88	8.07	+0.90	15.86	+0.48	17.2	+3.2	24.3	+2.4
Both ..	6.93	+2.38	9.54	+2.37	16.09	+0.71	22.3	+8.3	27.6	+5.7
St. Errors	±0.254	±0.359	±0.374	±0.529						

Conclusions

Salt and muriate of potash both gave significant increases in the yields of roots and tops, the increases due to salt being significantly greater than those due to muriate of potash. The treatments also increased the sugar percentage.

Sugar Beet. J. A. Stevenson, Esq., Billinghay, 1935
Bardney and Brigg Sugar Factory
F. Wakerley, Esq., County Organiser.

5×5 Latin square. Plots : 1/40 acre.

TREATMENTS : No manure (A), 3 cwt. nitrate of soda (B), 3 cwt. nitrate of potash (C), 3 cwt. nitrate of soda and 2 cwt. muriate of potash (D), and 3 cwt. nitrate of potash and 0.92 cwt. muriate of potash per acre (E).

BASAL MANURING : No dung. 4 cwt. superphosphate per acre.

SOIL : Good fen, on clay. Variety : Kleinwanzleben Z. Manures applied : April 12. Seed sown : April 26. Lifted : Oct. 17. Previous crop : Wheat.

STANDARD ERRORS PER PLOT : Roots (washed) : 0.487 tons per acre or 3.60% ; tops : 0.619 tons per acre or 5.51%. Mean dirt tare : 0.1679.

	ROOTS (washed)		TOPS		SUGAR PERCENTAGE		TOTAL SUGAR		PLANT NUMBER	
	Tons	*Increase*	Tons	*Increase*		*Increase*	Cwt.	*Increase*	Thou-sands	*Increase*
Mean	*13.51*		*11.22*		*17.54*		*47.4*		*23.2*	
A ..	12.89		8.98		18.05		46.5		23.4	
B ..	13.83	+0.94	11.92	+2.94	17.25	−0.80	47.7	+1.2	23.2	−0.2
C ..	12.91	+0.02	10.95	+1.97	17.59	−0.46	45.4	−1.1	22.5	−0.9
D ..	14.14	+1.25	12.40	+3.42	17.33	−0.72	49.0	+2.5	24.0	+0.6
E ..	13.76	+0.87	11.86	+2.88	17.50	−0.55	48.2	+1.7	22.9	−0.5
St. Errors	±0.218	±0.308	±0.277	±0.392						

Conclusions

Apart from nitrate of potash applied alone, the fertilisers gave significant increases in roots and tops and significant decreases in sugar percentage, there being no significant differences between the different fertilisers. Nitrate of potash applied alone behaved anomalously, giving no increase in roots, a smaller increase in tops and a smaller decrease in sugar percentage.

Sugar Beet. W. Arden, Esq., Newton-on-Trent, 1935
Bardney and Brigg Sugar Factory

A. McVicar, Esq, County Organiser.

5 × 5 Latin square. Plots : 1/40 acre.

TREATMENTS : No manure, 1.08 cwt. muriate of potash, 3 cwt. nitrate of soda, alone and in combination; and 3 cwt. nitrate of potash per acre.

BASAL MANURING : 3 cwt. superphosphate per acre.

SOIL : Sand. Variety : Dippe E. Manures applied : April 18. Seed sown : May 1. Lifted : December 5. Previous crop : Carrots.

STANDARD ERRORS PER PLOT : Roots (washed) : 0.708 tons per acre or 5.95% ; tops : 0.656 tons per acre or 12.4%. Mean dirt tare : 0.1372.

	ROOTS (washed)		TOPS		SUGAR PERCENTAGE		TOTAL SUGAR		PLANT NUMBER	
	Tons	*Increase*	Tons	*Increase*		*Increase*	Cwt.	*Increase*	Thous.	*Increase*
Mean	*11.89*		*5.29*		*17.27*		*41.0*		*26.6*	
None	10.70		4.00		17.42		37.3		26.6	
N/Soda	12.56	*+1.86*	6.10	*+2.10*	17.32	*−0.10*	43.5	*+6.2*	26.9	*+0.3*
Mur.pot.	10.58	*−0.12*	4.23	*+0.23*	17.46	*+0.04*	36.9	*−0.4*	25.6	*−1.0*
N/S and mur.pot.	12.72	*+2.02*	5.91	*+1.91*	16.96	*−0.46*	43.1	*+5.8*	27.0	*+0.4*
N/Pot.	12.91	*+2.21*	6.22	*+2.22*	17.18	*−0.24*	44.4	*+7.1*	26.9	*+0.3*
St. Errors	*±0.317*	*±0.448*	*±0.293*	*±0.414*						

Conclusions

Potash did not appear to have any effect. Nitrate of soda and nitrate of potash both gave significant increases in the yields of roots and tops, the increases not being significantly different.

Kale. Oxcroft, Derbyshire, 1935.
G. E. Limb, Esq., Derbyshire Education Committee.

4 randomised blocks of 6 plots each. Plots : 1/60 acre. (Outside rows discarded at harvest).

TREATMENTS : All combinations of

Sulphate of Ammonia $\left\{ \begin{array}{l} \text{None} \\ \text{2 cwt.} \\ \text{4 cwt.} \end{array} \right\}$ × Superphosphate $\left\{ \begin{array}{l} \text{None} \\ \text{4 cwt.} \end{array} \right\}$

BASAL MANURING : 1½ cwt. 20% potash salt per acre.

SOIL : Magnesian limestone, medium strong loam. Variety : Thousand head. Manures applied : June 3. Seed sown : June 4. Harvested : October 21-29. Previous crop : Oats, grown without manure.

STANDARD ERROR PER PLOT : 1.33 tons per acre or 11.0%.

Yields, Tons per Acre (± 0.665)

Superphosphate cwt.	Sulphate of ammonia, cwt.			*Mean* (± 0.384)	*Increase* (± 0.543)
	0	2	4		
0	8.22	12.66	15.88	*12.25*	
4	8.20	11.75	16.28	*12.08*	*−0.17*
Mean (± 0.470)	*8.21*	*12.20*	*16.08*	*12.16*	
Incr. (± 0.665)		*+3.99*	*+3.88*		

Conclusions

There was a significant response to sulphate of ammonia, with no sign of deviation from linearity of response. There was no apparent response to superphosphate.

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Kale. Midland Agricultural College, Loughborough, 1935

4 randomised blocks of 6 plots each. Plots : 1/48.8 acre.

TREATMENTS :

$$\left\{\begin{array}{l}\text{None}\\\text{3 cwt. nitro-chalk}\\\text{6 cwt. nitro-chalk}\end{array}\right\} \times \left\{\begin{array}{l}\text{Unthinned}\\\text{Thinned}\end{array}\right\}$$

BASAL MANURING : 16 tons farmyard manure, 10 cwt. basic slag (15% P_2O_5), 2 cwt. potash salt (30% K_2O).

SOIL : Light loam. Variety : Marrow stem. Manures applied : phosphate and potash in February; nitrochalk, May 2. Seed sown : April 17. Harvested : December 6-January 3. Previous crop : Wheat.

SPECIAL NOTE : Thinned plants 9 ins. to 10 ins. apart. Unthinned, chopped out to 6 ins. and left in groups of three or four plants.

STANDARD ERROR PER PLOT : 2.30 tons per acre or 6.55%.

Tons per acre (± 1.15)	Nitro-chalk (cwt.)			Mean (± 0.664)	Increase (± 0.939)
	None	3	6		
Unthinned ..	32.33	35.30	39.57	35.73	
Thinned ..	34.39	33.93	35.23	34.52	-1.21
Mean (± 0.813)	33.36	34.62	37.40	35.13	
Incr. (± 1.15)		$+1.26$	$+2.78$		

Conclusions

There was a significant response to nitro-chalk where the plants were not thinned. With thinning the response to nitro-chalk was small and not significant. The average effect of thinning was not itself significant.