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# Yields of the Field Experiments 1948

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## Long-term

### Rothamsted Research

Rothamsted Research (1949) *Long-term* ; Yields Of The Field Experiments 1948, pp 11 - 57

48/Ba/1.1

## TWO COURSE ROTATION EXPERIMENT

### Cumulative Effects of Agricultural Salt

Rothamsted 1948

(For full details see 1942 Report)

#### Treatments:

All combinations of:

- (1) Agricultural salt: None,  $2\frac{1}{2}$ , 5 and  $7\frac{1}{2}$  cwt per acre applied to sugar beet or at half these rates to barley.
- (2) Muriate of potash: None, the equivalent of half the single dressing of salt (approximately 1 cwt.  $K_2O$  per acre), the equivalent of the single dressings of salt (approximately 2 cwt.  $K_2O$  per acre), applied to sugar beet at sowing.
- (3) Time of application of salt: In seed bed at sowing, before ploughing in winter.
- (4) Salt applied to sugar beet only, salt repeated at half rate on barley.

Note: treatment (3) applies to both sugar beet and barley crops; the barley receives no potash treatment. For ease of analysis  $K_2O$  of the muriate of potash dressings is made equivalent to  $Cl$  of agricultural salt dressings.

Basal dressings, applied to all plots at sowing:

Barley: 0.3 cwt. N per acre as sulphate of ammonia  
Sugar beet: 0.8 cwt. N per acre as sulphate of ammonia  
0.6 cwt.  $P_2O_5$  per acre as superphosphate.

Cultivations, etc:

Sugar Beet. Series I. Long Hoos VII

Agricultural salt applied: Oct. 21. Ploughed: Nov. 10-21. Cultivated: Mar. 16. Rolled and springtime harrowed, ring rolled: Mar. 27. Sulphate of ammonia applied: Mar. 30. Superphosphate, agricultural salt and muriate of potash applied: Apr. 12. Harrowed: Apr. 14. Seed drilled: Apr. 15. Seed harrowed in: Apr. 16. Rolled: Apr. 22. Dusted with Flea beetle dust: May 14. Plots 6, 12, 18, 24, 30, 36, 42, 48 damaged by herbicide spray from adjacent barley; May 14. Bare patches resown: late May. Hoed: May 20-21, 25. Weeds hand pulled: June 9-11. Singled: June 10-11. Hoed: June 21 - July 22. Lifted: Nov. 23-30. Variety: Klein E. Previous crop: Barley.

48/Ba/1.2

Barley. Series II. Long Hoos V.  
Agricultural salt applied: Dec 2. Ploughed: Dec 10-12.  
Springtime harrowed: Mar 1. Harrowed, seed drilled,  
sulphate of ammonia applied: Mar 8. Applied agricultural  
salt, harrowed in, ring rolled: Mar 9. Sprayed with  
"Denocate" to clear charlock, (plots 66, 65, 64, 63, 62,  
61 damaged by an overdose of spray): May 14. Hand weeded:  
June 30. Harvested: Aug. 14. Variety: Plumage Archer.  
Previous crop: Sugar Beet.

Standard errors per plot:

Sugar beet, total sugar,	4.40 cwt. per acre or	10.9%
tops,	1.13 tons per acre or	7.8%
Barley, grain,	2.20 cwt. per acre or	7.1%

All standard errors estimated from 22 d.f.

48/Ba/1.3

Series I: Sugar Beet

Salt in 1948 (cwt. per acre)	Muriate of potash K <sub>2</sub> O cwt. per acre			Salt applied		Mean
	0.0	1.0	2.0	Winter	In seed bed	
Total Sugar: cwt. per acre						
		(±2.20)		(±1.68)		(±1.27)
0	33.4	34.2	35.7	41.6	39.6	34.4
2.5	43.7	37.9	40.2	41.6	39.6	40.6
5.0	41.8	44.6	42.0	42.2	43.5	42.8
7.5	41.9	44.6	46.1	43.4	45.1	44.2
Mean	40.2	40.3 (±1.10)	41.0	42.4	42.7 (±1.02)	40.5
Sugar percentage						
0	16.24	16.34	16.57			16.38
2.5	16.49	16.46	16.78	16.57	16.58	16.57
5.0	16.75	16.90	16.42	16.58	16.80	16.69
7.5	16.59	16.62	16.84	16.78	16.60	16.69
Mean	16.51	16.58	16.65	16.64	16.66	16.58
Roots (washed): tons per acre						
0	10.26	10.44	10.74			10.48
2.5	13.27	11.50	11.97	12.56	11.93	12.25
5.0	12.49	13.20	12.74	12.69	12.93	12.81
7.5	12.63	13.42	13.71	12.92	13.59	13.25
Mean	12.16	12.14	12.29	12.73	12.81	12.20
Tops: tons per acre						
		(±0.566)		(±0.433)		(±0.327)
0	14.21	14.80	13.90			14.30
2.5	14.57	14.27	14.68	13.05	15.97	14.51
5.0	13.28	13.75	15.36	14.86	13.40	14.13
7.5	14.90	17.08	13.56	13.79	16.57	15.18
Mean	14.24	14.98 (±0.283)	14.37	13.90	15.31 (±0.261)	14.53

48/Bn/1.4

Series I: Sugar Beet (contd.)

Salt in 1948 (cwt. per acre)	Muriate of potash K <sub>2</sub> O cwt. per acre			Salt applied		Mean
	0.0	1.0	2.0	Winter	In seed bed	
	Plant No.: thousands per acre					
0	22.3	22.2	21.4			22.0
2.5	22.0	21.9	22.3	21.9	22.3	22.1
5.0	21.9	22.6	21.6	21.7	22.3	22.0
7.5	22.1	22.4	21.5	22.2	21.8	22.0
Mean	22.1	22.3	21.7	21.9	22.1	22.0
	Noxious Nitrogen: m.g. per 100 grams.					
0	30.2	31.5	31.2			31.0
2.5	28.5	30.2	28.8	28.7	29.7	29.2
5.0	29.8	28.6	28.0	29.3	28.3	28.8
7.5	31.0	29.5	30.8	31.2	29.7	30.4
Mean	29.9	30.0	29.7	29.7	29.2	29.8

48/Ba/1.5

Series II: Barley

Salt in 1947 (cwt. per acre)	Muriate of potash K <sub>2</sub> O cwt. per acre applied in 1947			Salt applied In seed bed		Salt in 1948 None Half Rate		Mean
	0.0	1.0	2.0	Winter				
	Grain: cwt. per acre							
	(±1.10)			(±0.84)				(±0.63)
0	31.3	33.6	30.6					31.8
2.5	32.6	30.8	31.2	31.6	31.5	31.2	31.9	31.5
5.0	30.2	31.1	29.8	30.8	30.0	29.1	31.6	30.4
7.5	29.6	30.0	29.6	30.5	29.0	29.1	30.3	29.7
Mean	30.9	31.4	30.3	31.0	30.2	29.8	31.3	30.9
	(±0.55)			(±0.51)				
	Straw: cwt. per acre							
0	35.9	37.0	35.3					36.1
2.5	36.8	33.2	34.7	34.8	34.9	35.6	34.1	34.9
5.0	32.7	33.4	32.0	31.9	33.5	32.1	33.3	32.7
7.5	32.4	32.2	31.5	31.4	32.7	30.7	33.4	32.0
Mean	34.4	34.0	33.4	32.7	33.7	32.8	33.6	33.9

48/Ba/2.1

### THREE COURSE ROTATION EXPERIMENT

Long Hoos VI, 1948

Effect of ploughing in straw

Treatments as given in 1933 Report, pp. 118-9, except that no comparisons of winter green manuring crops are now made, and that commencing in 1942 a yearly dressing of  $2\frac{1}{2}$  cwt. per acre magnesium sulphate is applied to one of the replicate plots of each treatment, in each crop block.

Cultivations, etc.

Barley, Series I.

Applied Adco and straw with accompanying artificials, ploughed: Nov 10-21. Springtine harrowed: Mar 1. Artificials applied: Mar 3. Harrowed, seed drilled and harrowed in: Mar 4. Ring rolled: Mar 9. Weeded: June 8. Harvested: Aug 18. Variety: Plumage Archer. Previous crop: Potatoes.

Potatoes, Series II.

Applied Adco and straw with accompanying artificials, ploughed: Nov 10-21. Cultivated: Mar 16. Harrowed and rolled: Mar 22. Ridged: Mar 24. Artificials applied, potatoes planted and covered in: Mar 25. Ridges rolled down: Mar 27. Harrowed: Apr 30. Weeded: June 11. Grubbed: June 9, 16. Earthed up: June 17. Sprayed with "Perinox": Aug 9. Sprayed to kill haulm: Sept 13. Lifted: Sept 29. Variety: Majestic. Previous crop: Sugar Beet.

Sugar Beet, Series III.

Applied Adco and straw with accompanying artificials, ploughed: Nov 10-21. Cultivated: Mar 16. Harrowed and rolled: Mar 22. Artificials applied: Apr 13. Harrowed: Apr 14. Seed drilled: Apr 15. Harrowed in: Apr 16. Rolled: Apr 22. Dusted with Flea beetle dust: May 14. Plots 54, 60, 66 and 72 were damaged by herbicide spray from 2 Course Rotation Experiment, May 14, and bare patches (including the whole of plots 66 and 72) were redrilled May 20. Hoed: May 20. Late sown plants dusted with Flea beetle dust: June 9. Weeded: June 10-11. Singled: June 12. Hoed: June 21, July 20. Lifted: Nov 12, 15. Variety: Klein E. Previous crop: Barley.

48/Ba/2.2

Note: Considerable damage to sugar beet tops was caused by sheep on plots 49, 50, 51, 55, 56, 57, 61, 62, 67, 68.

Standard errors per plot:

Sugar beet, roots (washed),	±0.573 tons per acre or 5.9%
tops,	±1.348 tons per acre or 18.8%
total sugar,	±2.69 cwt. per acre or 7.7%
sugar percent:	±0.437
plant number,	±1.66 thousands per acre or 7.6%
Barley, grain,	±3.47 cwt. per acre or 10.4%
straw,	±4.75 cwt. per acre or 12.6%
Potatoes total tubers,	±0.661 tons per acre or 6.4%
percentage ware	±0.581

All standard errors are based on 8 d.f.



48/Ba/2.3

Summary of Results

	Treatments applied 1946/7					Treatments applied 1947/8				
	Arts	Adco	St 1	St 2	Mean	Arts	Adco	St 1	St 2	Mean
<u>Series I</u>										
Barley										
Grain cwt./acre	34.0	32.1 (±2.00)	33.3	33.3	33.1 (±1.00)	36.8	32.3 (±2.00)	31.0	35.2	33.9 (±1.00)
Straw cwt./acre	36.8	35.9 (±2.74)	36.8	36.5	36.5 (±1.37)	43.1	36.5 (±2.74)	36.9	40.0	39.1 (±1.37)
<u>Series II</u>										
Potatoes tons/acre	8.47	10.12 (±0.382)	9.78	10.41	9.70 (±0.191)	10.40	10.40 (±0.382)	12.35	11.12	11.07 (±0.191)
Percentage Ware	92.0	93.5 (±0.335)	93.6	93.6	93.2 (±0.168)	94.0	93.7 (±0.335)	95.3	94.4	94.4 (±0.168)
<u>Series III</u>										
Sugar Beet Roots (washed) tons/acre	9.30	9.12 (±0.331)	8.95	9.63	9.25 (±0.166)	10.79	9.04 (±0.331)	10.21	10.69	10.18 (±0.166)
Tops tons/acre	6.41	6.94 (±0.778)	7.09	7.43	6.79 (±0.389)	9.49	6.14 (±0.778)	7.28	7.40	7.58 (±0.389)
Sugar percentage	17.32	17.89 (±0.252)	17.13	17.59	17.48 (±0.126)	18.18	18.18 (±0.252)	18.12	17.88	18.09 (±0.126)
Total sugar cwt./acre	32.2	32.6 (±1.55)	30.6	33.9	32.3 (±0.78)	39.3	32.9 (±1.55)	37.0	38.3	36.9 (±0.78)
Plant number thous./acre	22.2	22.6 (±0.96)	20.0	22.6	21.9 (±0.48)	21.8	22.0 (±0.96)	22.3	22.2	22.1 (±0.48)

48/Ba/2.4

Responses to Magnesium Sulphate

	Treatments applied 1946/7					Treatments applied 1947/8				
	Arts	Adco	St.1	St.2	Mean	Arts	Adco	St.1	St.2	Mean
<u>Series I</u>										
Barley Grain cwt./acre	-4.3	-0.6 (±4.25)	2.8	-5.0	-1.8	0.2	-8.0 (±4.25)	-5.9	1.9	-3.0
Straw cwt./acre	-4.0	-4.2 (±5.82)	6.1	-3.4	-1.4	-0.2	-5.4 (±5.82)	-4.9	0.4	-2.5
<u>Series II</u>										
Potatoes tons/acre	-0.38	0.22 (±0.810)	0.07	-0.07	-0.04	1.12	0.44 (±0.810)	0.82	-1.14	0.31
Percentage Ware	-0.4	0.3 (±0.71)	-0.6	-0.6	-0.3	0.2	0.3 (±0.71)	0.6	0.0	0.3
<u>Series III</u>										
Sugar Beet Roots (washed) tons/acre	-0.34	-1.02 (±0.702)	-1.80	-0.50	-0.92	1.06	1.28 (±0.702)	-1.21	0.01	+0.28
Tops tons/acre	-1.77	-0.92 (±1.652)	0.56	2.06	-0.02	1.38	1.21 (±1.652)	-2.44	0.52	0.17
Total sugar cwt/acre	0.7	-2.7 (±3.30)	-5.6	-2.7	-2.6	7.3	4.8 (±3.30)	-5.0	1.1	2.0
Sugar percentage	1.02	0.56 (±0.535)	0.36	-0.46	0.37	1.54	0.07 (±0.535)	-0.30	0.48	0.45
Plant number thous./acre	0.6	-2.2 (±2.03)	-7.1	-3.8	-3.1	0.6	2.6 (±2.03)	-4.6	-1.2	-0.6

48/Ba/3.1

FOUR COURSE ROTATION EXPERIMENT

Hoosfield, 1948

Residual values of organic and phosphatic fertilizers.

The scheme of the experiment is as given in the 1932 Report, pp.127-8, with the following alterations:-

1. From 1935 onwards, clover ryegrass ley has been replaced by ryegrass alone, sown in autumn after ploughing barley stubble, with fertilizers applied as on wheat.
2. From 1935 onwards, lime was applied every year at the rate of 10 cwt. per acre to the potato break after the crop had been lifted.
3. Each plot of the potato break has been split from 1942 onwards, a random half of each plot receiving an additional 2 cwt. per acre sulphate of ammonia.
4. Majestic potato seed has been used since 1942 in place of Ally.

Manures applied 1947-8

RESULTS OF FIELD EXPERIMENTS - 1948

ERRATUM

48/Ba/3.1, Table of manures applied 1947-8 should read:-

Manures applied 1947-8

Treatment	Organic fertilizers (cwt. per acre)				Additional artificial fertilizers (cwt. per acre)		
	Organic matter	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	N as Sulph. of amm.	P <sub>2</sub> O <sub>5</sub> as Super	K <sub>2</sub> O as mur. of potash
Dung	50 (as FYM)	1.404	0.709	2.230	0.396	0.491	0.770
Adco	50 (as Adco)	0.980	0.510	0.419	0.820	0.690	2.581
Straw	77 (as Straw)	1.392	0.104	0.627	0.408	1.096	2.373
Super			None		0.36	1.2	0.6
Rock phosphate			None		0.36	1.2*	0.6

\* As mineral phosphate

48/Ba/3.2

Cultivations, etc.

Potatoes, Series I.

Ploughed: Sept. 8. Dung, Adco with accompanying artificials applied; straw with first dressing of artificials applied; ploughed in: Nov. 20, 21. Second dressing of artificials applied to straw plot: Jan. 22. Ploughed, harrowed, rolled: Mar. 16-23. Ridged: Mar. 30. Artificials, including third dressing to straw plot applied in the ridges; Apr. 2. Potatoes planted and covered in: Apr. 7. Ridges rolled: Apr. 10. Ridges harrowed: May 10. Grubbed: June 9-16. Weeded: June 11-13. Earthed up: June 26. Hoed: June 30. Weeded: July 29. Sprayed with "Perinox": Aug. 9. Sprayed to kill haulm: Sept. 13. Lifted: Sept. 27, 28. Variety: Majestic. Previous crop: Wheat.

Barley, Series II

Applied dung, Adco and supplementary artificials: Nov. 12. Straw with first dressing of artificials applied; ploughed: Nov. 12, 13. Ground chalk (22 cwt. per acre) applied: Nov. 13. Second dressing of artificials applied to straw plots: Jan. 22. Springtine harrowed: Mar. 1. Artificials applied, including third dressing to straw plots: Mar. 4. Harrowed, seed drilled and harrowed in: Mar. 5. Ring rolled: Mar. 10. Hand weeded to clear thistles: May 28. Hoed: June 4. Harvested: Aug. 19. Variety: Plumage Archer. Previous crop: Potatoes.  
Note: Ground chalk was used in place of ground lime.

Wheat, Series III

Applied dung and Adco with supplementary artificials, applied straw with first dressing of artificials, ploughed: Sept. 15-24. Flat rolled and harrowed: Sept. 25. Artificials applied excluding special dressing straw plots and sulphate of ammonia: Sept. 27. Harrowed: Oct. 2. Springtine harrowed, harrowed, seed (Squareheads Master 13/4) drilled and harrowed in: Oct. 3. Resown with Squareheads Master (13/4) as plant had failed, second dressing of artificials applied to straw

48/Ba/3.3

plot, harrowed in: Nov.29. Plant failed over winter, decided to resow, springtime harrowed, harrowed: Mar.8. Redrilled with Atle, applied sulphate of ammonia and third dressing of artificials to straw plots, harrowed in: Mar.9. Ring rolled: Mar.10. Weeded to clear thistles: May 28. Hoed: June 4. Harvested: Aug.28. Variety: Atle. Previous crop: Ryegrass.

#### Ryegrass, Series IV.

Dung, Adco with accompanying artificials applied: Sept.24. Straw with first dressing of artificials applied, ploughed: Sept.23-25. Harrowed and rolled: Sept.26. Autumn artificials applied not including sulphate of ammonia: Sept.27. Harrowed twice, ring rolled: Nov.10. Seed sown and harrowed in: Nov.13. Second dressing of artificials applied to straw plots: Nov.29. Applied sulphate of ammonia, third dressing of artificials applied to straw plot: Mar.17. Rolled: Mar.20. Hand weeded to clear thistles: June 12. Cut: June 15. Variety: Western Worths. Previous crop: Barley.

FOUR COURSE ROTATION  
Summary of Results 1948

Manure	Year of Cycle	Wheat		Barley		Ryegrass cwt per acre Dry matter	Total tubers tons per acre		Resp. to N	Percentage Ware		Resp. to N
		Grain	Straw	Grain	Straw		Additional N Without	Additional N With		Mean		
Manure as F.Y.M.	I	16.3	37.6	32.1	46.3	6.5	5.94	8.70	2.76	97.1	97.6	0.5
	II	9.7	29.5	27.1	28.1	5.7	7.89	10.09	2.20	97.2	97.7	0.5
	III	9.9	28.0	22.9	27.4	5.6	7.75	9.09	1.33	97.3	97.7	0.4
	IV	8.6	25.7	24.0	31.7	4.9	8.05	9.61	1.56	97.9	98.0	0.1
	V	10.4	29.2	21.4	29.0	4.4	7.62	9.42	1.80	97.2	98.4	1.2
Manure as A.D.C.	I	20.2	47.8	35.7	26.6	16.7	9.09	10.72	1.63	98.1	98.4	0.3
	II	10.7	32.5	24.4	30.4	3.7	6.37	9.69	3.32	97.9	98.8	0.9
	III	8.9	23.0	25.1	30.4	3.5	6.04	9.71	3.67	97.4	98.2	0.8
	IV	9.0	21.2	23.6	30.6	4.4	7.94	9.46	1.52	98.1	98.2	0.1
	V	9.7	24.6	22.6	31.9	2.8	5.85	9.28	3.43	97.0	98.3	1.3
Manure as Straw	I	21.6	47.8	36.5	47.1	19.2	10.19	12.30	2.11	97.6	98.1	0.5
	II	11.0	33.0	28.3	33.6	6.6	6.54	8.55	2.01	96.1	97.3	1.2
	III	13.1	32.0	23.9	25.0	6.5	6.79	10.56	3.77	97.2	98.2	1.0
	IV	10.6	29.0	26.4	32.0	4.8	7.39	9.67	2.28	97.2	98.4	1.2
	V	9.7	25.8	24.7	28.7	2.9	8.29	10.65	2.56	97.5	97.6	0.1
Super phos- phate	I	15.1	32.4	32.1	34.2	9.3	10.69	11.65	0.96	97.5	97.2	-0.3
	II	14.1	32.0	27.6	32.5	5.5	9.20	9.81	0.61	98.1	98.8	0.7
	III	12.7	30.4	30.2	33.0	9.4	7.69	11.38	3.49	98.5	98.8	0.3
	IV	11.6	23.8	27.5	32.1	6.1	7.59	8.59	0.80	97.7	98.0	0.3
	V	11.7	28.4	29.0	31.8	2.9	7.32	8.90	1.58	97.6	98.7	1.1
Rock phos- phate	I	16.6	33.5	26.8	33.8	4.6	9.25	9.95	0.70	97.3	98.1	0.8
	II	12.1	27.1	26.2	31.2	4.0	7.03	7.82	0.79	97.3	97.8	0.5
	III	11.9	27.8	28.4	31.9	4.0	6.13	7.80	1.67	96.6	98.0	1.4
	IV	13.5	26.2	27.5	35.2	2.4	6.31	5.82	-0.49	97.2	95.9	-1.3
	V	10.3	21.8	29.0	45.6	4.6	6.74	6.22	-0.52	97.7	97.5	-0.2

48/Ba/3.4

48/Ba/4.1

## SIX COURSE ROTATION EXPERIMENT

1947-8

Seasonal effects of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O

Rotation and treatments as given in 1932 Report, p. 131, with the exceptions that since 1934 the forage crop has been replaced by rye, harvested as a mature crop, and that the green manure crops are now omitted. Since 1934 lime has been applied at the rate of 10 cwt. per acre at two stages in the rotation: immediately after the removal of the potato crop and before sowing barley.

Cultivations, etc.:

Rothamsted, Long Hoos IV

Sugar beet. Series 3.

Ploughed: Sept 11, 12. Harrowed: Mar 22. Ploughed, harrowed and ring rolled: Apr 15, 16. Artificials applied, seed drilled and harrowed in: Apr 16. Ring rolled: Apr 22. Applied Agroxide ( $\frac{1}{2}$  cwt. per acre) against wireworm: Apr 29. Dusted with Flea beetle dust: May 8, 14, 15. Applied Agroxide ( $1\frac{1}{2}$  cwt. per acre): May 10. Hoed: June 8 - July 22. Singled: June 9. Lifted: Nov 10. Variety: Klein E. Previous crop: Rye.

Barley. Series 4.

Sugar beet tops remaining from 1947 crop ploughed in: Nov 7. Ground chalk applied (22 cwt. per acre); Nov 14. Springtime harrowed: Mar 1. Artificials applied: Mar 4. Harrowed, seed drilled and harrowed in: Mar 5. Ring rolled: Mar 9. Clover seed undersown: Apr 15. Harrowed and ring rolled: Apr 16. Harvested: Aug 18. Variety: Plumage Archer. Previous crop: Sugar beet.

Clover. Series 1.

Seed undersown in barley, harrowed in: Apr 12. Ring rolled: Apr 14. Phosphate and potash fertilizer applied: Dec 10. Rolled: Mar 10. Sulphate of ammonia applied: Mar 16. Self sown barley cut: Apr 26. Cut: July 6. Variety: Late flowering Montgomery Red. Previous crop: Barley.

Wheat. Series 5.

Ploughed: June 30. Twice harrowed: Oct 1. Autumn artificials applied, seed drilled and harrowed in: Oct 2. Seed resown (owing to plant failure) and harrowed in: Nov 12. Rolled: Mar 16. Sulphate of ammonia applied: Apr 15. Harvested: Aug 18. Variety: Yeoman. Previous crop: Clover.

48/Ba/4.2

Potatoes. Series 6.

Ploughed: Sept. 9, 10. Harrowed: Mar. 10. Ploughed and harrowed: Mar. 10, 11. Harrowed and rolled: Mar. 22. Ridged: Mar. 23. Artificials applied, potatoes planted and covered in: Mar. 24. Ridges rolled down: Mar. 27. Harrowed: Mar. 30. Hoed: June 4-10. Grubbed: June 7, 18. Earthed up: June 19. Sprayed with "Perinox": Aug. 9. Sprayed to kill haulm: Sept. 13. Lifted: Sept. 29. Variety: Majestic. Previous crop: Wheat.

Rye. Series 2.

Ploughed: Sept. 30 - Oct. 1. Harrowed twice, ring rolled, harrowed: Oct. 1. Autumn artificials applied, seed drilled and harrowed in: Oct. 3. Ground chalk (22 cwt. per acre) applied: Nov. 14. Ring rolled: Mar. 31. Sulphate of ammonia applied: Apr. 16. Cut: July 30. Previous crop: Potatoes.

Woburn, Stackyard Field, Series B.

Sugar beet. Series 4.

Ploughed: Sept. 16, Oct. 1, Feb. 25-28. Springtime harrowed: Mar. 17. Harrowed: Mar. 19. Rolled: Mar. 27. Seed drilled: Apr. 2. Artificials applied and harrowed in: Apr. 5. Rolled: Apr. 6. Hoed: May 19. Singled, and weeded to clear thistles, hoed: May 25 - June 1. Hoed: June 5 - July 21. Lifted: Oct. 4. Variety: Klein E. Previous crop: Rye.

Barley. Series 6.

Sugar beet tops from 1947 crop ploughed in: Oct. 29-30. Ground chalk applied (96.5%  $\text{CaCO}_3$ , at rate of  $1\frac{1}{2}$  tons per acre of  $\text{CaCO}_3$ ). Springtime harrowed: Mar. 1. Artificials applied, harrowed: Mar. 4. Seed drilled and harrowed in: Mar. 10. Rolled, Clover seed undersown: Mar. 12. Harrowed: Mar. 13. Harvested: Aug. 14. Variety: Plumage Archer. Previous crop: Sugar beet.

Clover. Series 3.

Clover seed (late flowering Montgomery Red) undersown in barley: Apr. 17, 1947. Failed owing to drought. Ploughed: Sept. 26, 27, Feb. 26-28. Harrowed, all artificials including sulphate of ammonia applied: Mar. 4. Rolled, seed sown by hand and harrowed in: May 12. Harrowed and rolled: Mar. 13. Cut: July 1. Variety: Early red Trifolium. Previous crop: Barley.



48/Ea/4.3

Wheat. Series 1.

Ploughed: July 9. Cultivated: Aug. 21, Sept. 1. Rolled three times, cultivated three times, harrowed: Oct. 9. Autumn artificials applied: Oct. 14. Seed drilled and harrowed in: Oct. 14-15. Sowing destroyed by birds. Harrowed, seed drilled and harrowed in: Nov. 14. Harrowed: Apr. 14. Sulphate of ammonia applied: Apr. 22. Rolled: Apr. 26. Harvested: Aug. 28. Variety: Squareheads Master (13/4). Previous crop: Clover.

Potatoes. Series 2.

Ploughed: Sept. 30, Oct. 6, Feb. 27-28. Springtine harrowed: Mar. 17. Harrowed: Mar. 19. Rolled: Mar. 27. Ridged: Apr. 6-7. Artificials applied, potatoes planted and covered in: Apr. 9. Ridges harrowed down: May 8. Grubbed: May 28. June 8. Hoed, earthed up: June 21. Sprayed with "Perinox": Early Aug. Sprayed to kill haulm: Sept. 22. Lifted: Sept. 30. Variety: Majestic. Previous crop: Wheat.

Rye. Series 5.

Ploughed: Oct. 6, 7. Harrowed: Oct. 9. Ground chalk spread (14 cwt. per acre): Oct. 13. Autumn artificials applied: Nov. 14. Seed drilled and harrowed in: Nov. 15. Harrowed: Apr. 14. Sulphate of ammonia applied: Apr. 22. Cut: July 30. Previous crop: Potatoes.

48/Ba/4.4

Mean yields per acre and increments in yield per cwt. of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O

	Rothamsted		Woburn		Rothamsted		Woburn		
	Response	S.E.	Response	S.E.	Response	S.E.	Response	S.E.	
<b>Sugar Beet: Roots (washed)</b> tons/acre					<b>Clover Hay: Dry Matter</b> cwt/acre				
Yield	11.51		8.52		36.3		32.6		
N	0.84	1.263	<u>9.11</u>	1.237	-1.2	5.15	-1.3	6.54	
P	-1.23	1.263	<u>-0.85</u>	1.237	-8.1	5.15	-1.9	6.54	
K	0.19	0.758	-1.35	0.742	6.3	3.09	1.1	3.92	
<b>Tops: tons/acre</b>					<b>Wheat grain: cwt/acre</b>				
Yield	10.72		6.92		26.6		20.8		
N	3.45	2.191	<u>13.31</u>	1.510	7.5	2.15	<u>23.1</u>	5.79	
P	-3.17	2.191	<u>-2.02</u>	1.510	-0.3	2.15	<u>-13.2</u>	5.79	
K	0.70	1.315	<u>-2.28</u>	0.906	3.3	1.29	<u>-11.8</u>	3.47	
<b>Sugar Percentage</b>					<b>Wheat straw: cwt/acre</b>				
Yield	17.87		17.57		47.8		40.2		
N	0.09	0.696	0.76	0.727	18.5		36.9		
P	-0.43	0.696	0.47	0.727	-1.5		-13.3		
K	-0.39	0.418	0.56	0.436	7.4		-19.9		
<b>Total Sugar: cwt/acre</b>					<b>Potatoes:</b> total tubers tons/acre				
Yield	41.2		30.0		9.52		8.94		
N	3.1	4.38	<u>32.9</u>	4.02	6.09	1.541	7.62	1.326	
P	-5.5	4.38	<u>-2.1</u>	4.02	-1.08	1.541	<u>0.55</u>	1.326	
K	-0.3	2.63	<u>-3.8</u>	2.41	<u>2.41</u>	0.924	-0.57	0.795	
<b>Plant Number: thous/acre</b>					<b>Potatoes: Percentage Ware</b>				
Yield	20.9				97.1		93.2		
N	-1.3	2.77			1.7	1.36	-0.7	2.30	
P	2.9	2.77			-2.5	1.36	-4.8	2.30	
K	0.8	1.66			1.8	0.82	<u>-3.5</u>	1.38	

Note: The underlined values are significant at 5% level.

48/Ba/4.5

	Rothamsted Response S.E.	Woburn Response S.E.	Rothamsted Response S.E.	Woburn Response S.E.
Barley Grain: cwt/acre			Rye Grain: cwt/acre	
Yield	<u>36.2</u>	<u>27.5</u>	<u>25.8</u>	<u>21.2</u>
N	<u>10.7</u> 3.71	<u>17.6</u> 5.33	<u>18.4</u> 3.50	<u>15.0</u> 4.39
P	<u>-2.3</u> 3.71	<u>3.5</u> 5.33	<u>2.6</u> 3.50	<u>-5.3</u> 4.39
K	<u>-1.2</u> 2.23	<u>1.7</u> 3.20	<u>2.3</u> 2.10	<u>7.8</u> 2.64
Barley Straw: cwt/acre			Rye Straw: cwt/acre	
Yield	<u>39.6</u>	<u>26.4</u>	<u>47.3</u>	<u>42.8</u>
N	<u>24.7</u>	<u>20.9</u>	<u>14.7</u>	<u>4.5</u>
P	<u>-1.6</u>	<u>-6.5</u>	<u>0.7</u>	<u>-3.8</u>
K	<u>-3.7</u>	<u>3.7</u>	<u>4.6</u>	<u>10.6</u>

Note: The underlined values are significant at 5% level.

48/Bb/1

## DEEP CULTIVATION ROTATION EXPERIMENT

Long Hoos I and III, 1948

### Objects:

- (1) To compare deep ploughing (about 12 inches) with shallow (about 6 inches)
- (2) To compare the effects of ploughing in the mineral fertilizers at different depths with applying them in the seedbed.
- (3) To compare the effects of ploughing in dung at different depths.

Rotation: Sugar beet, barley, clover-ryegrass ley, wheat, potatoes, spring oats. (Ley ploughed in (not deeper than 6 inches) soon after first cut. Sugar beet tops carted off).

### Treatments:

Whole plots. All combinations of:

1. Shallow ploughing (6 inches) v. deep ploughing (12 inches). (This is done before potatoes and sugar beet, and after ley before wheat, at the same time in autumn for all three).
2. Farmyard manure: None v. 20 tons per acre for potatoes and 10 tons per acre for sugar beet, applied before ploughing.
3. Superphosphate: None v. 0.8 cwt.  $P_2O_5$  per acre for potatoes and 0.6 cwt.  $P_2O_5$  per acre for sugar beet.
4. Muriate of potash: None v. 1.0 cwt.  $K_2O$  per acre for potatoes and 0.6 cwt.  $K_2O$  per acre for sugar beet.

Treatments 2, 3 and 4 are applied only to potatoes and sugar beet.

Half plots (potatoes and sugar beet):

Phosphate and potash (where given) ploughed in v. applied in the seedbed.

Basal manuring: Applied in the ridges for potatoes, as a top dressing for wheat, and in the seed bed for other crops.

Sulphate of ammonia, for potatoes 0.6 cwt. N per acre, for sugar beet 0.8 cwt. N per acre, for spring oats 0.2 cwt. N per acre, for wheat 0.5 cwt. N per acre, for barley 0.3 cwt. N per acre.

Basic slag, for barley 0.6 cwt.  $P_2O_5$  per acre.

Area of each whole plot: 0.03125 acre (before rejecting edge rows).

Cultivations, etc.:

Ley. Series 1-KS.

Seeds undersown in barley: Apr 12, 1947. Rolled: Mar 10, 1948. Cut: June 14, 15. Seeds mixture per acre: 18 lb. ryegrass (Aberystwyth S2.4), 8 lb. late flowering red clover (Cert. N.Z. Mother seed), 2 lb. Alsike clover. Previous crop: Barley.

48/Bb/1.2

Potatoes. Series 2 - KP.

Artificially applied: Sept 29. Dung applied (before deep ploughing), ploughed deep (about 12 inches): Sept 30. Dung applied (before shallow ploughing), ploughed shallow (about 6 inches): Oct 1,2. Cultivated: Mar 11, 20. Rolled and springtime harrowed: Mar 22. Harrowed twice, ring rolled: Mar 23. Ridged: Mar 31. Spring artificials applied, potatoes planted and covered in: Apr 7. Rolled down ridges: Apr 12. Ridges harrowed: May 10. Grubbed: June 9, 18. Earthed up: June 19, 21. Hand weeded: June 10-11, July 28. Sprayed with "Perinox": Aug 9. Sprayed to kill haulm: Sept 13. Lifted: Sept 30. Variety: Majestic (Scotch seed A). Previous crop: Wheat.

Spring oats. Series 3 - KO.

Ploughed: Oct 15-20. Springtime harrowed: Mar 1. Sulphate of ammonia applied; seed drilled and harrowed in: Mar 5. Ring rolled: Mar 9. Weeded: May 28 - June 7. Harvested: Aug 16. Variety: Star. Previous crop: Potatoes.

Sugar beet. Series 4 - KS.

Artificially applied (before ploughing): Sept 29. Dung applied (before deep ploughing), ploughed deep (about 12 inches): Sept 30. Dung applied (before shallow ploughing); ploughed shallow (about 6 inches): Oct 1,2. Cultivated: Mar 11, 20. Rolled and springtime harrowed: Mar 22. Harrowed twice, ring rolled: Mar 23. Spring artificials applied: Apr 13. Harrowed: Apr 14. Seed drilled: Apr 15. Harrowed in: Apr 16. Ring rolled: Apr 22. Dusted with Flea beetle dust: May 8, 14, 15. Thistles hand weeded: June 5. Hoed: June 7 - July 21. Singled: June 8. Hand weeded for thistles: July 28. Lifted: Dec 2-4. Variety: Klein E. Previous crop: Oats.

Barley. Series 5 - KB.

Ploughed: Nov 22-25. Springtime harrowed: Mar 1. Artificially applied, seed drilled and harrowed in: Mar 5. Ring rolled: Mar 9. Seeds mixture undersown: Apr 15. Harrowed and ring rolled: Apr 16. Weeded: May 28 - June 7. Harvested: Aug 16. Variety: Plumage Archer. Previous crop: Sugar beet.

Wheat. Series 6 - KW.

Ploughed: June 17-18, 1947. Ring rolled: June 19. Ploughed deep (about 12 inches): Sept 1. Ploughed shallow (about 6 inches) Sept 2. Cultivated (deep ploughed plots twice, shallow ploughed plots once), ring rolled deep ploughed plots, all plots cultivated: Oct 2. Rolled twice and springtime harrowed: Nov 1. Rolled and springtime harrowed twice: Nov 3. Seed drilled and harrowed in: Nov 4. Rolled: Mar 16. Sulphate of ammonia applied: May 5. Weeded: May 28-June 7. Harvested: Aug 16. Variety: Yeoman. Previous crop: Seeds

Standard errors per plot:

Ley. 1.58 cwt. per acre or 2.4% (4 d.f.)

Potatoes. Ware yield, whole plot, 2.058 tons per acre or 13.9% (4 d.f.)  
sub-plot, 2.506 tons per acre or 16.9% (7 d.f.)

Spring oats. Grain, 4.46 cwt. per acre or 14.5% (4 d.f.)

48/Bb/1.3

Sugar beet. Total sugar, whole plot, 3.19 cwt. per acre or 6.0% (4 d.f.)  
sub-plot, 5.87 cwt. per acre or 11.1% (7 d.f.)  
Tops, whole plot, 0.651 tons per acre or 3.5% (4 d.f.)  
sub-plot, 1.849 tons per acre or 9.9% (7 d.f.)  
Barley. Grain, 0.846 cwt. per acre or 2.1% (4 d.f.)  
Wheat. Grain, 2.69 cwt. per acre or 7.1% (4 d.f.)

48/Bb/1.4

Series I, Ley  
Residual Effects

	Mean	Ploughing		Dung		Super		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Hay: Mean yield 66.5 cwt. per acre ( $\pm 1.12$ , Means $\pm 0.79$ )									
Ploughing deep									
-shallow	-1.1	-	-	-1.6	-0.6	-1.7	-0.5	-1.1	-1.1
Dung	3.3	2.8	3.8	-	-	0.9	5.7	2.2	4.4
Superphosphate	1.0	0.4	1.6	-1.4	3.4	-	-	4.2	-2.2
Potash	5.8	5.8	5.8	4.7	6.9	9.0	2.6	-	-

Series 2, Potatoes

	Mean	Ploughing		Dung		Super		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Ware tubers: Mean yield 14.85 tons per acre ( $\pm 1.46$ , Means $\pm 1.03$ )									
Ploughing deep									
-shallow	0.23	-	-	0.63	-0.17	0.98	-0.52	-1.62	2.08
Dung	4.64	5.04	4.24	-	-	4.23	5.05	6.29	2.99
Superphosphate	1.57	2.32	0.82	1.16	1.98	-	-	0.56	2.58
Potash	2.37	0.52	4.22	4.02	0.72	1.36	3.38	-	-

Percentage ware: Mean 98.7

Ploughing deep									
-shallow	0.3	-	-	0.2	0.4	0.4	0.2	0.2	0.4
Dung	0.4	0.3	0.5	-	-	0.3	0.5	0.6	0.2
Superphosphate	0.0	0.1	-0.1	-0.1	0.1	-	-	0.1	-0.1
Potash	0.5	0.4	0.6	0.7	0.3	0.6	0.4	-	-

48/Bb/1.5

Series 2, Potatoes

	Superphosphate			Potash			Mean
	None	Ploughed in	In ridges	None	Ploughed in	In ridges	
Ware tubers: tons per acre							
	(a)	(b) and (c)		(a)	(b) and (c)		
Shallow	13.57	14.77	17.02	14.47	14.58	15.41	14.74
Deep	14.55	14.51	16.24	12.85	15.82	18.34	14.97
No Dung	11.95	11.40	14.82	10.52	13.39	15.70	12.53
Dung	16.18	17.88	18.44	16.81	17.02	18.05	17.17
Mean	14.06	14.64	16.63	13.66	15.20	16.87	14.84
Percentage ware							
Shallow	98.5	98.4	98.8	98.3	98.6	99.0	98.5
Deep	98.8	98.6	98.8	98.5	99.0	99.2	98.8
No Dung	98.5	98.2	98.7	98.1	98.6	99.0	98.5
Dung	98.8	98.8	98.9	98.7	99.0	99.1	98.9
Mean	98.7	98.5	98.8	98.4	98.8	99.1	98.7

Standard errors (a)  $\pm 1.03$  (b)  $\pm 1.25$  (c)  $\pm 1.36$

Standard error (b) is for use in horizontal comparisons only; standard errors (a) and (c) for use in all other comparisons.

Series 3, Spring Oats

Residual Effects

	Mean	Responses to treatments							
		Ploughing		Dung		Super		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.

Grain: Mean yield 30.8 cwt. per acre ( $\pm 3.16$ , Means  $\pm 2.23$ )

Ploughing deep - shallow	0.9	-	-	2.4	-0.6	-1.8	3.6	-0.1	1.9
Dung	-0.2	1.3	-1.7	-	-	-0.2	-0.2	-2.1	1.7
Superphosphate	-1.0	-3.7	1.7	-1.0	-1.0	-	-	0.8	-2.8
Potash	-1.3	-2.3	-0.3	-3.2	0.6	-0.5	-3.1	-	-

Straw: Mean yield 49.8 cwt. per acre

Ploughing deep - shallow	2.5	-	-	4.1	0.9	0.4	4.6	1.8	3.2
Dung	1.8	3.4	0.2	-	-	3.0	0.6	1.0	2.6
Superphosphate	-3.0	-5.1	-0.9	-1.8	-4.2	-	-	-1.4	-4.6
Potash	-1.9	-2.6	-1.2	-2.7	-1.1	-0.3	-3.5	-	-



48/Bb/1.6

Series 4: Sugar Beet

	Mean	Responses to treatments							
		Ploughing		Dung		Super		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Total Sugar: Mean yield 52.9 cwt. per acre ( $\pm 2.25$ , Means $\pm 1.59$ )									
Ploughing deep									
-shallow	-4.5	-	-	-0.8	-8.2	-4.9	-4.1	-1.3	-7.7
Dung	2.6	6.3	-1.1	-	-	3.7	1.5	5.5	-0.3
Superphosphate	-0.4	-0.8	0.0	0.7	-1.5	-	-	-0.3	-0.5
Potash	0.6	3.8	-2.6	3.5	-2.3	0.7	0.5	-	-

Roots (washed): Mean yield 15.75 tons per acre									
	Mean	Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Ploughing deep									
-shallow	-1.13	-	-	-0.15	-2.11	-1.22	-1.04	-0.35	-1.91
Dung	0.91	1.89	-0.07	-	-	1.09	0.73	1.48	0.34
Superphosphate	-0.06	-0.15	0.03	0.12	-0.24	-	-	-0.24	0.12
Potash	0.25	1.03	-0.53	0.82	-0.32	0.07	0.43	-	-

Sugar Percentage: Mean 16.79

	Mean	Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Ploughing deep									
-shallow	-0.19	-	-	-0.06	-0.32	-0.22	-0.16	0.01	-0.39
Dung	-0.15	-0.02	-0.28	-	-	0.00	-0.30	0.14	-0.44
Superphosphate	-0.02	-0.05	0.01	0.13	-0.17	-	-	0.19	-0.23
Potash	-0.08	0.12	-0.28	0.21	-0.37	0.13	-0.29	-	-

Tops: Mean yield 18.62 tons per acre ( $\pm 0.461$ , Means  $\pm 0.326$ )

	Mean	Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Ploughing deep									
-shallow	2.60	-	-	2.54	2.66	1.52	3.68	2.13	3.07
Dung	1.65	1.59	1.71	-	-	0.94	2.36	0.64	2.66
Superphosphate	-0.01	-1.09	1.07	-0.72	0.70	-	-	-0.96	0.94
Potash	1.44	0.97	1.91	0.43	2.45	0.49	2.39	-	-

Plant Number: Mean 18.3 thousands per acre

	Mean	Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Ploughing deep									
-shallow	-0.7	-	-	-0.4	-1.0	-0.5	-0.9	-0.3	-1.1
Dung	0.4	-0.7	0.1	-	-	0.6	0.2	0.4	0.4
Superphosphate	-0.3	-0.1	-0.5	-0.1	-0.5	-	-	-0.1	-0.5
Potash	-0.1	0.3	-0.5	-0.1	-0.1	0.1	-0.3	-	-

Noxious Nitrogen: Mean 43.9

	Mean	Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Ploughing deep									
-shallow	4.9	-	-	5.8	4.0	4.1	5.7	4.9	4.9
Dung	1.8	2.7	0.9	-	-	2.4	1.2	-0.1	3.7
Superphosphate	-0.9	-1.7	-0.1	-0.3	-1.5	-	-	0.6	-2.4
Potash	2.4	2.4	2.4	0.5	4.3	3.9	0.9	-	-

48/Bb/1.7

Series 4. Sugar Beet

	Superphosphate			Potash			Mean
	None	Ploughed in	In seed bed	None	Ploughed in	In seed bed	
Total Sugar: cwt per acre							
	(a)	(b) and (c)		(a)	(b) and (c)		
Shallow	55.5	57.0	52.5	53.2	60.1	54.0	55.1
Deep	50.6	53.0	48.4	52.0	54.3	44.3	50.7
No dung	51.2	53.4	50.6	49.9	57.8	48.9	51.6
Dung	54.9	56.6	50.3	55.3	56.6	49.4	54.2
Mean	53.1	55.0	50.5	52.6	57.2	49.2	52.9

Roots (washed): tons per acre							
Shallow	16.40	16.83	15.66	15.80	17.75	15.93	16.32
Deep	15.17	16.02	14.39	15.45	16.55	13.30	15.19
No dung	15.23	15.69	15.04	14.89	17.01	14.41	15.30
Dung	16.33	17.17	15.01	16.37	17.29	14.82	16.21
Mean	15.78	16.43	15.02	15.63	17.15	14.61	15.75

Sugar Percentage							
Shallow	16.91	16.93	16.78	16.83	16.94	16.95	16.88
Deep	16.69	16.59	16.82	16.84	16.44	16.68	16.70
No dung	16.80	17.04	16.84	16.76	16.98	16.96	16.87
Dung	16.80	16.49	16.78	16.90	16.49	16.67	16.72
Mean	16.80	16.76	16.80	16.83	16.69	16.81	16.79

Standard errors (b) are for use in horizontal comparisons only, (a) and (c) for use in all other comparisons

Standard errors	(a)	(b)	(c)
Total sugar	±1.59	±2.93	±2.62

48/Bb/1.8

Series 4. Sugar Beet

	Superphosphate			Potash			Mean
	None	Ploughed in	In seed bed	None	Ploughed in	In seed bed	
Tops: tons per acre							
	(a)	(b)	(c)	(a)	(b)	(c)	
Shallow	17.86	17.14	16.40	16.83	18.21	17.40	17.32
Deep	19.39	21.51	19.39	18.97	21.84	19.91	19.92
No dung	18.15	17.65	17.21	17.58	18.62	17.39	17.79
Dung	19.10	21.00	18.58	16.22	21.43	19.92	19.44
Mean	18.62	19.33	17.90	17.90	20.02	18.65	18.62

Plant Number: thous. per acre							
Shallow	18.7	18.3	18.9	18.5	18.9	18.7	18.7
Deep	18.2	17.4	18.0	16.2	17.7	17.7	17.9
No dung	18.1	18.0	18.1	18.1	18.1	18.0	18.1
Dung	18.7	17.7	18.8	18.5	18.5	18.4	18.5
Mean	18.4	17.9	18.4	18.3	18.3	18.2	18.3

Noxious Nitrogen							
Shallow	42.2	40.2	41.0	40.2	44.0	41.2	41.4
Deep	46.4	46.2	46.2	45.1	48.0	47.0	46.3
No dung	43.1	41.8	44.0	42.8	43.5	43.0	43.0
Dung	45.5	44.6	43.2	42.6	48.5	45.2	44.8
Mean	44.3	43.2	43.6	42.7	46.0	44.1	43.9

Standard errors (b) are for use in horizontal comparisons only, (a) and (c) for use in all other comparisons.

Standard errors:	(a)	(b)	(c)
Tops	±0.326	±0.925	±0.730

48/Bb/1.9

Series 5. Barley

Residual effects

Responses to treatments.

	Mean	Ploughing		Dung		Super		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Grain: Mean yield 40.9 cwt. per acre ( $\pm 0.60$ , Means $\pm 0.42$ )									
Ploughing deep									
-shallow	0.2	-	-	1.4	-1.0	0.0	0.4	0.4	0.0
Dung	1.6	2.8	0.4	-	-	3.1	0.1	2.4	0.8
Superphosphate	1.3	1.1	1.5	2.8	-0.2	-	-	2.4	0.2
Potash	-1.0	-0.6	-1.2	-0.2	-1.8	0.1	-2.1	-	-

Straw: Mean yield 44.8 cwt. per acre

Ploughing deep									
-shallow	0.1	-	-	0.0	0.2	1.0	-0.8	-0.5	0.7
Dung	2.3	2.2	2.4	-	-	3.6	1.0	4.9	-0.3
Superphosphate	0.2	1.1	-0.7	1.5	-1.1	-	-	-1.0	1.4
Potash	0.2	-0.4	0.8	2.3	-2.4	-1.0	1.4	-	-

Series 6. Wheat

Residual effects

Responses to treatments

	Mean	Ploughing		Dung		Super		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Grain: Mean yield 40.7 cwt. per acre ( $\pm 2.04$ , Means $\pm 1.45$ )									
Ploughing deep									
-shallow	-3.5	-	-	-4.5	-2.5	-2.5	-4.5	-2.3	-4.7
Dung	2.2	1.2	3.2	-	-	2.3	2.1	4.5	-0.1
Superphosphate	0.7	1.7	-0.3	0.8	0.6	-	-	1.0	0.4
Potash	0.9	2.1	-0.3	3.2	-1.4	1.2	0.6	-	-

Straw: Mean yield 60.6 cwt. per acre

Ploughing deep									
-shallow	-3.4	-	-	-3.2	-3.6	-1.2	-5.6	-1.6	-5.2
Dung	2.7	2.9	2.5	-	-	3.3	2.1	5.3	-0.9
Superphosphate	0.2	2.4	-2.0	0.8	-0.4	-	-	-0.6	1.0
Potash	0.2	2.0	-1.6	3.8	-3.4	-0.6	1.0	-	-

48/Bc/1.1

### GREEN MANURING EXPERIMENT

LB and LU - Woburn Stackyard, Series A, 1948

Treatments as given in 1936 Report, p. 203, with the exceptions that from 1946 onwards lupins replace tares, and rape replaces mustard as green manuring crops, while kale is replaced by winter cabbages as a testing crop. From 1944 onwards a top dressing of sulphate of ammonia has been applied to half the plots under barley, and in 1946 this top dressing was applied to the green manuring crops. The experiment is now in half replicate, according to the identity  $I \equiv (R + C - M - F - T)DSNA$ , A representing the top dressing of sulphate of ammonia.

#### Cultivations, etc.:

##### Upper Half. Cabbages

Red Clover and Italian Ryegrass undersown in barley: Apr 25, 1947. Failed owing to drought. Whole area ploughed : Nov 24 - Dec 8. Springtine harrowed: Feb 18-19, Mar 9. Harrowed: Mar 17. Rolloed: Mar 22. Rape sown, ryegrass and clover resown, sulphate of ammonia applied, harrowed in: Mar 24. Lupins drilled: Apr 2, 6. Rape plots dusted with Flea beetle dust: Apr 27. Lupin plots hoed: May 11. All plots hoed: May 20-24. Lupin plots hoed: June 8. Fallow plots cultivated: June 25. Dung and straw applied on appropriate plots, green manure rolled: June 28. Whole area ploughed: June 30. Harrowed: July 1. Basal manures and sulphate of ammonia applied, harrowed: July 2. Rolloed: July 3. Cabbages transplanted: July 5-8. Gaps filled in: July 14-15, July 31 - Aug 7. Hoed: Aug 16-20, Sept. 6-7, Oct 8. Harvested: Jan 24, Feb 11, 23, Mar:3. Variety: January King. Previous Crop: Barley.

##### Lower Half. Barley

Ploughed: Mar 3-9. Harrowed: Mar 9. Lime at 3 cwt. CaO per acre applied: Mar 10. Harrowed: Mar 11. Sulphate of ammonia applied to appropriate plots, seed drilled: Mar 12. Harrowed in: Mar 17. Rolloed: Mar 22. Dorset Mail Clover and Italian Ryegrass undersown on appropriate plots: Apr 16. Harrowed in: Apr 23. Whole area rolled: Apr 26. Hand weeded: June 15. Harvested: Aug 14. Variety: Plumage Archer. Previous Crop: Cabbages.

#### Standard errors per plot:

Cabbages:	total yield,	1.175 tons per acre or 15.7% (9 d.f.)
	plant number,	0.27 thousands per acre or 1.5% (9 d.f.)
Barley:	grain,	2.78 cwt. per acre or 12.4% (9 d.f.)
	straw,	3.26 cwt. per acre or 11.9% (9 d.f.)

48/Bc/1.2

Upper Half - Cabbages

Green manure crop	None	Lupins	Clover	Rape	Ryegrass	Mean
	Total Weight: tons per acre ( $\pm 0.588$ )					( $\pm 0.263$ )
No Dung	6.02	7.61	7.41	4.76	5.98	6.36
Dung	8.12	9.37	9.67	7.89	8.18	8.65
No Straw	6.47	8.83	8.37	6.94	7.31	7.58
Straw	7.68	8.15	8.72	5.70	6.86	7.42
Sulph. amm.						
2 cwt./acre	6.47	6.56	7.80	5.21	6.44	6.50
4 cwt./acre	7.68	10.42	9.29	7.43	7.73	8.51
Sulph. amm. to barley						
absent	6.20	8.44	9.26	6.16	7.24	7.46
Present	7.95	8.54	7.82	6.48	6.93	7.54
Mean ( $\pm 0.415$ )	7.07	8.49	8.54	6.32	7.08	7.50
	Total number: thousands per acre ( $\pm 0.136$ )					( $\pm 0.061$ )
No Dung	17.4	17.6	17.6	17.3	17.6	17.5
Dung	17.5	17.7	18.0	17.7	17.7	17.7
No Straw	17.2	17.7	17.7	17.4	17.7	17.5
Straw	17.6	17.6	17.9	17.6	17.5	17.6
Sulph. amm.						
2 cwt./acre	17.4	17.7	17.8	17.5	17.7	17.6
4 cwt./acre	17.4	17.7	17.8	17.6	17.6	17.6
Sulph. amm. to barley						
absent	17.5	17.7	17.9	17.5	17.6	17.6
Present	17.4	17.6	17.8	17.5	17.6	17.6
Mean ( $\pm 0.096$ )	17.4	17.7	17.8	17.5	17.6	17.6

48/Bc/1.3

Upper Half - Cabbages

Differential Responses

	Mean	Dung		Straw		Sulph. amm.		Sulph. amm. to barley	
		Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Total Weight: tons per acre ( $\pm 0.531$ Means $\pm 0.372$ )									
Dung	2.29	-	-	2.30	2.27	2.33	2.24	2.36	2.21
Straw	-0.16	-0.14	-0.17	-	-	-0.01	-0.30	-0.28	-0.03
Sulph. amm.	2.01	2.05	1.96	2.15	1.86	-	-	2.11	1.90
Sulph. amm. to barley	0.08	0.15	0.00	-0.04	0.20	0.18	-0.02	-	-

Total number: thousands per acre ( $\pm 0.12$ ) Means ( $\pm 0.09$ )

Dung	0.2	-	-	0.2	0.1	0.2	0.1	0.1	0.2
Straw	0.1	0.1	0.0	-	-	0.1	0.0	0.1	0.0
Sulph. amm.	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Sulph. amm. to barley	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-

48/Bc/1.4

Lower Half - Barley

Green Manure Crop	Lupins	Rape	Clover	Ryegrass	Fallow	Mean
Grain: cwt. per acre ( $\pm 1.39$ )						( $\pm 0.62$ )
No Dung to Cabbages	21.7	20.7	23.3	16.9	22.9	21.1
Dung	25.6	21.9	26.6	22.1	22.6	23.8
No Straw to Cabbages	22.6	21.6	25.0	19.8	21.7	22.1
Straw	24.7	21.0	24.9	19.2	24.1	22.8
Sulph. amm. to Cabbages						
2 cwt./acre	23.0	22.1	24.9	17.3	21.5	21.6
4 cwt./acre	24.3	20.6	25.0	21.6	24.3	23.2
Sulph. amm. to Barley						
Absent	19.9	18.2	20.9	15.0	18.9	18.6
Present	27.4	24.5	29.0	23.9	26.8	26.3
Mean ( $\pm 0.98$ )	23.7	21.3	24.9	19.5	22.9	22.4
Straw: cwt. per acre ( $\pm 1.63$ )						( $\pm 0.73$ )
No Dung to Cabbages	26.8	24.5	26.5	19.0	26.8	24.7
Dung	31.5	28.8	32.7	26.2	31.2	30.1
No Straw to Cabbages	28.2	26.4	28.0	23.0	28.1	26.7
Straw	30.1	26.9	31.2	22.2	30.0	28.1
Sulph. amm. to Cabbages						
2 cwt./acre	27.7	24.4	29.1	21.3	27.7	26.0
4 cwt./acre	30.6	28.9	30.1	23.8	30.3	28.7
Sulph. amm. to Barley						
Absent	25.6	22.8	25.0	19.3	24.4	23.4
Present	32.7	30.4	34.2	25.6	33.6	31.3
Mean ( $\pm 1.15$ )	29.2	26.6	29.6	22.6	29.0	27.4



48/Bc/1.5

Lower Half - Barley

	Mean	Dung		Differential Responses				Sulph. amm. to barley	
		Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Grain: cwt. per acre ( $\pm 1.26$ Means $\pm 0.88$ )									
Dung to Cabbages	2.7	-	-	1.4	3.9	4.3	1.0	3.3	2.0
Straw to Cabbages	0.6	-0.6	1.8	-	-	-0.6	1.8	1.3	-0.1
Sulph. amm. to Cabbages	1.4	3.0	-0.2	0.1	2.6	-	-	1.8	0.9
Sulph. amm. to Barley	7.8	8.4	7.1	8.5	7.0	8.2	7.3	-	-
Straw: cwt. per acre ( $\pm 1.47$ Means $\pm 1.03$ )									
Dung to Cabbages	5.4	-	-	5.3	5.4	7.1	3.6	5.5	5.2
Straw to Cabbages	1.3	1.2	1.3	-	-	1.0	1.5	2.6	0.0
Sulph. amm. to Cabbages	2.7	4.4	0.9	2.4	2.9	-	-	2.6	2.7
Sulph. amm. to Barley	7.9	8.0	7.7	9.2	6.5	7.8	7.9	-	-

48/Bd/1.1

## LEY AND ARABLE ROTATIONS

Woburn - Stackyard Series D, 1948

Details as given in 1938 Report, pp. 135-137, except that owing to the unsatisfactory crops obtained on kale plots in the years 1938-44 sugar beet has been substituted for kale from 1945 onwards.

### Cultivations, etc.:

Block I. Ley. Second year. Grazed by sheep: May 3-21, June 13-17, July 9-13, Aug 17-25, Sept 7-11, Nov 4-10.

Lucerne. Second year. Harrowed three times: Nov 1. Hoed: Nov 3. First cut: July 9. Second cut: Sept 6. Third cut: Nov 12.

Wheat. Ploughed: Oct 7-8. Harrowed: Oct 9. Seed (Squarheads Master) drilled, harrowed: Oct 14, 15. Failure due to birds. Harrowed, seed redrilled: Oct 21. Plant failure due to damage by birds. Harrowed, sulphate of ammonia applied, seed (Atle) drilled, harrowed: Mar 10. Rolled: Mar 13. Harrowed: Apr 23. Rolled: Apr 26. Harvested: Sept 4. Variety: Atle. Previous crop: Potatoes.

Block II. Ley. Third year. Grazed by sheep: May 14-20, June 17-21, July 13-17, Aug 25-Sept 2, Sept 11-15, Nov 10-14.

Lucerne. Third year. Hoed: June 14-18. First cut: July 9. Second cut: Sept 6. Third cut (small crop only): Nov 12.

May. Grass and clover mixture under sown in wheat: Apr 17, 1947. Total failure due to drought. All wheat plots ploughed: Sept 30. Springtime harrowed: Mar 1. Sulphate of ammonia applied, harrowed: Mar 10. Harrowed twice: Mar 18. Rolled: Mar 22. Seed sown: Mar 23. Harrowed and rolled: Mar 25. Rolled: Mar 27. First cut: June 9. Second cut (small): Sept 6. Seeds mixture: Giant Italian Ryegrass: (22 lb per acre) and Trifolium (27 lb per acre). Previous crop: Wheat. Sugar beet. Ploughed: Sept 30, Mar 18. Harrowed: Mar 19. Rolled: Mar 27. Seed drilled: Apr 2. Nitrate of soda applied: Apr 5. Rolled: Apr 6. Hoed: Apr 19, June 1-3. Singled: June 1-3. Hoed: June 8-July 2. Lifted: Oct 5, 6. Variety: Klein E. Previous crop: Wheat.

Block III. Ley. First year. Ploughed: Sept 27-29. Springtime harrowed, harrowed: Mar 10. Rolled, harrowed, rolled: Mar 20. Artificials applied: Mar 23. Seed sown and harrowed in: Mar 25. Topped, toppings left on ground: July 9. Grazed by sheep: June 9-13, July 1-9,

48/Ba/1.2

July 17-22, Aug 9-17, Sept 2-7, Sept 15-16 (Plot 44 only),  
Nov 29-Dec 4. Seeds mixture: S.23 Perennial Ryegrass  
(21 lb per acre), S.143 Cocksfoot (12 lb per acre), late  
flowering Montgomery Red Clover (6 lb per acre), S.100  
White Clover (3 lb per acre). Previous crop: Barley.

Lucerne. First year. Ploughed: Sept 27-29.  
Springtime harrowed, harrowed: Mar 10. Rolled, harrowed,  
rolled: Mar 20. Artificials applied: Mar 23. Rolled,  
seed sown: Mar 24. Failed, probably due to Flea beetle  
attack. Harrowed and rolled: Mar 25. Cultivated:  
May 15. Seed drilled: May 18. Dusted with Flea beetle  
dust: June 11. Cleaned: June 13, 23. Hoed: June 22-  
Sept 22. First cut: Sept 6. Second cut: Nov 12.

Variety: Provence. Previous crop: Barley.  
Potatoes. Ploughed: Sept 27-29. Springtime  
harrowed: Mar 10. Rolled, harrowed, rolled: Mar 20.  
Rolled: Mar 27. Ridged: Apr 6-7. Artificials applied,  
potatoes planted and covered in: Apr 9. Ridges harrowed:  
May 8. Grubbed: May 28. Earthed up: June 21. Sprayed  
with "Perinox": Aug 11. Sprayed to kill haulm: Sept 20.  
Lifted: Sept 30. Variety: Majestic. Previous crop:  
Barley.

Block IV. Potatoes. Ploughed: Oct 30-Nov 4. Springtime  
harrowed: Mar 1, 18. Harrowed: Mar 20. Rolled: Mar 27.  
Ridged: Apr 6-7. Dung applied: Apr 8. Potatoes planted,  
artificials applied, covered in: Apr 9. Ridges harrowed  
down: May 8. Grubbed: May 28. Earthed up: June 21.  
Sprayed with "Perinox": Aug 11. Lifted: Oct 1, 2.  
Variety: Majestic. Previous crop: Ley, lucerne, hay,  
sugar beet.

Block V. Barley. Ploughed: Oct 9-10. Springtime harrowed:  
Feb 27. Lime applied (14 cwt per acre, 82% Cao),  
harrowed, sulphate of ammonia applied: Mar 4. Harrowed,  
seed drilled: Mar 10. Rolled: Mar 13. Harvested:  
Aug 16. Variety: Plumage Archer. Previous crop:  
Potatoes.

Standard errors per plot:

Block V.

Barley, grain: whole plot, 1.61 cwt. per acre or 5.3%  
sub-plot, 1.49 cwt. per acre or 4.9%  
straw: whole plot, 2.68 cwt. per acre or 6.5%  
sub-plot, 1.50 cwt. per acre or 3.6%

Block IV

Potatoes, total produce: whole plot, 0.626 tons per acre or  
sub-plot, 0.903 tons per acre or  
percentage ware: whole plot, 0.380  
sub-plot, 0.435

All standard errors are estimated from 4 d.f.

48/Ba/1.3

Note:

For the ley plots of blocks I, II, III, only the mean number of sheep days of grazing per acre and the mean number of sheep carried per acre for the year are given for each block in the summary tables. Each plot was grazed separately, but the number of grazing days is not sufficiently accurately determined for each plot to justify treatment comparisons.

48/Bd/1.4

Block I

<u>Ley.</u>	2nd Year.	Sheep days of grazing per acre	No. of sheep carried per acre for the year
Mean	1986		5.4

Lucerne. 2nd Year.

Yield of Lucerne Hay (85% dry matter): tons per acre

	1st crop	2nd crop	3rd crop	Total
No dung	2.10	1.74	0.47	4.32
Dung in 1945	2.01	1.77	0.52	4.30
Mean	2.06	1.76	0.49	4.30
Increase	-0.09	0.03	0.05	-0.02
<u>Previous Rotation</u>				
Lucerne	1.94	1.64	0.48	4.04
Arable with sugar beet	2.18	1.88	0.51	4.56

Wheat

	Grain: cwt. per acre	Straw: cwt. per acre
No dung	14.7	30.2
Dung in 1945	14.1	31.4
Mean	14.4	30.8
Increase	-0.6	1.2
<u>Previous Rotation</u>		
Ley	18.6	37.2
Lucerne	14.2	29.8
Arable with hay	12.7	27.0
Arable with sugar beet	12.1	29.0

48/Ba/1.5

Block II

Ley. 3rd Year.

	Sheep days of grazing per acre	No. of sheep carried per acre for the year
Mean	1551	4.3

Lucerne 3rd year.

Yield of Lucerne Hay (85% Dry Matter): tons per acre

	1st Crop	2nd Crop	3rd Crop	Total
No Dung	1.38	1.41	0.04	2.84
Dung in 1944	1.84	1.68	0.08	3.61
Mean	1.62	1.54	0.06	3.22
Increase	0.46	0.27	0.04	0.77
Previous Rotation				
Lucerne	1.40	1.30	0.06	2.75
Arable with hay	1.83	1.80	0.08	3.70

<u>Hay</u>	1st Crop	2nd Crop	Total
No Dung	1.04	0.20	1.24
Dung in 1944	1.34	0.24	1.58
Mean	1.19	0.22	1.41
Increase	0.30	0.04	0.34
Previous Rotation			
Lucerne	1.38	0.16	1.54
Arable with hay	1.00	0.28	1.28

Sugar Beet

	Clean Beet tons per acre	Tops tons per acre	Total Sugar cwt per acre	Sugar %
No Dung	10.40	10.54	35.8	17.21
Dung in 1944	9.64	9.00	34.7	18.02
Mean	10.02	9.78	35.2	17.62
Increase	-0.76	-1.54	-1.1	0.81
Previous Rotation				
Ley	10.41	9.54	36.6	17.62
Arable with sugar beet	9.63	10.01	33.8	17.62

48/Ba/1.6

Block III

Ley. 1st Year.

	Sheep days of grazing per acre	No. of sheep carried per acre for the year
Mean	1986	5.4

Potatoes

	Total tubers tons per acre	Percentage Ware
No Dung	14.90	96.7
Dung in 1946	17.13	97.4
Mean	16.01	97.0
Increase	2.23	0.7
Previous Rotation		
Ley	17.08	97.35
Lucerne	15.35	96.45
Arable with hay	15.22	97.30
Arable with sugar beet	16.42	97.00

Lucerne 1st Year.

Yield of Lucerne Hay (85% dry matter): Tons per acre

No Dung	0.32
Dung in 1946	0.66
Mean	0.49
Increase	0.34
Previous Rotation	
Lucerne	0.46
Arable with hay	0.53

48/Ed/1.7

Block IV

Potatoes

Previous Crop Rotation

	Ley	Lucerne	Arable with hay	Arable with sugar beet	Mean
<b>Total tubers: tons per acre</b>					
No Dung	15.86	16.37	14.19	13.63	15.01
Dung in 1948 ( $\pm 0.632$ ) <sup>(1)</sup>	19.02	21.35	19.00	17.44	19.20
Mean ( $\pm 0.443$ )	17.44	18.86	16.59	15.54	17.11
Increase ( $\pm 0.903$ )	3.16	4.98	4.81	3.81	4.19 ( $\pm 0.452$ )
<b>Percentage Warc</b>					
No Dung	97.8	97.4	96.6	96.5	97.1
Dung in 1948 ( $\pm 0.35$ ) <sup>(1)</sup>	97.8	97.7	97.1	97.2	97.5
Mean ( $\pm 0.27$ )	97.8	97.6	96.8	96.9	97.3
Increase ( $\pm 0.44$ )	0.0	0.3	0.5	0.7	0.4 ( $\pm 0.22$ )

Block V

Barley

	Ley	Lucerne	Arable with hay	Arable with sugar beet	Mean
<b>Grain: cwt per acre</b>					
No Dung	30.6	31.6	29.2	28.1	29.9
Dung in 1947 ( $\pm 1.36$ ) <sup>(1)</sup>	32.5	28.3	33.1	31.3	31.3
Mean ( $\pm 1.14$ )	31.5	30.0	31.1	29.7	30.6
Increase ( $\pm 1.49$ )	1.9	-3.3	3.9	3.2	1.4 ( $\pm 0.75$ )

Standard error (1) for comparisons other than vertical ones.



Block V

48/Da/1.8

Barley

	Ley	Lucerne	Arable with hay	Arable with sugar beet	Mean
Straw: cwt. per acre					
No Dung ( $\pm 2.03$ ) (1)	42.3	41.3	36.2	34.6	38.6
Dung in 1947	46.3	42.3	44.1	41.2	43.5
Mean ( $\pm 1.89$ )	44.3	41.8	40.2	37.9	41.0
Increase ( $\pm 1.50$ )	4.0	1.0	7.9	6.6	4.9 ( $\pm 0.75$ )

Standard error (1) for comparisons other than vertical ones

48/Be/1.1

## WOBURN MARKET GARDEN EXPERIMENT

Globe Beet and Peas. First crops of 7th year.

The use of heavy dressings of organic manures for making a market garden soil, and the effect of sulphate of ammonia.

JRB and JPE - Lansome, 1948.

System of replication: 2 series, one of each crop, each consisting of 4 randomized blocks of 10 plots each, certain interactions being confounded with block differences.

Area of each plot:  $1/80$  acre.

### Treatments:

Organic manures: Dung, sewage sludge compost, sewage sludge (West Middlesex), and vegetable compost, each at 15 and 30 tons per acre.

Sulphate of ammonia: None, 0.2 cwt. N per acre on organic manure plots. None, 0.2, 0.4, 0.6 cwt. N per acre on plots without organic manure.

Basal manuring: Superphosphate, 0.4 cwt.  $P_2O_5$  per acre.  
Muriate of potash, 0.5 cwt  $K_2O$  per acre.

### Cultivations, etc.:

#### Series A. Globe Beet.

Organic manures applied: Mar 31. Ploughed: Apr 1.  
Harrowed: Apr 2. Ground lime applied to all plots receiving sulphate of ammonia (plots 1,7 at 33 cwt per acre, plots 24, 27 at 22 cwt per acre, other plots at 11 cwt per acre). Harrowed in: Apr 5. Rolled, basal manures and sulphate of ammonia dressings applied, seed drilled and harrowed in: Apr 6. Ring rolled: Apr 10. Dusted with Flea beetle dust: Apr 27. Hoed: May 6-10. Hoed and hand weeded: May 13-28. Harvested: July 6,12-13. Variety: Crimson Globe. Previous crop: Leeks.

#### Series B. Peas.

Organic manures applied: Jan 16-19. Ploughed: Jan 19-20. Springtime harrowed: Feb 17-19. Harrowed: Mar 15. Rolled, basal manures and sulphate of ammonia applied, peas drilled: Mar 16. Ring rolled: Mar 23. Hoed: Apr 29, May 10. Harvested: July 14-26. Variety: Kelvedon Wonder. Previous crop: Winter cabbage\*.

Note: The winter cabbage crop failed owing to drought.

### Standard errors per plot:

Peas, marketable produce, 11.88 cwt. per acre or 18.3%

Globe beet, weight of marketable produce, 1.272 tons per acre or 24.0%

total plant number, 4.01 thousands per acre or 12.3%

weight of bulbs, 0.719 cwt per acre or 26.4%

48/3e/1.2

Summary of Results

Organic manures	Level of manuring (tons/acre)	Sulphate of ammonia, cwt. N per acre				Mean
		None	0.2	0.4	0.6	

Green peas, marketable produce: cwt. per acre  
( $\pm 8.40$ , means  $\pm 5.94$ )

None		66.1	61.8	45.0	71.1	63.9*
Dung	15	96.1	75.0			85.5
Dung	30	79.3	41.3			61.8
Composted	15	75.7	85.0			80.4
sewage sludge	30	80.4	73.9			77.1
Sewage	15	47.1	46.8			47.0
sludge	30	35.7	38.2			37.0
Vegetable	15	85.4	84.3			84.8
compost	30	52.1	57.1			54.6

Globe beet, total produce: tons per acre  
( $\pm 0.900$ , means  $\pm 0.636$ )

None		1.30	2.92	3.86	2.37	2.11*
Dung	15	4.50	6.02			5.26
Dung	30	9.34	7.58			8.46
Composted	15	3.07	3.68			3.38
sewage sludge	30	4.72	6.19			5.45
Sewage	15	6.37	5.94			6.15
sludge	30	6.74	6.35			6.54
Vegetable	15	4.32	5.02			4.67
compost	30	6.85	8.78			7.82

Globe beet, weight of bulbs: tons per acre  
( $\pm 0.508$ , means  $\pm 0.360$ )

None		0.47	1.37	2.04	1.20	0.92*
Dung	15	2.04	3.20			2.62
Dung	30	5.01	4.12			4.56
Composted	15	1.39	1.77			1.58
sewage sludge	30	2.46	3.26			2.86
Sewage	15	3.25	3.08			3.17
sludge	30	3.50	3.30			3.40
Vegetable	15	2.10	2.62			2.36
compost	30	3.53	4.74			4.14

\* These means are for 0.0 and 0.2 cwt. N per acre only

48/Be/1.3

Organic manures	Level of manuring (tons/acre)	Sulphate of ammonia, cwt. N per acre				Mean
		None	0.2	0.4	0.6	
Globe beet, total plant number: thous. per acre ( $\pm 2.87$ , means $\pm 2.01$ )						
None		27.1	32.4	33.4	25.2	29.8*
Dung	15	32.8	31.6			32.2
Dung	30	42.8	29.4			36.1
Composted	15	29.6	35.0			32.4
sewage sludge	30	33.5	34.2			33.9
Sewage	15	37.6	29.9			33.8
sludge	30	28.8	27.2			28.0
Vegetable	15	37.0	39.0			38.0
compost	30	31.8	34.9			33.4

\*These means are for 0.0 and 0.2 cwt. N per acre only

48/Be/2.1

WOBURN MARKET GARDEN EXPERIMENT

Leeks and Winter Cabbage. 2nd crops for 7th year

The use of heavy dressings of organic manures for making garden soil, and the effect of sulphate of ammonia.

JLE and JU - Lancaster 1948 - 9

System of replication: 2 series, one for each crop, each consisting of 4 randomized blocks of 10 plots each, certain interactions being confounded with block differences.

Area of each plot:  $\frac{1}{80}$  acre.

Treatments:

Organic manures (applied to previous crops): Dung, sewage, sludge compost, sewage sludge (West Middlesex), and vegetable compost, each at 15 and 30 tons per acre.

Sulphate of ammonia: None, 0.4 cwt. N per acre on organic manure plots. None, 0.4, 0.8, 1.2 cwt. N per acre on plots without organic manure.

Basal manuring: None.

Cultivations, etc:

Series A. Winter Cabbage.

Ploughed and harrowed: July 15, 16. Rolled, sulphate of ammonia applied, cabbages planted: July 19, 20. Cabbages replanted where necessary: Aug 3 - 7. Hoed: Aug 24 - Sept 29. Cut: Jan 11, Feb 8, 15, 22. Variety: January King. Previous crop: Globe beet.

Series B. Leeks.

Ploughed: July 26, 27. Harrowed, rolled: July 27. Sulphate of ammonia applied, plots 48, 51, 72, 78 receiving only half dressings: July 30. Leeks planted: Aug 3 - 5. Hoed: Aug 24 - Sept 29. Second dressing of sulphate of ammonia to plots 48, 51, 72, 78: Sept 27. Harvested: Mar 16 - 29. Variety: Musselburgh. Previous crop: Peas.

Standard errors per plot:

Winter cabbages, marketable weight, 40.828 tons per acre or 11.8%  
total number, 0.372 thousands per acre or 2.1%

Leeks, total weight 14.40 cwt. per acre or 12.0%  
total number, 0.879 thousands per acre or 2.1%

48/Be/2.2

Summary of Results

Organic manures	Level of manuring tons per acre	Sulphate of Ammonia cwt N per acre				Mean
		None	0.4	0.8	1.2	
Cabbages, Marketable Weight: tons per acre						
( $\pm 0.586$ Means $\pm 0.414$ )						
None		2.41	5.98	7.59	7.49	4.20*
Dung	15	3.36	6.66			5.01
Dung	30	8.14	7.86			8.00
Composted	15	4.98	6.91			5.94
sewage sludge	30	5.88	8.05			6.96
Sewage	15	8.34	9.66			9.00
sludge	30	9.77	9.88			9.82
Vegetable	15	5.68	6.99			6.33
compost	30	6.95	8.26			7.61
Cabbages, Total Number: thous. per acre						
( $\pm 0.263$ Means $\pm 0.166$ )						
None		17.6	17.9	18.0	18.2	17.8*
Dung	15	16.7	18.3			17.5
Dung	30	18.3	18.0			18.1
Composted	15	17.8	18.2			18.0
sewage sludge	30	18.1	17.8			17.9
Sewage	15	17.8	17.8			17.8
sludge	30	17.4	18.0			17.7
Vegetable	15	17.9	17.5			17.7
compost	30	18.0	18.3			18.2

\* These means are for 0.0 and 0.4 cwt N. per acre only.

48/Be/2.3

Organic Manures	Level of manuring tons per acre	Sulphate of Ammonia cwt. N per acre			Mean
		None	0.4	0.8	

Leeks, Total Weight: cwt per acre

( $\pm 10.2$  Means  $\pm 7.20$ )

None		66.3	113.7	107.3	116.2	90.0*
Dung	15	114.4	113.6			114.0
Dung	30	139.6	143.7			141.6
Composted	15	103.8	124.1			114.0
sewage sludge	30	120.5	113.2			116.8
Sewage	15	127.6	125.5			126.5
sludge	30	131.8	163.5			147.6
Vegetable	15	109.0	106.2			107.6
compost	30	124.4	126.8			125.6

Leeks, Total Number: thous. per acre

( $\pm 0.622$  Means  $\pm 0.440$ )

None		40.9	42.6	38.7	41.1	41.8*
Dung	15	41.8	41.9			41.9
Dung	30	42.8	40.6			41.7
Composted	15	41.5	41.9			41.7
sewage sludge	30	41.1	40.6			40.8
Sewage Sludge	15	40.9	39.9			40.4
"  "	30	41.5	42.4			41.9
Vegetable compost	15	43.5	40.5			42.0
"  "	30	42.3	42.1			42.2

\* These means are for 0.0 and 0.4 cwt N per acre only.

48/Bf/1

GRAZING EXPERIMENT

Highfield - 1948

The effects of cake feeding and equivalent manures on the nutritive value of the herbage.

For details see 1937 Report, pp. 24-26

Area of each plot: Plots 4, 5, 6: 4.93 acres

Cultivations: All plots topped to cut off thistles: June 17-18

Grazing periods: Cattle: May 4 - June 30, and Nov. 4 - Dec. 3  
 Sheep: June 8 - Sept. 22

Block II

Plot	5	4	6
	No Manure	Cake 1938, 40, 43, 46	Equivalent Manures
	Live weight increases: lb per acre		
Cattle	631	480	566
Sheep	116	134	128
	Grazing days per acre		
Cattle	144	104	160
Sheep	327	289	336
	Starch equivalent: lb per acre		
Cattle	2285	1720	2236
Sheep	889	911	922