

14474

Rothamsted Experimental Station  
Harpenden  
LAWES AGRICULTURAL TRUST

**RESULTS**  
**OF THE**  
**FIELD**  
**EXPERIMENTS**  
**1950**



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Rothamsted Experimental Station

Harpenden

Lawes Agricultural Trust

RESULTS  
of the  
FIELD  
EXPERIMENTS

1950

The summaries given in this report are similar to those contained in the appendices to the Annual Reports of the Station before the war. With one or two special exceptions only experiments conducted at Rothamsted and Woburn are included. The design and supervision of these experiments are the responsibility of the Field Plots Committee (present members: E.M.Crowther (Chairman), H.V.Garner (Secretary), H.H.Mann, J.R.Moffatt, D.J.Watson, F.Yates).

Reports covering the war years are being prepared.

Note. In the reports of the Classical and Long Term Experiments, reference is made to an Appendix for details of rotations, treatments etc. For convenience it has now been decided to issue this Appendix separately; the relevant details may also be found in the references given in the 1949 reports.

Price: 5/-

Index 1950

Classicals

Broadbalk	Wheat	A/1
Hoosfield	Barley	A/2
Hoosfield	Wheat after fallow	A/3
Agdell	Rotation	A/3
Barnfield	Mangolds and sugar beet	A/4
Park Grass	Hay	A/5
Hoosfield	Exhaustion Land	A/6
Woburn	Permanent Wheat	A/7
Woburn	Permanent Barley	A/7

Long Term Experiments

2-Course Rotation	Rothamsted	Ba/1
3-Course "	"	Ba/2
4-Course "	"	Ba/3
6-Course "	Rothamsted and Woburn	Ba/4
Deep Cultivation Rotation	Rothamsted	Bb/1
Ley and Arable Rotations	"	Bc/1
Green Manuring	Woburn	Bd/1
Ley and Arable Rotations	"	Be/1
Market Garden	" 1st crops	Bf/1
Market Garden	" 2nd crops	Bf/2

Short Term Experiments

Wheat	Eyespot	Rothamsted	Ca/1
Wheat	Residual of dung	"	Ca/2
Wheat	Wireworm 1	"	Ca/3
Wheat	Wireworm 2	"	Ca/4
Wheat	Late application of nitrogen	"	Ca/5
Barley	" " " " "	"	Cb/1
Spring Oats	" " " " "	"	Cc/1
Spring Beans	Fertilizer placement	"	Cd/1
Winter Beans	" "	"	Cd/2
Potatoes	Application of dung	"	Ce/1
Potatoes	Time of Planting	"	Ce/2
Potatoes	Method of planting	Rothamsted and Woburn	Ce/3
Kale	Fertilizer placement	Rothamsted	Cf/1
Lucerne	" "	"	Cg/1
Permanent grass	" "	"	Ch/1

Outside Experiments

Sugar Beet	Irrigation	Kesgrave	Da/1
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Miscellaneous Data

Chemical Analyses of Manures			E/1
Meteorological Readings	Rothamsted		E/2

## WHEAT - BROADBALK 1950

The 107th year

For details of treatments etc. see Appendix Y.

## Cultivations, etc.:

Cropped sections. Ploughed all except dung plots: Aug 24-29.

Dung applied and ploughed in: Sept 5-6. Springtined:

Oct 15-Nov 1. Artificials applied: Nov 3-4. Springtined:

Nov 4 and 8. Harrowed, seed drilled and harrowed twice:

Sept 5-8. Nitrogenous fertilizers applied: Apr 20. Harrowed:

Apr 27. Rolled: May 1. Second dressing of nitrate of soda

applied to plot 16: May 4. Harvested: Aug 8. Variety:

Squareheads Master (13/4).

Fallow section. Ploughed all except dung plots: Aug 24-29.

Ploughed dung plots: Sept 5-6. Springtined: Oct 15-Nov 1,

and again Nov 4 and 8. Ploughed: Dec 12, and again Jan 2-7.

Springtined: Mar 13, Apr 22 and May 13. Thistlebarred:

May 30. Ploughed: Aug 2-3. Springtined: Aug 8.

Springtined, disced and ring rolled: Aug 11.

Summary of Results

Section Years after Fallow	Total Grain: cwt. per acre				Mean	Total straw <sup>*</sup> cwt per acre				Mean
	IV	V	II	I		IV	V	II	I	
	1	2	3	4		1	2	3	4	
Plot 2A	24.2	19.7	22.8	19.2	21.5	59.6	53.7	54.3	41.5	52.3
2B	23.4	21.8	24.3	20.7	22.6	61.2	53.1	59.7	60.3	58.6
3	14.8	7.2	7.2	7.5	9.2	28.9	15.0	13.0	15.7	18.2
5	17.8	9.4	8.1	10.1	11.4	34.1	15.2	23.3	22.3	23.7
6	20.8	13.7	9.0	10.2	13.4	45.0	26.1	26.9	21.8	30.0
7	18.7	14.5	17.0	13.1	15.8	47.0	38.5	32.2	27.1	36.2
8	15.4	17.5	17.3	16.8	16.8	45.9	45.1	41.0	37.7	42.4
9	17.7	9.8	13.3	14.4	13.8	37.5	21.8	25.3	30.6	28.8
10	10.6	15.4	15.4	14.7	14.0	27.2	30.0	24.1	26.9	27.0
11	9.3	11.5	13.0	14.4	12.0	39.4	18.7	28.0	30.7	29.2
12	13.2	14.5	16.0	18.7	15.6	38.8	32.8	27.9	33.0	33.1
13	16.5	14.9	14.6	16.6	15.6	49.1	38.0	30.0	34.1	37.8
14	21.3	13.9	15.8	17.7	17.2	47.0	35.8	28.4	32.0	35.8
15	22.0	10.4	15.5	15.4	15.8	49.1	28.7	30.3	30.4	34.6
16	20.1	21.1	19.6	19.0	20.0	47.0	44.6	38.4	37.5	41.9
17	21.2	15.6	15.1	16.0	17.0	40.4	35.6	24.9	29.2	32.5
18	21.6	13.7	7.4	6.0	12.2	35.0	27.6	11.5	12.9	21.8
19	12.7	15.8	14.9	13.9	14.3	41.8	29.8	22.4	22.8	29.2
20	-	-	15.6	17.6	16.6	-	-	27.6	31.2	29.4

\* Includes straw, cavings and chaff.

## BARLEY - HOOSFIELD 1950

The 99th Year

For details of treatments etc. see Appendix Y.

Cultivations, etc.: Ploughed: Aug 24-26. Springtined: Oct 12 and again Nov 5. Dung applied: Dec 2. Ploughed: Dec 2-10. Applied all fertilizers except silicate of soda: Mar 16-20. Springtined: Mar 21. Springtined, harrowed, seed drilled: Mar 24. Harrowed in: Mar 25. Rolled: Mar 27. Silicate of soda applied: Apr 20. Thistles cut: May 26. Sprayed with D.N.O.C.: May 30. Harvested: Aug 14-16. Variety: Plumage Archer.

## Summary of Results

Plot	Total Grain cwt: per acre	Total Straw <sup>*</sup> cwt: per acre
1 0	6.6	6.6
2 0	8.6	8.1
3 0	9.1	8.6
4 0	12.5	10.8
5 0	10.6	12.3
1 A	10.7	10.9
2 A	22.2	17.4
3 A	16.9	19.3
4 A	20.2	19.1
5 A	9.9	15.4
1 AA	12.7	12.8
2 AA	17.7	22.3
3 AA	17.3	23.3
4 AA	20.7	21.0
1 AAS	17.0	20.0
2 AAS	25.5	26.1
3 AAS	19.4	20.8
4 AAS	20.5	21.4
1 C	18.7	22.3
2 C	24.1	21.4
3 C	22.3	20.3
4 C	22.1	20.0
7 - 1	11.3	11.7
7 - 2	29.6	31.8
6 - 1	6.8	7.1
6 - 2	6.7	7.7
1 N	13.9	20.0
2 N	21.9	21.4

\* Includes straw, savings and chaff.

Without manure 1851 and since

For details of treatments see Appendix Y.

Cultivations, etc.:

Cropped Sections: Ploughed: Aug 30-31. Springtined: Oct 29  
Harrowed, seed drilled and harrowed in: Oct 31. Rolled: Apr 8.  
Crop badly damaged by wheat bulb fly so decision made to plough in  
and resow: Apr 20. Harrowed three times, seed drilled, ring  
rolled and harrowed in: Apr 21. Ring rolled: Apr 22. Thistles  
cut: May 26. Harvested: Sept 8. Variety (Spring sowing):  
Fylgia.

Fallow Sections: Ploughed: Aug 30-31. Springtined: Oct 29  
and Mar 9. Harrowed three times: Apr 21. Ring rolled: May 12.  
Thistle barred: May 30. Ploughed: July 1. Springtined: July 15  
and 31.

#### Summary of Results

Produce: cwt per acre

No. of years of Fallow Section	1 A3	1 A4	3 A1	Mean
Total Grain	3.4	3.6	4.5	3.8
Total Straw	5.4	4.6	6.1	5.4

#### CROPS IN ROTATION - AGDELL FIELD 1950

Clover, 3rd crop of 26th course (1948-51)

For details of treatments and rotation see Appendix Y.

Cultivations, etc.:

Cropped Sections: Seed undersown in barley: Apr 14, 1949.  
Plot 2 ploughed up because of weeds: Apr 26, 1950. Topped with  
scythe: Apr 28. Rolled and springtined: May 13. Thistle  
barred: May 31. Weeded: June 30. Cut: July 20. Variety:  
Late-flowering Montgomery Red.

Fallow Sections: Ploughed: Nov 17-18. Springtined: Mar 18.  
Ploughed: Apr 26. Disced: Apr 28, and May 11. Rolled and  
springtined: May 13. Thistle barred: May 31. Ploughed: Aug 10.

#### Summary of Results

Clover hay: cwt per acre

Manure to Turnips 1948	Unmanured since 1848	Mineral Manure No Nitrogen	Complete Mineral and Nitrogenous manure
Plot	6	4	2
Clover	23.8	48.8	Ploughed up

## MANGOLDS AND SUGAR BEET - BARNFIELD 1950

For details of treatments etc. see Appendix Y.

## Cultivations, etc.:

Dung applied: Nov 14-16. Ploughed: Nov 17-19, and again Mar 13.  
 Disc harrowed: Mar 31 and again Apr 13. Fertilizers applied:  
 Apr 24-27. Harrowed twice, rolled, mangolds drilled and  
 harrowed in: Apr 28. Sugar beet drilled and harrowed in: Apr 29.  
 Rolled: Apr 29 - May 1. Hoed: May 6-9 and June 23-28. Singled:  
 various days, June 23 - July 8. Top dressings applied: July 8  
 and 12. Hoed: various days, July 13 - Aug 4. Sugar beet  
 lifted: Nov 22-24. Mangolds lifted: Nov 22-30. Varieties:  
 Mangolds - Yellow Globe, sugar beet - Klein E.

Summary of Results

Yields: tons per acre

Strip	0	Cross Dressings		AC	C
		N	A		
Mangolds: Roots					
1	6.10	17.88	18.30	22.20	17.39
2	10.52	24.27	25.18	26.99	23.16
4	0.97	(a) 11.00	8.56	14.48	13.42
		(b) 9.94			
5	1.60	9.35	6.05	9.93	7.39
6	1.08	11.79	10.50	18.72	10.55
7	1.48	10.26	9.48	18.46	10.05
8	1.11	5.68	4.94	10.36	6.49
9	7.05				
Mangolds: Leaves					
1	0.86	2.72	4.09	4.99	2.32
2	2.42	4.18	5.36	5.24	4.04
4	0.59	(a) 2.94	3.47	3.08	2.74
		(b) 3.42			
5	0.42	2.52	2.94	3.45	2.94
6	0.59	2.42	2.32	4.94	2.79
7	0.44	2.57	3.28	4.77	3.03
8	0.51	2.20	2.42	2.81	2.35
9	3.20				



## Yields: tons per acre

Strip	0	Cross Dressings		AC	C
		N	A		
Sugar Beet: Roots					
1	8.51	16.05	16.29	16.73	15.95
2	7.58	14.83	12.57	16.44	13.55
4	1.21	(b) 9.79	12.43	16.68	13.70
5	1.44	7.39	7.98	12.18	10.03
6	1.31	5.87	9.93	14.73	10.72
7	1.32	8.22	10.52	14.92	9.93
8	0.83	6.80	5.97	9.49	7.54
Sugar Beet: Leaves					
1	6.46	12.87	15.46	17.71	14.73
2	7.14	13.06	12.48	16.49	12.04
4	0.78	(b) 8.02	6.70	11.74	8.71
5	1.52	5.14	6.07	12.18	7.63
6	0.73	8.76	7.63	14.48	9.10
7	0.78	6.80	9.88	19.96	10.47
8	1.71	6.85	7.29	12.43	7.83

## HAY - THE PARK GRASS PLOTS 1950

The 95th year

For details of treatments etc.: see Appendix Y

Cultivations, etc.: Minerals applied: Dec 12-14. Chain harrowed: Mar 9. Rolled: Mar 13. Nitrogenous fertilizers applied: 1st dressing Apr 14-15; 2nd dressing: May 1. 1st cut: June 13-15. 2nd cut: Sept 13-14.

Summary of Results

Plot	Yield of Hay: cwt per acre					
	Not limed			Limed		
	1st Crop	2nd Crop <sup>xx</sup>	Total	1st Crop	2nd Crop <sup>xx</sup>	Total
1	0.8	7.1	7.9	12.3	4.8	17.1
2	13.0	9.0	22.0	10.1	8.5	18.6
3	10.0	7.9	17.9	11.1	6.1	17.2
4-1	15.7	9.2	24.9	17.9	10.4	28.3
4-2	0.7	4.0	4.7	27.8	6.0	33.8
5-1	3.1	1.8	4.9			
5-2	12.4	10.4	22.8			
6	25.9	20.4	46.3			
7	30.1	16.8	46.9	41.6	15.0	56.6
8	21.1	18.0	39.1	10.1	10.2	20.3
9	38.7	19.1	57.8	39.9	8.6	48.5
10	18.7	18.4	37.1	34.8	9.9	44.7
11-1	48.5	34.6	83.1	50.1	18.0	68.1
11-2	57.8	25.1	82.9	55.5	22.6	78.1
12	8.3	12.0	20.3			
13	28.8	20.0	48.8	30.6	18.2	48.8
14	46.6	24.9	71.5	49.7	12.1	61.8
				36.4 <sup>x</sup>	11.5 <sup>xx</sup>	47.9 <sup>xx</sup>
15	26.6	14.6	41.2	26.0	9.8	35.8
16	32.7	15.5	48.2	21.7	10.9	32.6
17	15.6	11.9	27.5	18.0	11.4	29.4
18	6.6	10.8	17.4	22.2 <sup>+</sup>	9.4 <sup>+</sup>	31.6 <sup>+</sup>
				21.1 <sup>++</sup>	11.2 <sup>++</sup>	32.3 <sup>++</sup>
19	29.6	20.5	50.1	29.0 <sup>+</sup>	25.4 <sup>+</sup>	54.4 <sup>+</sup>
				32.7 <sup>++</sup>	21.0 <sup>++</sup>	53.7 <sup>++</sup>
20	40.1	21.0	61.1	42.7 <sup>+</sup>	19.5 <sup>+</sup>	62.2 <sup>+</sup>
				43.5 <sup>++</sup>	20.1 <sup>++</sup>	63.6 <sup>++</sup>

<sup>x</sup> Shade<sup>xx</sup> These figures for the second crop are estimated hay yields calculated from the dry matter.<sup>+</sup> Heavy liming<sup>++</sup> Light liming

## BARLEY - EXHAUSTION LAND HOOSFIELD 1950

For details of previous treatments etc. see Appendix Y.

Cultivations, etc.: Ploughed: Aug 30-Sept 1. Springtined: Oct 14.  
 Ploughed: Dec 16. Springtined: Mar 8 and again Mar 11.  
 Sulphate of ammonia drilled: Mar 13. Harrowed: Mar 14. Seed  
 drilled, harrowed in and rolled: Mar 15. Thistles cut: May 30.  
 Harvested: Aug 7. Variety: Plumage Archer.

Summary of Results

Plot	Total Grain cwt per acre	Total Straw cwt per acre
1	11.3	16.7
2	15.1	20.4
3	24.2	26.4
4	29.0	30.8
5	12.5	15.2
6	14.7	17.9
7	22.2	26.2
8	26.3	27.4
9	24.4	25.8
10	26.6	28.2

PERMANENT WHEAT - WOBURN STACKYARD 1950

For details of treatments etc. see Appendix Y.

Owing to damage by vermin in the barn, the yields from this experiment were considered too unreliable for publication.

PERMANENT BARLEY - WOBURN STACKYARD 1950

For details of treatments etc. see Appendix Y.

Owing to severe infestation with spurrey the crop was ploughed in.

## TWO COURSE ROTATION EXPERIMENT

Cumulative effects of agricultural salt - Long Hoos V 1950

For details of treatments and rotations etc see Appendix Z.

Note. Only Barley (Series 2) was grown in 1950 and the experiment is now terminated.

Area of each plot: 0.0189 acre.

Cultivations, etc:

Agricultural salt applied: Dec 29. Ploughed: Jan 12.  
Springtined: Mar 8 and again Mar 11. Harrowed: Mar 13.  
Sulphate of ammonia applied: Mar 14. Seed drilled: Mar 15.  
Harrowed in and rolled: Mar 16. Sprayed against weeds with  
Cornox 2, 4-D: May 18. Harvested: Aug 5. Variety: Plumage  
Archer. Previous crop: Sugar beet.

Standard error per plot:

Barley, grain, 1.47 cwt per acre or 5.5% (22 d.f.)

## Series 2: Barley

Salt applied in 1949 cwt per acre	Potash applied in 1949 K <sub>2</sub> O cwt per acre			Salt applied In In seed		Salt in 1950 Half		Mean
	0.0	1.0	2.0	Winter	bed	None	Rate	

Grain: cwt per acre

	( $\pm 0.73$ )			( $\pm 0.56$ )		( $\pm 0.42$ )		
0	27.2	28.6	26.4					27.4
2.5	27.2	26.5	25.3	26.6	26.0	26.3	26.3	26.3
5.0	27.3	26.8	27.2	27.5	26.7	26.2	28.0	27.1
7.5	25.7	26.3	26.8	26.2	26.3	25.4	27.2	26.3
Mean	26.9	27.1	26.4	26.8	26.3	26.0	27.2	26.8

( $\pm 0.37$ )( $\pm 0.34$ )

Straw: cwt per acre

0	33.8	35.8	32.7					34.1
2.5	34.1	32.0	33.0	32.4	33.7	32.9	33.2	33.0
5.0	32.2	34.0	32.9	33.7	32.4	31.9	34.2	33.0
7.5	31.2	31.1	32.4	32.2	31.0	30.8	32.3	31.6
Mean	32.8	33.2	32.8	32.8	32.4	31.9	33.2	32.9

## THREE COURSE ROTATION EXPERIMENT

The 18th year

Ploughing in straw - Long Hoos VI 1950.

For details of rotation and treatments etc see Appendix Z.

Area of each plot: 0.0200 acre.

Cultivations, etc:

## Potatoes (Series 1)

Adco, straw and accompanying artificials applied and ploughed in: Dec 10-12. Cultivated: Mar 21. Harrowed: Mar 27. Ridged, artificials applied, potatoes planted and covered in: Mar 31. Rolled down ridges: Apr 3. Harrowed: May 5. Grubbed: May 23. Weeded: June 12-13 and 21. Earthed up: June 26. Sprayed with "Perenox": July 24. Sprayed with "Coppesan": Aug 18. Sprayed with 15% B.O.V. to kill off haulms: Sept 25. Lifted: Oct 10. Variety: Majestic. Previous crop: Sugar beet.

## Barley (Series 3)

Adco, straw and accompanying artificials applied and ploughed in: Dec 10-12. Springtined: Mar 8 and again Mar 10. Artificials applied: Mar 13. Seed drilled and harrowed in: Mar 14. Harvested: Aug 7. Variety: Plumage Archer. Previous crop: Potatoes.

## Sugar beet (Series 2)

Adco, straw and accompanying artificials applied and ploughed in: Dec 10-12. Cultivated: Mar 21. Harrowed, artificials applied: Mar 27. Ring rolled: Mar 28. Seed drilled, harrowed in: Mar 29. Rolled: Mar 30. Hoed: May 19. Singled: June 2-6. Hoed: June 6, 8, 30 and July 14. Lifted: Nov 1. Variety: Klein E. Previous crop: Barley.

Standard errors per plot:

Potatoes,	Total clean tubers:	1.46 tons per acre or 10.7% (8 d.f.)
	Percentage ware:	2.37 (5 d.f.)
Barley,	Grain:	1.38 cwt per acre or 4.4% (8 d.f.)
	Straw:	2.78 cwt per acre or 6.9% (8 d.f.)
Sugar beet,	Roots (washed):	1.13 tons per acre or 7.5% (8 d.f.)
	Tops:	1.34 tons per acre or 14.3% (8 d.f.)
	Sugar percentage:	0.382 (8 d.f.)
	Total sugar:	4.29 cwt per acre or 7.5% (8 d.f.)
	Plant number:	1.23 thousands per acre or 5.3% (8 d.f.)

Summary of Results

Treatments applied 1948/49

Treatments applied 1949/50

	Art.	Adco	St 1	St 2	Mean	Art.	Adco	St 1	St 2	Mean
<u>Sugar Beet</u>										
Roots (washed) tons per acre	14.16	13.80 (±0.654)	13.75	15.07	14.19 (±0.327)	17.24	14.90 (±0.654)	16.54	15.82	16.13 (±0.327)
Tops tons per acre	8.11	8.52 (±0.775)	8.90	8.53	8.51 (±0.388)	10.68	9.56 (±0.775)	10.67	10.23	10.29 (±0.388)
Sugar Percentage	18.79	18.75 (±0.22)	19.00	18.86	18.85 (±0.110)	19.05	18.72 (±0.221)	18.93	18.47	18.80 (±0.110)
Total sugar cwt per acre	53.2	51.6 (±2.47)	52.2	56.9	53.5 (±1.24)	65.7	55.7 (±2.47)	62.6	58.4	60.6 (±1.24)
Plant number thous. per acre	23.6	22.5 (±0.71)	23.6	22.9	23.1 (±0.35)	22.7	23.3 (±0.71)	22.9	22.7	22.9 (±0.35)
<u>Barley</u>										
Grain cwt per acre	29.5	30.4 (±0.80)	33.8	30.4	31.0 (±0.40)	31.2	30.4 (±0.80)	32.9	33.3	31.9 (±0.40)
Straw cwt per acre	39.6	38.1 (±1.60)	40.8	35.7	38.6 (±0.80)	42.5	36.8 (±1.60)	44.9	43.4	41.9 (±0.80)
<u>Potatoes</u>										
Clean tubers tons per acre	11.84	12.23 (±0.841)	13.24	14.04	12.84 (±0.420)	14.21	13.24 (±0.841)	14.57	15.14	14.29 (±0.420)
Percentage Ware	90.8	93.5 (±1.37)	91.6	92.8	92.2 (±0.69)	93.8	93.9 (±1.37)	91.1	92.4	92.8 (±0.69)



## Responses to Magnesium Sulphate

Treatments applied 1948/49

Treatments applied 1949/50

	Art.	Adco	St 1	St 2	Mean	Art.	Adco	St 1	St 2	Mean
<u>Sugar Beet</u>										
Roots (washed) tons per acre	1.24	2.42 (±1.389)	1.52	0.08	1.31	0.04	0.69 (±1.389)	0.16	0.12	0.26
Tops tons per acre	0.17	3.64 (±1.645)	-1.42	-0.67	0.43	-1.02	0.94 (±1.645)	0.21	0.34	0.12
Sugar Percentage	0.63	-0.88 (±0.468)	-0.04	0.92	0.16	0.46	-1.00 (±0.468)	0.42	-0.32	-0.11
Total sugar cwt per acre	6.5	6.5 (±5.25)	5.7	3.0	5.4	1.8	-0.3 (±5.25)	2.1	-0.6	0.7
Plant number thous. per acre	0.8	-1.0 (±1.51)	1.7	0.5	0.5	1.6	-1.1 (±1.51)	1.5	-1.4	0.2
<u>Barley</u>										
Grain cwt per acre	-1.7	-1.9 (±1.69)	-4.3	-0.2	-2.0	-0.6	1.7 (±1.69)	1.8	1.4	1.1
Straw cwt per acre	0.2	1.6 (±3.41)	-4.7	-1.8	-1.2	-2.4	-0.4 (±3.41)	0.7	4.4	0.6
<u>Potatoes</u>										
Clean tubers tons per acre	-1.94	1.08 (±1.784)	2.76	1.15	0.76	0.26	-0.84 (±1.784)	-1.79	1.17	-0.30
Percentage Ware	-3.9	-3.0 (±2.91)	2.0	0.0	-1.2	0.0	0.0 (±2.91)	-5.4	-1.7	-1.8

## FOUR COURSE ROTATION EXPERIMENT

Direct and residual effects of organics and phosphates - Hoosfield 1950.

For details of treatments and rotation etc. see Appendix Z.

Area of each plot: Potatoes; 0.0228 acre. Barley, Ryegrass and wheat; 0.0244 acre.

Manures applied 1949-50

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 F.Y.M.)	1.560	0.650	2.602	0.240	0.550	0.398
Adco	50 (as Adco)	1.604	0.912	0.864	0.196	0.288	2.136
Straw	155 (as Straw)	0.962	0.300	1.565	0.838	0.900	1.435
Super			None		0.36	1.2	0.6
Rock phosphate			None		0.36	1.2*	0.6

\* As mineral phosphate

## Cultivations; etc.:

## Potatoes,

Ploughed: Aug 26-29. First dressing of fertilizers applied to straw plots: Dec 6. Dung and Adco applied: Dec 12. Supplementary fertilizers to Adco and Dung applied, second dressing of fertilizers applied to straw plots: Dec 13. Straw applied and ploughed in: Dec 13-15. Cultivated: Mar 25. Cultivated, springtined and harrowed: Mar 27. Ridged, spring fertilizers including third dressing to straw plots, and sulphate of ammonia to half plots, applied; potatoes planted and covered in; rolled ridges: Apr 3. Chain harrowed: May 5. Grubbed: May 24. Weeded: June 21. Ridged: June 27. Sprayed with "Perenox": July 24. Sprayed with "Coppesan": Aug 18. Sprayed with B.O.V. 15% to kill off haulm. Lifted: Oct 12. Variety: Majestic. Previous crop: Wheat.

## Barley,

Ploughed: Sept 23-24. First dressing of fertilizers applied to straw plots: Dec 6. Dung, Adco and supplementary fertilizers, and second dressing of fertilizers to straw plots applied: Dec 14. Straw applied, all plots ploughed: Dec 22-29. Ground chalk applied: Jan 18. Springtined: Mar 9 and again Mar 11. Spring fertilizers including third dressing to straw plots applied, harrowed, seed drilled and harrowed in, rolled: Mar 14. Harvested: Aug 10. Variety: Plumage Archer. Previous crop: Potatoes.

## Ryegrass,

Dung, Adco and supplementary fertilizers applied: Sept 13. First dressing of fertilizers applied to straw plots: Sept 14. Straw applied, ploughed all plots: Sept 13-16. Springtined: Oct 14. Harrowed: Oct 15. Autumn fertilizers applied: Oct 22. Second dressing of fertilizers applied to straw plots: Dec 6. Seeds not sown owing to wet state of land. Reploughed: Dec 6-8. Springtined twice: Mar 9. Harrowed, rolled, fertilizers including third dressing to straw plots applied, seeds sown: Mar 13. Harrowed in and rolled: Mar 14. Sprayed with D.N.O.C. to kill off weeds: May 4. Harvested: July 20. Variety: Western Wolths. Previous crop: Barley.

## Wheat,

Ploughed: June 25-29. Dung, Adco and supplementary fertilizers, first dressing of fertilizers to straw plots applied: Sept 14. Ring rolled: Sept 15. Straw applied, all plots ploughed: Sept 16-19. Harrowed: Oct 15. Autumn fertilizers applied: Oct 22. Harrowed, seed drilled and harrowed in: Oct 29. Second dressing of fertilizers applied to straw plots: Dec 6. Rolled: Apr 6. Sulphate of ammonia applied: Apr 20. Third dressing of fertilizers applied to straw plots: Apr 21. Ring rolled: Apr 22. Sprayed to kill off weeds: May 4. Harvested: Aug 9. Variety: Squareheads Master 13/4. Previous crop: Ryegrass.

Summary of Results

Manure <sup>+</sup>	Year of Cycle	Wheat <sup>‡</sup>		Barley		Ryegrass	Total clean tubers, tons per acre		Potatoes		Percentage Ware		Resp. to N
		Grain cwt. per acre	Straw per acre	Grain cwt per acre	Straw per acre	Dry matter cwt per acre	Additional N Without	Mean	Resp. to Nitrogen	Additional N Without	Mean		
Manure as F.Y.M.	I	25.6	47.1	16.7	26.2	16.6	10.55	11.71	1.16	94.3	94.4	94.5	0.2
	II	23.2	40.0	21.0	25.1	14.3	6.42	10.42	4.00	69.2	89.1	69.0	-0.2
	III	19.6	41.2	16.7	23.6	11.9	5.39	7.72	2.33	69.2	91.4	93.5	4.3
	IV	22.1	39.9	16.3	24.3	13.5	6.42	7.43	1.01	91.5	91.0	90.4	-1.1
	V	24.9	32.1	15.9	20.5	9.7	6.48	6.30	1.62	91.1	90.2	89.3	-1.8
Manure as Adco (straw compost)	I	26.4	45.2	18.0	27.2	14.4	7.68	10.88	3.20	90.2	90.6	91.0	0.8
	II	26.1	46.7	11.7	17.6	15.9	9.01	10.22	1.21	93.6	89.0	84.5	-9.1
	III	20.3	40.7	17.7	26.4	10.5	7.43	10.07	2.64	94.5	91.5	88.5	-6.0
	IV	21.2	37.2	18.5	27.2	13.6	7.10	7.31	0.21	90.2	89.4	88.6	-1.6
	V	21.3	36.2	16.3	25.5	10.1	6.35	6.12	-0.23	67.9	89.0	90.0	2.1
Manure as Straw	I	26.6	45.7	25.0	34.2	14.2	6.64	10.63	1.99	69.0	91.6	94.5	5.5
	II	22.2	39.7	16.3	25.7	10.6	6.02	6.45	2.43	67.5	91.8	96.1	6.6
	III	21.1	41.5	19.7	26.1	10.9	7.45	6.93	1.46	69.9	88.6	67.4	-2.5
	IV	22.2	38.6	22.8	29.5	11.7	7.77	9.41	1.64	68.4	90.4	92.3	3.9
	V	18.7	31.7	15.7	20.9	10.3	6.48	9.70	3.22	90.6	91.7	92.8	2.2
Superphosphate	I	26.6	47.2	20.0	24.7	16.8	9.01	10.74	1.73	91.6	90.4	89.3	-2.3
	II	24.8	42.0	17.4	25.3	15.5	6.64	7.12	0.48	94.0	91.9	89.8	-4.2
	III	26.7	45.6	19.0	20.6	15.4	8.74	8.06	-0.68	95.3	93.4	91.4	-3.9
	IV	24.5	41.7	24.3	32.4	17.2	6.94	6.52	-0.42	62.1	85.0	87.9	5.8
	V	22.9	37.4	15.2	23.2	19.1	7.05	10.51	3.46	91.2	83.0	74.9	-16.3
Rock phosphate	I	25.7	46.3	11.3	22.0	16.9	3.51	3.20	-0.31	84.7	84.6	84.4	-0.3
	II	23.6	41.3	7.0	20.5	14.4	4.91	6.44	1.53	61.6	84.4	67.2	5.6
	III	23.9	43.4	21.9	30.5	16.0	5.15	6.27	0.12	66.3	89.2	92.0	5.7
	IV	20.8	33.9	16.7	24.2	16.2	5.02	6.31	1.29	67.4	89.2	91.1	3.7
	V	25.0	40.4	16.1	24.8	16.6	5.90	5.90	0.00	89.1	89.2	89.3	3.2

+ Note. All manures are supplemented by fertilizers as shown in Table on page 50/Ba/3.1.

‡ Owing to varying conditions during harvesting wheat grain yields have been corrected to 63% Dry Matter, and wheat straw to 62%.

## The 21st year

Seasonal effects of fertilizers - Rothamsted Long Hoos IV and Woburn Stackyard, 1950.

For details of rotation and treatments etc. see Appendix Z.

Area of each plot: Rothamsted - 0.0250 acre. Woburn - 0.0268 acre.

Cultivations, etc.:

## Rothamsted

## Sugar beet.

Ploughed: Aug 29 and again Jan 10-12. Cultivated: Mar 21.  
 Harrowed, fertilizers applied: Mar 27. Ring rolled: Mar 28.  
 Seed drilled and harrowed in: Mar 29. Rolled: Mar 30.  
 Hoed: May 17. Singled: May 31-June 1. Hoed: June 5 and  
 29, July 12 and 13. Lifted: Oct 31. Variety: Klein E.  
 Previous crop: Rye.

## Barley.

Ploughed: Dec 7-8. Ground chalk applied: Jan 16. Springtined:  
 Mar 8 and again Mar 10. Fertilizers applied and harrowed in,  
 seed drilled and harrowed in: Mar 14. Rolled: Mar 15. Clover  
 seed undersown and harrowed in: Mar 21. Ring rolled: Mar 22.  
 Harvested: Aug 4. Variety: Plumage Archer. Previous crop:  
 Sugar beet.

## Clover.

Seed undersown in barley and harrowed in: Apr 13. Autumn  
 fertilizers applied: Dec 6. Rolled: Mar 15. Sulphate of  
 ammonia applied: Apr 17. Cut: July 20. Variety: Late  
 flowering Montgomery Red. Previous crop: Barley.

## Wheat.

Ploughed: July 2-4. Springtined, autumn fertilizers applied:  
 Oct 14. Harrowed, seed drilled and harrowed in: Oct 28.  
 Harrowed: Mar 16. Rolled: Apr 8. Sulphate of ammonia  
 applied: Apr 17. Ring rolled: Apr 20. Harvested: Aug 3.  
 Variety: Yeoman. Previous crop: Clover.

## Potatoes.

Ploughed: Aug 30 and again Jan 7-9. Cultivated: Mar 31.  
 Harrowed: Mar 27 and again Mar 28. Ring rolled: Mar 29.  
 Ridged: Mar 31. Fertilizers applied, potatoes planted and  
 covered in: Apr 1. Rolled down ridges: Apr 3. Chain  
 harrowed: May 5. Grubbed: May 23. Hoed weeds: June 21.  
 Earthed up: June 26. Sprayed with Perenox: July 25. Sprayed  
 with Copper: Aug 18. Sprayed with 15% B.O.V. to kill off  
 haulm: Sept 22. Lifted: Oct 11. Variety: Majestic. Previous  
 crop: Wheat.

## Rye.

Ploughed: Sept 22. Springtined, autumn fertilizers applied:  
 Oct 14. Ground chalk applied: Oct 27. Harrowed, seed  
 drilled and harrowed in: Oct 28. Harrowed: Mar 16. Rolled:  
 Apr 8. Sulphate of ammonia applied: Apr 14. Ring rolled:  
 Apr 20. Harvested: Aug 3. Variety: King II. Previous  
 crop: Potatoes.

## Woburn

## Sugar beet.

Ploughed: Aug 31. Springtined: Nov 2. Ploughed: Nov 15 and  
 again Jan 23. Springtined: Mar 2. Harrowed and rolled:  
 Mar 27. Fertilizers applied: Mar 29. Harrowed, rolled, seed  
 drilled, harrowed and rolled in: Mar 30. Hoed: May 11.  
 Singled: June 1-2. Hoed: June 8, 15, 29, 30, July 1 and 26.  
 Weeded: Sept 11. Lifted: Sept 29. Variety: Klein E.  
 Previous crop: Rye.

## Barley.

Ploughed: Oct 5 and again Jan 24. Ground chalk applied:  
 Feb 27. Springtined: Mar 7. Fertilizers applied: Mar 15.  
 Seed drilled and harrowed in: Mar 16. Rolled: Mar 17.  
 Clover undersown, harrowed and rolled: Mar 22. Harvested:  
 Aug 4. Variety: Plumage Archer. Previous crop: Sugar beet.

## Clover.

Seed undersown in barley: Mar 18. Rolled: Mar 28.  
 Fertilizers applied: Apr 12. Cut: June 20. Variety:  
 Late flowering Montgomery Red. Previous crop: Barley.

## Wheat.

Ploughed: July 20. Harrowed: Aug 24. Ploughed: Aug 25 and  
 again Oct 5. Springtined: Oct 31. Harrowed, seed drilled,  
 autumn fertilizers applied, harrowed in: Nov 1. Tractor  
 weeded: Mar 21. Sulphate of ammonia applied: Apr 12. Sprayed  
 with D.N.O.C.: June 5. Harvested: Aug 8. Variety: Squarehead's  
 Master 13/4. Previous crop: Clover.

## Potatoes.

Ploughed: Aug 31, Nov 2-3 and Jan 23. Springtined: Mar 21.  
 Harrowed: Mar 27. Rolled: Mar 30. Ridged, fertilizers  
 applied: Apr 3. Potatoes planted and covered in: Apr 4.  
 Rolled: Apr 12. Tractor weeded: May 11. Chain harrowed  
 ridges: May 15. Reridged: May 16. Chain harrowed: May 24.  
 Grubbed: June 7. Ridged: June 29. Hand weeded: July 14.  
 Sprayed with Perenox: July 22 and again Aug 4. Sprayed with  
 15% B.O.V. to kill off haulm: Sept 18. Lifted: Oct 4. Variety:  
 Majestic. Previous crop: Wheat.

Summary of ResultsMean 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 Response	Woburn Response	Rothamsted Response	Woburn Response
	Sugar Beet, roots (washed): tons per acre		Clover, hay: dry matter cwt per acre	
Yield	15.34	10.72	44.2	38.4
N	6.39	10.23	-16.4	9.8
P	-2.25	1.41	4.8	1.5
K	-1.66	-1.36	-10.0	-13.8
	Sugar Beet, tops: tons per acre		Wheat, grain: cwt per acre	
Yield	11.05	4.80	27.8	11.5
N	6.93	4.34	8.5	12.0
P	-3.55	0.02	-3.6	-1.6
K	-1.63	-0.56	-1.7	-0.5
	Sugar Beet, Sugar percentage		Wheat, straw: cwt per acre	
Yield	18.52	19.25	45.4	20.9
N	-1.29	0.48	24.3	28.7
P	0.87	0.22	-3.9	2.7
K	0.25	-0.98	-6.8	-6.2
	Sugar Beet, total sugar: cwt per acre		Potatoes, total tubers: tons per acre	
Yield	56.8	41.3	12.59	8.21
N	19.9	40.8	5.63	8.78
P	-5.7	6.1	-0.32	-0.15
K	-5.5	-7.5	0.97	-1.61
	Sugar Beet, plant number: thousands per acre		Potatoes, percentage ware	
Yield	22.4		90.0	92.3
N	-3.0		0.1	2.1
P	-1.9		-12.5	-0.1
K	-0.1		4.2	-1.7

50/Ba/4.5.

	Rothamsted Response	Woburn Response	Rothamsted Response	Woburn Response
	Barley, grain: cwt per acre		Rye, grain: cwt per acre	
Yield	28.3	20.7	34.9	26.0
N	10.7	28.0	14.3	22.1
P	2.1	3.1	1.3	3.6
K	-0.4	-3.1	-0.7	1.6
	Barley, straw: cwt per acre		Rye, straw: cwt per acre	
Yield	37.3	25.9	44.5	33.1
N	4.2	14.7	23.4	26.9
P	-5.1	1.7	-4.2	3.1
K	1.9	2.4	-1.4	-0.3



## DEEP CULTIVATION ROTATION EXPERIMENT

## The 7th Year

Deep ploughing, fertilizers and dung - Long Hoos I and II 1950.

For details of rotation and treatments etc see Appendix Z.

Area of each plot: 0.03125 acre. Area harvested: wheat, spring oats, barley, 0.02652 acre; ley 0.02750 acre; sugar beet (half plot), 0.01186 acre; potatoes (half plot), 0.01068 acre.

## Cultivations, etc:

## Sugar Beet (Series 2)

Artificials applied "early": Sept 7. Dung applied: Sept 12. Ploughed deep and shallow: Sept 13. Cultivated: Jan 16. Ploughed: Jan 17. Cultivated: Mar 21. Springtined: Mar 22. Harrowed: Mar 27. Artificials applied "late", ring rolled: Mar 28. Seed drilled and harrowed in: Mar 29. Rolled: Mar 30. Hoed: May 17. Singled: June 2-6. Hoed: June 6, 8 and 30, and July 13. Lifted: Nov 3. Variety: Klein E. Previous crop: Spring Oats.

## Barley (Series 3)

Ploughed: Dec 9-13. Slag applied: Mar 6. Springtined: Mar 8 and again Mar 11. Sulphate of ammonia applied, harrowed, seed drilled, harrowed in and rolled: Mar 10. Seeds mixture undersown, harrowed in and rolled: Mar 22. Harvested: Aug 1. Variety: Plumage Archer. Previous crop: Sugar Beet.

## Ley (Series 4)

Seeds mixture undersown in barley, harrowed in and rolled: Apr 14, 1949. Rolled: Mar 15, 1950. Cut: June 9. Seeds mixture per acre: 14 lb ryegrass (S24), 4 lb English red clover (Montgomery), 1 lb American Alsike Clover. Previous crop: Barley.

## Wheat (Series 5)

Deep ploughed: July 6-7. Shallow ploughed: July 9. Cultivated: Oct 13. Disced, rolled and springtined: Oct 14. Springtined: Oct 15. Harrowed: Oct 28. Seed drilled and harrowed in: Oct 29. Harrowed: Mar 16. Ring rolled: Apr 20. Sulphate of ammonia applied: May 3. Harvested: Aug 4. Variety: Yeoman. Previous crop: Ley.

## Potatoes (Series 1)

Artificials applied "early": Sept 7. Dung applied, deep and shallow ploughed: Sept 12. Cultivated: Jan 16. Ploughed: Jan 17-19. Cultivated: Mar 21. Springtined: Mar 22. Harrowed: Mar 27. Ring rolled twice and harrowed: Mar 28. Ridged: Apr 3. Artificials applied to ridges, planted and covered in: Apr 4. Rolled down ridges: Apr 6. Harrowed ridges: May 5. Grubbed: May 24. Hoed weeds: June 21. Earthed up: June 26. Sprayed with Perenox: July 24. Sprayed with Coppezan: Aug 18. Sprayed with B.O.V. 15% to kill off haulm: Sept 21. Lifted: Oct 9. Variety: Majestic. Previous crop: Wheat.

## Spring Oats (Series 6).

Ploughed: Oct 13 and again Jan 16-19. Springtined: Mar 8 and again Mar 10. Sulphate of ammonia and seed drilled, harrowed in: Mar 10. Ring rolled: Mar 11. Harvested: Aug 4. Variety: Star. Previous crop: Potatoes.

## Standard errors per plot:

Sugar beet	Total sugar,	whole plot, 3.06 cwt per acre or 4.5% (4 d.f.)
		sub-plot, 2.81 cwt per acre or 4.1% (7 d.f.)
	Tops,	whole plot, 1.52 tons per acre or 7.2% (4 d.f.)
		sub-plot, 0.670 tons per acre or 3.2% (6 d.f.)
Barley	Grain,	1.16 cwt per acre or 3.5% (4 d.f.)
Ley		7.60 cwt per acre or 15.2% (4 d.f.)
Wheat	Grain,	1.45 cwt per acre or 4.0% (4 d.f.)
Potatoes	Ware tubers,	whole plot, 0.604 tons per acre or 4.0% (4 d.f.)
		sub-plot, 1.07 tons per acre or 7.1% (7 d.f.)
Spring oats	Grain,	2.47 cwt per acre or 6.7% (4 d.f.)

Summary of Results

## Series 2: Sugar Beet

## Responses to treatments

	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pros.	Abs.	Pros.	Abs.	Pros.
Total Sugar: Mean yield 68.1 cwt per acre									
	(±1.53)			(±2.17)					
Ploughing deep-shallow	-4.0	-	-	-2.3	-5.7	-2.5	-5.5	-2.7	-5.3
Dung	6.6	8.3	4.9	-	-	9.5	3.7	5.8	7.4
Phosphate	0.6	2.1	-0.9	3.5	-2.3	-	-	0.4	0.8
Potash	1.0	2.3	-0.3	0.2	1.8	0.8	1.2	-	-

Roots (washed): Mean yield 19.91 tons per acre

Ploughing deep-shallow	-0.76	-	-	-0.37	-1.15	-0.63	-0.89	-0.46	-1.06
Dung	2.17	2.56	1.78	-	-	2.96	1.38	1.91	2.43
Phosphate	-0.01	0.12	-0.14	0.78	-0.80	-	-	-0.01	-0.01
Potash	0.23	0.53	-0.07	-0.03	0.49	0.23	0.23	-	-

Sugar Percentage: Mean 17.10

Ploughing deep-shallow	-0.36	-	-	-0.28	-0.44	-0.10	-0.62	-0.32	-0.40
Dung	-0.21	-0.13	-0.29	-	-	-0.16	-0.26	-0.18	-0.24
Phosphate	0.14	0.40	-0.12	0.19	0.09	-	-	0.09	0.19
Potash	0.06	0.10	0.02	0.09	0.03	0.01	0.11	-	-

Tops: Mean yield 21.04 tons per acre

	(±0.761)			(±1.076)					
Ploughing deep-shallow	2.27	-	-	1.80	2.74	1.13	3.41	2.30	2.24
Dung	3.66	3.19	4.13	-	-	3.86	3.46	4.59	2.73
Phosphate	-0.92	-2.06	0.22	-0.72	-1.12	-	-	-1.04	-0.80
Potash	0.58	0.61	0.55	1.51	-0.35	0.46	0.70	-	-

Plant Number: Mean 25.3 thousands per acre

Ploughing deep-shallow	1.2	-	-	0.8	1.6	1.8	0.6	1.6	0.8
Dung	-0.6	-1.0	-0.2	-	-	-0.7	-0.5	0.0	-1.2
Phosphate	0.4	1.0	-0.2	0.3	0.5	-	-	0.7	0.1
Potash	0.3	0.7	-0.1	0.9	-0.3	0.6	0.0	-	-

Noxious Nitrogen: Mean 30.3 mgs. %

Ploughing deep-shallow	2.3	-	-	0.6	4.0	-1.6	6.2	1.4	3.2
Dung	4.8	3.1	6.5	-	-	4.6	5.0	3.1	6.5
Phosphate	0.1	-3.8	4.0	-0.1	0.3	-	-	-3.8	4.0
Potash	-0.7	-1.6	0.2	-2.4	1.0	-4.6	3.2	-	-

## Series 2: Sugar Beet

	Phosphate Ploughed In seed in bed			Potash Ploughed In seed in bed			Mean
	None	(a)	(b) and (c)	None	(a)	(b) and (c)	
Total sugar: cwt per acre							
Shallow	69.1	73.3	68.9	68.9	70.8	71.7	70.1
Deep	66.5	66.8	64.5	66.2	65.0	67.0	66.1
No dung	63.1	69.0	64.1	64.7	64.7	65.1	64.8
Dung	72.5	71.2	69.3	70.4	71.1	73.6	71.4
Mean	67.8	70.1	66.7	67.6	67.9	69.3	68.1
Roots (washed): tons per acre							
Shallow	20.23	21.09	19.62	20.02	20.61	20.50	20.29
Deep	19.60	19.78	19.14	19.57	19.41	19.57	19.53
No dung	18.43	19.95	18.49	18.84	18.93	18.69	18.83
Dung	21.39	20.92	20.27	20.75	21.09	21.39	20.99
Mean	19.91	20.43	19.38	19.80	20.01	20.04	19.91
Sugar Percentage							
Shallow	17.08	17.40	17.56	17.23	17.18	17.48	17.28
Deep	16.98	16.88	16.84	16.91	16.75	17.11	16.92
No dung	17.11	17.28	17.32	17.16	17.07	17.42	17.20
Dung	16.95	17.01	17.08	16.98	16.85	17.17	17.00
Mean	17.03	17.14	17.20	17.07	16.96	17.30	17.10
Tops: tons per acre							
Shallow	20.94	18.93	18.83	19.61	20.09	20.33	19.91
Deep	22.07	22.28	22.29	21.90	22.54	22.37	22.18
No dung	19.58	19.32	18.39	18.46	20.47	19.47	19.21
Dung	23.43	21.90	22.73	23.05	22.16	23.23	22.87
Mean	21.50	20.61	20.56	20.76	21.31	21.35	21.04

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	1.53	1.41	1.83
Tops	0.761	0.335	0.797

Series 2: Sugar Beet

50/Bb/1.5

	None	Phosphate		None	Potash		Mean
		Ploughed in	In seed bed		Ploughed in	In seed bed	

Plant Number: thousands per acre

Shallow	24.2	24.9	25.5	24.4	24.7	25.4	24.7
Deep	26.0	26.7	25.0	26.0	26.3	25.4	25.9
No dung	25.5	26.5	25.1	25.2	26.5	25.6	25.6
Dung	24.8	25.1	25.5	25.2	24.6	25.2	25.0
Mean	25.1	25.8	25.3	25.2	25.5	25.4	25.3

Noxious Nitrogen: mg. %

Shallow	31.1	28.8	25.8	30.0	30.2	26.5	29.2
Deep	29.5	36.2	30.8	31.4	33.8	29.5	31.5
No dung	28.0	30.0	25.8	29.1	27.0	26.5	27.9
Dung	32.6	35.0	30.8	32.2	37.0	29.5	32.8
Mean	30.3	32.5	28.2	30.7	32.0	28.0	30.3

Series 3: Barley

Responses to treatments

	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Grain: Mean yield 33.1 cwt per acre									
(±0.58) (±0.82)									
Ploughing deep-shallow	-0.1	-	-	-1.5	1.3	0.1	-0.3	-0.2	0.0
Dung	1.3	-0.1	2.7	-	-	1.3	1.3	1.0	1.6
Phosphate	0.1	0.3	-0.1	0.1	0.1	-	-	1.2	-1.0
Potash	-0.1	-0.2	0.0	-0.4	0.2	1.0	-1.2	-	-

Straw: Mean yield 46.5 cwt per acre

Ploughing deep-shallow	-0.5	-	-	-0.7	-0.3	-1.2	0.2	0.1	-1.1
Dung	3.2	3.0	3.4	-	-	3.1	3.3	3.8	2.6
Phosphate	-1.0	-1.7	-0.3	-1.1	-0.9	-	-	0.8	-2.8
Potash	0.4	1.0	-0.2	1.0	-0.2	2.2	-1.4	-	-

## Series 4: Ley

## Responses to treatments

	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Hay: Mean yield 50.1 cwt per acre									
	(±3.80)				(±5.37)				
Ploughing deep-shallow	-8.8	-	-	-10.4	-7.2	-13.3	-4.3	-10.7	-6.9
Dung	3.7	2.1	5.3	-	-	3.9	3.5	5.3	2.1
Phosphate	4.7	0.2	9.2	4.9	4.5	-	-	6.6	2.8
Potash	6.1	4.2	8.0	7.7	4.5	8.0	4.2	-	-

## Series 5: Wheat

## Responses to treatments

	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Grain: Mean yield 36.6 cwt per acre									
	(±0.72)				(±1.02)				
Ploughing deep-shallow	0.1	-	-	-0.4	0.6	-0.1	0.3	-1.2	1.4
Dung	0.6	0.1	1.1	-	-	1.6	-0.4	1.9	-0.7
Phosphate	1.0	0.8	1.2	2.0	0.0	-	-	1.0	1.0
Potash	0.2	-1.1	1.5	1.5	-1.1	0.2	0.2	-	-

Straw: Mean yield 56.1 cwt per acre

Ploughing deep-shallow	3.8	-	-	2.5	5.1	5.5	2.1	3.0	4.6
Dung	1.3	0.0	2.6	-	-	2.8	-0.2	2.8	-0.2
Phosphate	1.4	3.1	-0.3	2.9	-0.1	-	-	1.1	1.7
Potash	-0.3	-1.1	0.5	1.2	-1.8	-0.6	0.0	-	-

## Series 1: Potatoes

## Responses to treatments

	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Ware Tubers: Mean yield 15.13 tons per acre									
	(±0.302)								
Ploughing deep-shallow	0.19	-	-	0.21	0.17	0.62	-0.24	0.52	-0.14
Dung	2.37	2.39	2.35	-	-	2.49	2.25	4.41	0.33
Phosphate	0.38	0.81	-0.05	0.50	0.26	-	-	0.97	-0.21
Potash	2.04	2.37	1.71	4.08	0.00	2.63	1.45	-	-

Percentage ware: Mean 88.9

Ploughing deep-shallow	-0.1	-	-	2.0	-2.2	-1.1	0.9	1.0	-1.2
Dung	0.7	2.8	-1.4	-	-	-0.1	1.5	3.3	-1.9
Phosphate	-0.5	-1.5	0.5	-1.3	0.3	-	-	-0.3	-0.7
Potash	0.9	2.0	-0.2	3.5	-1.7	1.1	0.7	-	-

	None	Phosphate		None	Potash		Mean
		Ploughed in	In ridges		Ploughed in	In ridges	

Ware Tubers: tons per acre

	(a)	(b) and (c)		(a)	(b) and (c)		
Shallow	14.63	15.29	15.60	13.85	16.39	16.05	15.04
Deep	15.25	14.99	15.41	14.37	15.43	16.72	15.23
No dung	13.70	14.11	14.28	11.91	16.08	15.89	13.95
Dung	16.18	16.16	16.73	16.32	15.74	16.89	16.32
Mean	14.94	15.14	15.51	14.11	15.91	16.39	15.13

Percentage ware

Shallow	89.7	88.6	88.0	88.0	89.6	90.5	89.0
Deep	88.6	89.0	89.3	89.0	87.8	89.8	88.9
No dung	89.2	88.5	87.4	86.8	90.0	90.8	88.6
Dung	89.1	89.1	89.8	90.1	87.4	89.5	89.3
Mean	89.2	88.8	88.6	88.5	88.7	90.1	88.9

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

Standard errors (a) ±0.302 (b) ±0.537 (c) ±0.485

## Series 6: Oats

## Responses to treatments

	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Grain: Mean yield 37.0 cwt per acre									
	(±1.24)			(±1.75)					
Ploughing									
deep-shallow	-2.3	-	-	-2.7	-1.9	-1.8	-2.8	-2.8	-1.8
Dung	0.5	0.1	0.9	-	-	0.8	0.2	0.1	0.9
Phosphate	-0.1	0.4	-0.6	0.2	-0.4	-	-	-0.4	0.2
Potash	0.5	0.0	1.0	0.1	0.9	0.2	0.8	-	-
Straw: Mean yield 53.2 cwt per acre									
Ploughing									
deep-shallow	-1.4	-	-	0.3	-3.1	-2.0	-0.8	-0.7	-2.1
Dung	5.2	6.9	3.5	-	-	5.2	5.2	7.8	2.6
Phosphate	1.4	0.8	2.0	1.4	1.4	-	-	0.9	1.9
Potash	1.0	1.7	0.3	3.6	-1.6	0.5	1.5	-	-



## LEY AND ARABLE ROTATIONS

Highfield and Fosters Field - 1950

For details of treatments and rotations etc. see Appendix Z.

Cultivations, etc.:

## Highfield

Wheat (Blocks 6 & 7). Ploughed: Oct 18-27. 1st application of ground chalk: Oct 27. Rolled and disced: Oct 27-28. Disced and harrowed: Oct 29. 2nd and 3rd applications of ground chalk: Nov 18 and 19. Seed drilled, basal fertilizer applied and harrowed in: Oct 31. Dusted against wireworm: Feb 14. Harrowed and ring rolled: Apr 6. Nitrochalk applied: Apr 15. Weeded: June 16. Harvested: Aug 11. Variety: Yeoman.

Potatoes (Blocks 1-4). Ploughed: Sept 1 and Jan 10-11. Springtined: Mar 21. Cultivated and harrowed: Mar 28. Ring rolled: Mar 30. Ridged: Apr 4. Dung, sulphate of ammonia and basal fertilizers applied, potatoes planted and covered in: Apr 5. Ridges rolled: Apr 8. Ridges harrowed: May 5 and again May 10. Grubbed: June 1. Hoed: June 21-22. Earthed up: June 26. Sprayed with Perenox: July 27. Sprayed with Coppesol: Aug 19. Sprayed with 15% B.O.V. to kill off haulm: Sept 27. Lifted: Oct 13. Variety: Majestic.

Hay, Cut Grass, Grazed Ley, Reseeded Grass and Lucerne, all 1st year (Blocks 5 and 8, Reseeded Grass 5-8). Ploughed: Oct 18-27. Ground chalk applied: Oct 27. Ring rolled and disced: Oct 27-28. Disced and harrowed: Oct 29. Ground chalk applied: Nov 18 and 19. Springtined: Mar 21. Basal fertilizer applied: Mar 22. Harrowed: Mar 23. Nitrochalk applied (none to Lucerne): Mar 28.

Hay. Harrowed, rolled, seeds sown, harrowed and rolled in: Mar 25.  
Cut: July 13.

Cut Grass. Harrowed, rolled, seeds sown, harrowed and rolled in: Mar 25. Cut 5 times: June 15, July 11, Aug 2, Aug 31, Oct 5. Nitrochalk applied after each cut except the last. Topped: Nov 15.

Grazed Ley. Harrowed: Mar 28. Rolled: Mar 30. Seeds sown, harrowed and rolled in: Apr 6. Nitrochalk applied: July 13. Grazed: 7 circuits June - Nov.

Reseeded Grass. Grazed: 7 circuits June - Nov.

Lucerne. Drilled: Mar 22. Cut: 3 times, June 20, Aug 1, Oct 5. Variety: Du Puits.

Permanent Grass. 1st year (Blocks 5-8). Three applications of ground chalk: Oct 27, Nov 18 and 19. Basal fertilizer applied: Jan 14. 1st application of nitrochalk: Mar 28. Rolled: Mar 29. 2nd application of nitrochalk: July 4-7. Grazed: 6 circuits June - Nov.

Cut Grass. 2nd year (Blocks 2 and 3). Basal fertilizers applied: Jan 14. Nitrochalk applied: Mar 28. Rolled: Mar 29. Cut 8 times: Apr 22, May 10, May 30, June 20, July 11, Aug 2, Aug 31, Oct 5. Nitrochalk applied after each of the first 5 cuts.

Grazed Ley and Reseeded Grass. 2nd year (Blocks 2 and 3). Basal fertilizer applied: Jan 14. Nitrochalk applied: Mar 28. Rolled: Mar 29. Topped after grazing: May 27, June 21. Nitrochalk applied: July 10-12. Grazed: Ley - 8 circuits, Reseeded - 9 circuits June-Nov.

Lucerne. 2nd year (Blocks 2 and 3). Basal fertilizer applied: Jan 14. Hoed and weeded: Apr 20. Cut 3 times: June 20, Aug 1, Oct 5.

Permanent Grass. 2nd year (Blocks 1-4). Basal fertilizers applied: Jan 14. 1st application of nitrochalk: Mar 28. Rolled: Mar 29. 2nd application of nitrochalk: July 10-12. Grazed: 7 circuits June - Nov.

### Fosters

Wheat (Blocks 8 and 9). Ploughed: Oct 17-27. Harrowed, seed and basal fertilizers drilled and harrowed in: Oct 31. Nitrochalk applied: Apr 14. Rolled: Apr 25. Sprayed with D.N.O.C.: May 10. Weeded: June 16-20. Harvested: Aug 11. Variety: Yeoman.

Potatoes (Blocks 1-4). Ploughed wheat stubble: Aug 29-30. Ploughed hay stubble: Sept 5-6. Springtined: Mar 18. Cultivated: Mar 27. Harrowed twice: Mar 28. Ring rolled: Mar 29. Ridged: Apr 3. Dung sulphate of ammonia applied and basal fertilizers drilled: Apr 4. Potatoes planted and covered in: Apr 5. Rolled ridges: Apr 6. Chain harrowed: May 5 and again May 10. Grubbed: May 25. Hoed: June 20-21. Earthed up: June 26. Sprayed with Perenox: July 25. Sprayed with Coppesant Aug 4 and again Aug 18. Weeded: Sept 4-5. Sprayed with 20% B.O.V. to kill off haulm: Sept 25. Lifted: Oct 9-10. Variety: Majestic.

Hay, Cut Grass, Grazed Ley, Reseeded Grass and Lucerne, all 1st year (Blocks 5 and 7, Reseeded Grass 5, 7, 8 and 9). Ploughed: various days Oct 17-27. Springtined: Mar 18. Basal fertilizers applied, harrowed, rolled and harrowed: Mar 21-22. Nitrochalk applied (none to lucerne): Mar 29.

Hay. Rolled, seeds sown, harrowed and rolled in: Mar 24. Weeded: June 12-14. Cut: Aug 10.

Cut Grass. Rolled, harrowed, seeds sown, harrowed and rolled in: Mar 22. Weeded: June 12-14. Cut 4 times: July 10, Aug 3, Aug 30, Oct 6. Nitrochalk applied after each cut except the last.

Grazed Ley. Seeds sown: Apr 4. Harrowed and rolled in: Apr 5. Nitrochalk applied: July 10. Topped: July 12 and Nov 14. Grazed: 4 circuits June - Oct.

Reseeded Grass. Seeds sown: Apr 4. Harrowed and rolled in: Apr 5. Topped: July 12 and Nov 14. Nitrochalk applied: July 25. Grazed: 4 circuits June - Oct.

Lucerne. Harrowed, rolled, seeds sown: Mar 27. Rolled in:  
 Mar 29. Hoed and weeded: Apr 21. Dusted with D.D.T. powder:  
 Apr 27. Hoed: June 13. Weeded: June 12-14. Cut twice:  
 July 31, Oct 6. Variety: Du Puits.

Cut Grass. 2nd year (Blocks 2 and 4). Owing to poor plant it was decided to resow. Ploughed: Jan 13. Springtined: Mar 18. Basal fertilizer applied, harrowed, rolled and harrowed: Mar 21. Rolled, seeds sown, harrowed and rolled in: Mar 22. Nitrochalk applied:  
 Mar 29. Weeded: June 10-14. Cut: 4 times July 10, Aug 3, Aug 30, Oct 6. Nitrochalk applied after each cut except the last.

Grazed Ley and Reseeded Grass. 2nd year (Blocks 2 and 4). Basal fertilizer applied: Jan 13. Nitrochalk applied: Mar 29. Rolled: Mar 30. Topped: May 16, June 7, June 23, July 12, Nov 14. 2nd application of nitrochalk: to Grazed Ley - July 14, to Reseeded Grass - July 25. Grazed: 5 circuits May - Oct.

Lucerne. 2nd year (Blocks 2 and 4). Basal fertilizer applied: Jan 13. Hoed and harrowed: Apr 1. Hoed and weeded: Apr 21-22. Cut: 3 times - June 16, July 31, Oct 6.

Standard errors per sub plot

Per $\frac{1}{4}$ plot. Wheat, grain.	Highfield:	1.72 cwt per acre or 5.8%	(23 d.f.)
	Fosters:	2.90 cwt per acre or 18.1%	(23 d.f.)
Potatoes, total tubers	Highfield:	0.941 tons per acre or 6.7%	(27 d.f.)
	Fosters:	0.896 tons per acre or 6.2%	(27 d.f.)
Hay, dry matter.	Highfield:	1.46 cwt per acre or 12.7%	(5 d.f.)
	Fosters:	1.33 cwt per acre or 8.6%	(5 d.f.)
Cut Grass, dry matter	Highfield:	3.47 cwt per acre or 5.1%	(10 d.f.)
	Fosters:	3.52 cwt per acre or 7.7%	(10 d.f.)
Per $\frac{1}{2}$ plot. Old Pasture, dry matter.	Highfield:	5.10 cwt per acre or 11.2%	(7 d.f.)
Ley and Reseeded grass, dry matter	Highfield:	3.40 cwt per acre or 7.8%	(11 d.f.)
	Fosters:	4.17 cwt per acre or 11.6%	(11 d.f.)

Wheat. cwt per acre	Highfield			Fosters		
	cwt N per acre			cwt N per acre		
	0.3	0.6	Mean	0.3	0.6	Mean
	$(\pm 0.43)$			$(\pm 0.73)$		
Grain	30.1	29.6	29.9	14.8	17.3	16.0
Straw	42.8	43.2	43.0	19.4	21.9	20.6

Potatoes

	Dung: tons per acre	cwt N per acre			cwt N per acre		
		0.5	1.0	mean	0.5	1.0	Mean
Total tubers tons per acre	None	14.19	13.56	13.88	14.15	14.09	14.12
		$(\pm 0.297)$			$(\pm 0.283)$		
	15	14.26	14.19	14.22	14.61	14.86	14.74
	Mean	14.23	13.87	14.05	14.38	14.48	14.43
		$(\pm 0.210)$			$(\pm 0.200)$		

Percentage Ware	None	81.4	83.6	82.5	87.5	85.2	86.4
	15	80.2	82.5	81.4	87.0	83.7	85.4
	Mean	80.8	83.1	81.9	87.3	84.4	85.9

Hay. Dry Matter: cwt per acre

	cwt N per acre			cwt N per acre		
	0.3	0.6	Mean	0.3	0.6	Mean
	11.1	11.9	11.5	14.3	16.7	15.5
	$(\pm 0.73)$			$(\pm 0.67)$		

Cut Grass Dry Matter: cwt per acre

	No. of cuts	cwt N per acre			No. of cuts	cwt N per acre		
		0.15	0.30	Mean		0.15	0.30	Mean
1st year	5	61.4	67.8	64.6	4	40.8	47.7	44.2
		$(\pm 1.74)$				$(\pm 1.76)$		
2nd year	8	66.3	78.6	72.4	4	42.8	51.9	47.3
Mean		63.8	73.2	68.5		41.8	49.8	45.8
		$(\pm 1.23)$				$(\pm 1.24)$		

		Highfield		Fosters	
		No. of cuts		No. of cuts	
<u>Lucerne.</u>	Dry Matter: cwt per acre				
1st year		2	51.3	2	46.2
2nd year		3	94.2	3	83.0

Grazed Plots. Estimates from Sample cuts of amount of Dry Matter cwt per acre, consumed by sheep.

	cwt N per acre			cwt N per acre		
	0.15	0.30	Mean	0.15	0.30	Mean
<u>Permanent Grass</u>			(±1.80)			
1st year blocks	40.2 (±2.55)	43.5	41.8			
2nd year blocks	49.0	49.7	49.4			
Mean	44.6 (±1.80)	46.6	45.6			
<u>Ley &amp; Reseeded Grass</u>			(±0.98)			(±1.20)
1st year	34.8 (±1.39)	36.4	35.6	32.8 (±1.70)	37.8	35.3
2nd year	52.0	51.8	51.9	36.3	36.7	36.5
Mean	43.4 (±0.98)	44.1	43.8	34.5 (±1.20)	37.2	35.9

Note. The estimates of Dry Matter calculated from the sheep weights were considered unreliable and have been omitted.

Mean Grazing Days per acre. (Mean of 1st and 2nd year blocks)

	Highfield			Fosters		
	cwt N per acre			cwt N per acre		
	0.15	0.30	Mean	0.15	0.30	Mean
Permanent Grass	2626	2667	2646			
Ley and Reseeded Grass	2309	2389	2349	1368	1393	1380

## GREEN MANURING EXPERIMENT

Woburn Stackyard - 1950, 14th year

For details of treatments etc. see Appendix Z.

## Cultivations, etc.:

Green manures (Upper half). Ryegrass and clover undersown in Barley: Mar 23. Ploughed Lupin, rape and fallow plots: Sept 7, Oct 5-6. Springtined: Nov 15. 3rd ploughing: Mar 1-2. Springtine and harrowed: Mar 24-25. Rolled rape and lupin plots: Mar 27. Fertilizers applied to green crops: Mar 28-29. Lupins drilled and rape sown, rolled and harrowed: Mar 29. Rape dusted with D.D.T: Apr 21. Lupin plots hoed: May 5 and 10. Fallow plots thistle barred and weeded, lupin plots weeded: May 11. Lupin plots hoed: June 9 and 16.

Cabbages (Upper half). Dung and straw applied to ryegrass, clover and fallow plots, ploughed, rolled, harrowed: May 23-24. Harrowed twice: June 21. Harrowed, rolled and applied manures to half plots for early planting: June 22. Cabbages planted and watered in: June 23-24. Dung and straw applied to rape and lupin plots, ploughed in, harrowed and rolled twice: June 29. Manures applied: June 30. Cabbages planted on rape and lupin plots and on "late" half plots, and watered in: July 4-6. Cabbages hoed: July 19, 24-25, Aug. 4, 8-15 and 18, Sept 12. Weeded: Sept 25-26. Harvested: Feb-Mar. Variety: January King. Previous crop: Barley.

Barley (Lower half). Ploughed: Mar 2-4. Chalk applied: Mar 10. Harrowed: Mar 11 and 16. Seed drilled and harrowed in: Mar 17. Rolled: Mar 18. Sulphate of ammonia applied; clover and ryegrass sown, all plots harrowed: Mar 22. Rolled: Mar 24. Harvested: Aug 10. Variety: Plumage Archer. Previous crop: Cabbages.

## Standard Errors per plot:

Cabbages, total yield. Whole plot: 0.560 tons per acre or 8.4% (8 d.f.)  
Sub-plot: 0.432 tons per acre or 6.5% (16 d.f.)

Barley, grain. 4.00 cwt per acre or 20.9% (9 d.f.)

Note

The Cabbages were severely infected with club root and the total weight has been corrected to allow for this.

## Upper Half - Cabbage

	None	Lupins	Clover	Rape	Rye- grass	Mean
Total weight: tons per acre ( $\pm 0.280$ )						( $\pm 0.125$ )
No Dung	5.15	5.92	7.53	6.00	5.29	5.98
Dung	6.74	7.45	8.90	6.22	7.44	7.35
No Straw	5.75	7.00	7.84	6.33	6.75	6.73
Straw	6.14	6.37	8.58	5.89	5.98	6.59
Sulph. amm.						
2 cwt per acre	5.66	6.71	8.13	6.06	5.98	6.51
4 cwt per acre	6.24	6.66	8.30	6.17	6.75	6.82
Sulph. amm. to barley*						
Low	5.61	6.67	7.86	6.05	6.28	6.49
High	6.28	6.70	8.57	6.17	6.45	6.83
-----						
Time of Planting			(a) and (b)			( $\pm 0.088$ )
Early	6.02		8.58		6.49	7.03
Late	5.87		7.85		6.24	6.65
Mean ( $\pm 0.198$ )	5.95	6.68	8.22	6.11	6.37	6.66

(a)  $\pm 0.153$  for use in vertical comparisons only.

(b)  $\pm 0.226$  for use in all others.

## Total number: thousands per acre

No Dung	17.8	17.7	17.8	17.2	17.6	17.6
Dung	18.0	17.8	17.1	18.2	17.8	17.8
No Straw	17.9	18.1	17.6	18.0	18.0	17.9
Straw	17.9	17.5	17.2	17.4	17.4	17.5
Sulph. amm.						
2 cwt per acre	17.8	17.9	17.2	18.2	17.9	17.8
4 cwt per acre	18.0	17.6	17.6	17.1	17.5	17.6
Sulph. amm. to barley*						
Low	17.7	17.6	17.6	17.4	18.0	17.7
High	18.1	18.0	17.2	17.8	17.4	17.7
-----						
Time of Planting						
Early	17.6		17.0		17.6	17.4
Late	18.1		17.8		17.8	17.9
Mean	17.9	17.8	17.4	17.6	17.7	17.7

\* Sulphate of ammonia to barley and green manure crops, 1949.

Differential Responses

Mean	Dung		Straw		Sulph. Amm. cwt per acre		Sulph. Amm. Barley		Time of planting	
	Abs.	Pres.	Abs.	Pres.	2	4	Low	High	Early	Late

Total weight: tons per acre											
Total number: thousands per acre											
S.E. of horizontal difference between two responses ( $\pm 0.193$ )											
( $\pm 0.177$ )	1.37	-	1.26	1.48	1.54	1.20	1.50	1.24	1.53	1.87	( $\pm 0.202$ ) <sup>*</sup>
	-0.14	-0.03	-	-	0.08	-0.36	-0.64	0.36	0.02	0.22	
	0.32	0.15	0.54	0.10	-	-	0.49	0.15	0.29	0.73	
	0.34	0.21	-0.16	0.84	0.51	0.17	-	-	0.54	0.50	
( $\pm 0.097$ )	-0.38	-0.21	-0.48	-0.28	-0.60	-0.16	-0.36	-0.40	-	-	

\*S.E. of horizontal difference between two responses ( $\pm 0.193$ )

Dung	0.2	-	0.1	0.3	-0.1	0.5	0.4	0.0	-0.5	0.3	
Straw	-0.4	-0.3	-	-	-0.3	-0.5	-0.3	-0.5	-0.7	0.1	
Sulph. Amm.	-0.2	0.1	-0.1	-0.3	-	-	-0.6	0.2	0.0	0.2	
Sulph. Amm. to Barley	0.1	-0.1	0.2	0.0	-0.3	0.5	-	-	-0.3	-0.1	
Late-Early Planting	0.5	0.9	0.1	0.9	0.4	0.6	0.4	0.6	-	-	



## Lower Half - Barley

Green Manure Crops	None	Lupins	Clover	Rape	Rye- grass	Mean
Grain: cwt per acre ( $\pm 2.00$ )						( $\pm 0.89$ )
No Dung to cabbages 1949	22.7	19.2	13.3	18.4	14.6	17.6
Dung to cabbages	22.1	23.6	16.2	21.4	19.8	20.6
No straw to cabbages 1949	22.3	20.6	14.5	20.2	17.9	19.1
Straw to cabbages	22.5	22.2	15.0	19.6	16.6	19.2
Sulph. Amm. to cabbages 1949						
2 cwt per acre	21.8	20.8	12.9	19.6	17.0	18.4
4 cwt per acre	22.9	22.1	16.6	20.2	17.5	19.9
Sulph. Amm. to barley						
Nil	20.5	19.6	13.4	18.8	14.4	17.3
$1\frac{1}{2}$ cwt per acre	21.2	23.2	16.0	21.0	20.1	20.9
Mean ( $\pm 1.41$ )	22.4	21.4	14.7	19.9	17.2	19.1
Straw: cwt per acre						
No Dung to cabbages 1949	23.3	19.8	19.0	21.2	20.5	20.8
Dung to cabbages	25.0	27.7	22.5	25.0	27.9	25.6
No straw to cabbages 1949	23.8	22.3	21.0	23.4	24.3	23.0
Straw to cabbages	24.6	25.2	20.6	22.8	24.1	23.4
Sulph. Amm. to cabbages 1949						
2 cwt per acre	23.1	24.2	19.6	23.1	24.4	22.9
4 cwt per acre	25.2	23.4	21.9	23.1	24.0	23.5
Sulph. Amm. to barley						
Nil	20.6	21.5	16.6	21.3	23.2	20.7
$1\frac{1}{2}$ cwt per acre	27.7	26.0	24.9	25.0	25.2	25.8
Mean	24.2	23.8	20.8	23.1	24.2	23.2

## Lower Half - Barley

Mean	Dung to Cabbages Abs. Pres.		Straw to Cabbages Abs. Pres.		Sulph. amm. to cabbages cwt per acre		Sulph. amm. to barley cwt per acre	
	2	4	0	1½				

## Grain: cwt per acre

(+1.26)

(+1.81)

Dung to Cabbages 1949	3.0	-	-	2.8	3.2	3.0	3.0	2.8	3.2
Straw to Cabbages 1949	0.1	-0.1	0.3	-	-	-1.2	1.4	0.8	-0.6
Sulph. amm. to Cabbages 1949	1.5	1.5	1.5	0.2	2.8	-	-	1.9	1.1
Sulph. amm. to barley	3.6	3.4	3.8	4.3	2.9	4.0	3.2	-	-

## Straw: cwt per acre

Dung to Cabbages 1949	4.8	-	-	3.7	5.9	5.7	3.9	4.1	5.5
Straw to Cabbages 1949	0.5	-0.6	1.6	-	-	-0.6	1.6	-0.1	1.1
Sulph. amm. to Cabbages 1949	0.7	1.6	-0.2	-0.4	1.8	-	-	1.9	-0.5
Sulph. amm. to barley	5.1	4.4	5.8	4.5	5.7	6.3	3.9	-	-

## LEY AND ARABLE ROTATIONS

Woburn, Stackyard - 1950.

For details of rotations, etc. see Appendix Z.

Cultivations, etc.:

Block I. Potatoes. Ploughed: Nov 1-2, Jan 24-25, and Mar 5.  
Springtined and rolled: Mar 30. Ridged: Apr 3. Dung  
applied: Apr 2-5. Potatoes planted and covered in, basal  
fertilizer applied: Apr 5. Rolled down ridges: Apr 12.  
Tractor weeded: May 11. Harrowed: May 15. Ridged: May 16.  
Harrowed: May 24. Grubbed: June 7. Ridged: June 29.  
Thistles pulled: July 14-17. Sprayed with Perenox: July 22  
and again Aug 4. Sprayed with 15% B.O.V. to kill off haulm:  
Sept 18. This was ineffective so sprayed with 20% B.O.V.:  
Sept 23. Lifted: Oct 3-4. Variety: Majestic. Previous  
crops: Ley, lucerne, hay, sugar beet.

Block II. Barley. Ploughed: Sept 26. and Jan 20. Ground chalk (8.1  
cwt CaO per acre) applied: Feb 27. Springtined: Mar 7.  
Basal fertilizers applied: Mar 15. Harrowed, seed drilled and  
harrowed in: Mar 16. Rolled: Mar 17. Rows patched: Apr 21.  
Sprayed with D.N.O.C.: June 5. Harvested: Aug 10. Variety:  
Plumage Archer. Previous crop: Potatoes.

Block III. Ley. Third year. Grazed by sheep: Apr 24-28, May 7-15,  
May 30 - June 7, June 15-19, July 11-18, July 28 - Aug 1,  
Aug 17-19, Aug 31 - Sept 3, Sept 14-15 and Oct 3-7.

Lucerne. Third year. Harrowed: Jan 19. Hoed: Feb 17.  
Weeded: Feb 18 and Mar 10. Harrowed: Mar 24-25. Harrowed  
three times: Apr 5. Hoed: Apr 21. First cut: June 20.  
Second cut: July 31. Third cut: Oct 4.

Hay. Seeds mixture undersown in rye: Mar 30. Rolled:  
Mar 27. First dressing of nitrochalk applied: Mar 28. First  
cut: June 20. Second dressing of nitrochalk applied: June 22.  
Second cut: Aug 30. Seeds mixture: Late flowering Montgomery  
Red Clover (12 lb. per acre); Perennial Ryegrass (24 lb. per  
acre) and American Alsike Clover (3 lb. per acre). Previous  
crop: Rye.

Sugar beet. Ploughed: Sept 6 and Jan 20. Springtined:  
Mar 7, 24 and 25. Rolled: Mar 27. Nitrate of soda applied:  
Mar 28. Seed drilled: Mar 29. Hoed: May 11. Singled:  
May 31. Hoed: June 7 and 15. Lifted: Oct 5. Variety:  
Klein E. Previous crop: Rye.

Block IV. Ley. First year. Ploughed: Sept 6 and Jan 19. Spring-  
tined: Mar 7 and 24. Harrowed: Mar 25. Rolled: Mar 27.  
Seed sown, harrowed and rolled in: Mar 28. Fertilizers  
applied: Apr 3. Topped: June 15. Grazed by sheep; June 12-15;  
June 23-26, July 22-26. Aug 8-12, Sept 5-8 and Oct 10-12.  
Seeds mixture: S23 Perennial Ryegrass (21 lb. per acre);  
S143 Cocksfoot (12 lb. per acre); Late flowering Montgomery Red  
Clover (6 lb. per acre); S100 White Clover (3 lb per acre).  
Previous crop: Barley.

Lucerne. First year. Ploughed: Sept 16 and Jan 19. Springtined: Mar 7 and 24. Harrowed: Mar 25. Rolled: Mar 27. Seed drilled and rolled in: Mar 28. Fertilizers applied: Apr 3. Dusted with D.D.T.: May 10. Plots 55 and 56 (Arable with Hay rotation) spoilt by tornado: May 21. Plots 55 and 56. Thistle barred: May 30. Harrowed, rolled, seed redrilled and rolled in: May 31. Dusted with D.D.T.: June 7. Hoed and weeded: June 21-22. Hoed: Aug 16. First cut: Aug 30. Second cut: Oct 4.

Plots 59 and 60. (Lucerne Rotation). Hoed: June 2. First cut: June 30. Second cut: Oct 4.

Variety: Du Puit. Previous crop: Barley.

Potatoes. Ploughed: Sept 16 and Jan 19. Springtined: Mar 7 and 24. Harrowed: Mar 25. Rolled: Mar 30. Ridged, fertilizers applied: Apr 3. Potatoes planted: Apr 4. Covered in: Apr 5. Rolled down ridges: Apr 12. Tractor weeded: May 11. Harrowed: May 15. Ridged: May 17. Harrowed: May 31. Grubbed: June 7. Ridged: June 29. Sprayed with Perenox: June 22 and Aug 4. Sprayed with 15% B.O.V. to kill off haulm: Sept 18. Lifted: Oct 2. Variety: Majestic. Previous crop: Barley.

Block V. Ley. Second year. Rolled: Mar 30. 1 cwt Nitrochalk per acre applied: June 13. Grazed by sheep: Apr 28 - May 7, May 15-23, June 7 - 12, June 19-23, July 18-28, Aug 12-17, Sept 3-5, Sept 12-14 and Oct 7-10.

Lucerne. Second year. Harrowed: Jan 19. Hoed and weeded: Feb 15. Weeded: Mar 10. Hoed and harrowed: Mar 24. Hoed: Apr 21. First cut: June 20. Second cut: July 31. Third cut: Oct 4.

Rye. Ploughed: Sept 29. Springtined: Oct 31. Harrowed; seed sown: Nov 1. Harrowed in: Nov 2. Weeded: Mar 10. Rolled: Mar 18. 3 cwt Nitrochalk per acre applied, hay mixtures undersown on appropriate plots: Mar 28. Variety: King II. Previous crops: Ley, lucerne, potatoes.

Standard errors per plot:

Block I. Potatoes.

Total tubers:	whole plot,	1.12 tons per acre or 7.0% (4 d. f.)
	sub-plot,	0.358 tons per acre or 2.2% (4 d. f.)
Percentage ware:	whole plot,	1.24 (4 d. f.)
	sub-plot,	1.29 (4 d. f.)

Block II. Barley.

Grain:	whole plot,	3.62 cwt per acre or 21.9% (4 d. f.)
	sub-plot,	2.38 cwt per acre or 14.4% (3 d. f.)
Straw:	whole plot,	2.36 cwt per acre or 10.8% (4 d. f.)
	sub-plot,	1.60 cwt per acre or 7.3% (4 d. f.)

## Previous Rotation

	Ley	Lucerne	Arable with hay	Arable with sugar beet	Mean
Block I					
Potatoes. Total tubers: tons per acre					
No Dung ( $\pm 0.810$ ) <sup>(1)</sup>	14.94	15.02	13.40	12.26	13.90
Dung in 1950	18.66	18.74	17.73	16.55	17.92
Mean ( $\pm 0.790$ )	16.80	16.88	15.56	14.41	15.91
Increase ( $\pm 0.358$ )	3.72	3.72	4.33	4.29	4.02 ( $\pm 0.179$ )

## Potatoes: Percentage Ware

No Dung ( $\pm 1.09$ ) <sup>(1)</sup>	93.7	93.4	92.1	93.8	93.2
Dung in 1950	95.1	95.0	94.2	93.4	94.4
Mean ( $\pm 0.88$ )	94.4	94.2	93.2	93.6	93.8
Increase ( $\pm 1.29$ )	1.4	1.6	2.1	-0.4	1.2 ( $\pm 0.64$ )

## Block II

## Barley. Grain: cwt per acre

No Dung ( $\pm 2.82$ ) <sup>(1)</sup>	23.0	16.4	14.3	16.1	17.4
Dung in 1949	19.7	16.9	12.4	13.6	15.7
Mean ( $\pm 2.56$ )	21.3	16.6	13.4	14.9	16.5
Increase ( $\pm 2.38$ )	-3.3	0.5	-1.9	-2.5	-1.7 ( $\pm 1.19$ )

## Barley. Straw: cwt per acre

No Dung ( $\pm 1.85$ ) <sup>(1)</sup>	21.1	19.8	19.0	21.4	20.3
Dung in 1949	21.5	24.0	26.0	22.6	23.5
Mean ( $\pm 1.67$ )	21.3	21.9	22.5	22.0	21.9
Increase ( $\pm 1.60$ )	0.4	4.2	7.0	1.2	3.2 ( $\pm 0.80$ )

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

## Block III

Ley. 3rd YearSheep days of  
grazing per acreNo. of sheep  
carried per acre  
for the year

Mean

2089

5.7

Lucerne. 3rd Year

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

	1st Crop	2nd Crop	3rd Crop	Total
No Dung	1.86	1.60	0.78	4.24
Dung in 1946	2.27	1.86	0.90	5.03
Mean	2.07	1.73	0.84	4.64
Increase	0.41	0.26	0.12	0.79
Previous Rotation:				
Lucerne	1.84	1.58	0.80	4.22
Arable with hay	2.30	1.87	0.86	5.03

Hay

(85% dry matter): tons per acre

	1st Crop	2nd Crop	Total
No Dung	2.56	0.83	3.39
Dung in 1946	3.20	1.26	4.46
Mean	2.88	1.04	3.92
Increase	0.64	0.43	1.07
Previous Rotation:			
Lucerne	2.76	1.26	4.02
Arable with hay	2.98	0.84	3.82

Sugar Beet

	Clean Beet tons per acre	Tops tons per acre	Total Sugar cwt per acre	Sugar %
No Dung	13.41	8.02	50.6	18.87
Dung in 1946	14.90	8.80	57.9	19.44
Mean	14.16	8.41	54.3	19.16
Increase	1.49	0.78	7.3	0.57
Previous Rotation:				
Ley	14.48	9.03	55.6	19.18
Arable with sugar beet	13.84	7.79	53.0	19.12

## Block IV

Ley. 1st Year

	Sheep days of grazing per acre	No. of Sheep carried per acre for the year
Mean	1000	2.7

Potatoes

	Total tubers tons per acre	Percentage Ware
No Dung	11.79	91.3
Dung in 1948	14.82	92.8
Mean	13.30	92.0
Increase	3.03	1.5
Previous Rotation:		
Ley	15.20	93.4
Lucerne	13.27	92.6
Arable with hay	12.40	91.2
Arable with sugar beet	12.36	90.9

Lucerne. 1st Year

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

	1st Crop	2nd Crop	Total
No Dung	0.58	0.42	1.00
Dung in 1948	0.82	0.64	1.46
Mean	0.70	0.53	1.23
Increase	0.24	0.22	0.46
Previous Rotation:			
Lucerne	0.68	0.92	1.60
Arable with hay	0.71	0.13	0.84

## Block V

Ley. 2nd Year

	Sheep days of grazing per acre	No. of sheep carried per acre for the year
Mean	2217	6.1

Lucerne. 2nd Year

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

	1st Crop	2nd Crop	3rd Crop	Total
No Dung	1.61	1.56	0.74	3.91
Dung in 1947	1.92	1.63	0.82	4.37
Mean	1.77	1.60	0.78	4.15
Increase	0.31	0.07	0.08	0.46
Previous Rotation:				
Lucerne	1.70	1.62	0.77	4.09
Arable with sugar beet	1.84	1.58	0.78	4.20

Rye

	Grain: cwt per acre	Straw: cwt per acre
No Dung	34.7	43.1
Dung in 1947	34.5	45.4
Mean	34.6	44.2
Increase	-0.2	2.3
Previous Rotation:		
Ley	35.8	47.1
Lucerne	36.1	46.8
Arable with hay	33.7	41.6
Arable with sugar beet	32.8	41.5



## WOBURN MARKET GARDEN EXPERIMENT

Globe Beet and Green Peas. 1st crops of 9th year.

Organic manures and sulphate of ammonia - Lansome 1950.

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

Area of each plot: 0.0125 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 not receiving organic manures.

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.

Organics applied and ploughed in: Mar 22-24. Ground chalk applied to all plots receiving sulphate of ammonia (plots having 0.4 N at 11 cwt per acre, plots having 0.6 N at 17 cwt per acre, other plots at 6 cwt per acre): Mar 30. Springtine harrowed, rolled, harrowed and rolled, sulphate of ammonia applied (plots having 0.4 and 0.6 N receiving only half their total dressings), seed drilled and rolled in: Mar 31. Weeded and hoed: May 12, 17 and 24. Hoed: June 1-5 and 12. Singled: June 19-27. Second dressing of sulphate of ammonia applied to plots having 0.4 and 0.6 cwt N, and all plots hoed: June 28. Lifted: July 12-24. Variety: "Detroit"  
Previous crop: Leeks.

## Series B. Green Peas.

Organics applied and ploughed in: Mar 8-9. Harrowed twice, rolled and harrowed: Mar 18. Springtine harrowed and rolled: Mar 20. Harrowed, rolled, sulphate of ammonia applied (plots having 0.4 and 0.6 cwt N receiving only half their total dressings), peas drilled and rolled in: Mar 21. Hoed: Apr 20-21. Weeded: Apr 28. Second dressing of sulphate of ammonia applied to plots having 0.4 and 0.6 cwt N: June 12. Harvested: June 28-July 10. Variety: Kelvedon Wonder. Previous crop: Winter Cabbage.

## Standard errors per plot:

Globe Beet, total produce: 1.04 tons per acre or 13.9% (17 d.f.)  
weight of bulbs: 0.664 tons per acre or 16.1% (17 d.f.)  
plant number: 11.7 thousands per acre or 12.1% (17 d.f.)  
Green Peas, marketable produce: 11.3 cwt per acre or 22.2% (17 d.f.)

Summary of Results

## Globe Beet

Organic Manures	Level of manuring (tons/acre)	Sulphate of ammonia cwt N per acre				Mean
		None	0.2	0.4	0.6	
Total produce: Mean 7.49 tons per acre						
					(+0.739)	(+0.522)
None		3.30	5.20	7.06	6.96	4.25 <sup>±</sup>
Dung	15	6.14	8.28			7.21
	30	10.62	9.58			10.10
Sludge compost	15	6.38	6.12			6.25
	30	7.74	7.28			7.51
Sludge	15	8.08	9.12			8.60
	30	10.12	10.34			10.23
Vegetable compost	15	5.23	6.54			5.88
	30	7.56	8.18			7.88
Weight of bulbs: Mean 4.12 tons per acre						
					(+0.469)	(+0.332)
None		1.85	2.78	3.64	3.62	2.32 <sup>±</sup>
Dung	15	3.22	4.74			3.98
	30	5.86	5.48			5.66
Sludge compost	15	3.52	3.29			3.41
	30	4.34	4.10			4.22
Sludge	15	4.54	4.97			4.76
	30	5.85	5.76			5.81
Vegetable compost	15	2.84	3.41			3.12
	30	4.04	4.50			4.27
Plant number: Mean 97.1 thousands per acre						
					(+8.30)	(+5.87)
None		95.4	104.0	105.7	112.4	99.7 <sup>±</sup>
Dung	15	103.6	102.2			102.9
	30	105.4	97.2			101.3
Sludge compost	15	104.4	96.4			100.4
	30	103.8	83.6			93.7
Sludge	15	94.0	79.8			86.9
	30	84.8	86.6			85.8
Vegetable compost	15	98.0	100.8			99.4
	30	101.6	82.4			92.0

<sup>±</sup> Mean over None and 0.2 cwt N per acre only.

## Green Peas

50/Bf/1.3

Organic Manures	Level of manuring (tons/acre)	Sulphate of ammonia cwt N per acre				Mean
		None	0.2	0.4	0.6	
Marketable weight: Mean 50.8 cwt per acre						
(+8.00)						
None		45.0	32.8	45.7	52.8	38.9 <sup>*</sup>
Dung	15	68.5	64.2			66.4
	30	57.8	64.9			61.4
Sludge compost	15	51.4	43.9			47.6
	30	69.6	47.1			58.3
Sludge	15	27.5	49.2			38.4
	30	35.2	46.4			39.8
Vegetable compost	15	47.8	58.5			53.2
	30	56.4	53.5			55.0

\* Mean over None and 0.2 cwt N per acre only.

## WOBURN MARKET GARDEN EXPERIMENT

Leeks and Winter Cabbages 2nd Crops of 9th year.

Organic manures and sulphate of ammonia - Lansome 1950-51.

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

Area of each plot: 0.0125 acre.

## Treatments:

Organic manures applied to previous crops: Dung, sewage sludge compost, sewage sludge (West Middlesex), and vegetable compost, each of 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 not receiving organic manures.

Basal manuring: None.

## Cultivations, etc.:

## Series B. Leeks.

Ploughed and harrowed: July 12. Sulphate of ammonia applied, plots having 0.8 and 1.2 cwt N receiving only half their dressings: July 13. Leeks planted and watered in: July 13-18. Cultivated: July 27. Hoed: July 31-Aug 2, Aug 9, 10, 12-16. 25-30, Sept 1-2, 4-8 and 11. Replanted where necessary: Aug 21 and Sept 1. Second dressing of sulphate of ammonia applied to plots having 0.8 and 1.2 cwt N: Nov 17. Lifted: Feb 13-Mar 28. Variety: Musselburgh. Previous crop: Peas.

## Series A. Winter Cabbages.

Ploughed: July 27. Harrowed, rolled, sulphate of ammonia applied, plots having 0.8 and 1.2 cwt N receiving only half their dressings July 28. Cabbages planted and watered in: July 28-29. Replanted where necessary: Aug 8-9, 21 and Sept 21. Hoed: Aug 9-10 and Sept 2-4. Second dressing of sulphate of ammonia applied to plots having 0.8 and 1.2 cwt N: Nov 17. Lifted: Feb 23-Apr 10. Variety: January King. Previous crop: Globe Beet.

## Standard errors per plot:

Leeks,	total weight	9.40 cwt per acre or 8.8% (17 d.f.)
	plant number:	0.560 thousands per acre or 1.3% (" )
Winter Cabbages,	marketable weight:	0.662 tons per acre or 8.3% (" )
	plant number:	1.01 thousands per acre or 6.7% (" )

Summary of Results

Organic manures	Level of manuring tons per acre	Leeks				Mean
		None	0.4	0.8	1.2	
Total weight: cwt per acre						
			(±6.64)			(±4.70)
None		64.2	89.8	94.4	104.8	77.0*
Dung	15	96.8	105.2			101.0
	30	104.8	119.4			112.1
Sludge compost	15	96.3	123.1			109.7
	30	117.9	117.9			117.9
Sludge	15	112.2	114.4			113.3
	30	129.4	129.9			129.6
Vegetable compost	15	93.2	115.2			104.2
	30	96.2	107.4			101.8

Organic manures	Level of manuring tons per acre	Plant number: thousands per acre				Mean
		None	0.4	0.8	1.2	
Plant number: thousands per acre						
			(±0.40)			(±0.28)
None		43.2	42.5	42.4	42.8	42.8*
Dung	15	42.6	43.4			43.0
	30	43.0	42.2			42.6
Sludge compost	15	42.3	42.8			42.6
	30	43.6	41.9			42.8
Sludge	15	43.0	42.8			42.9
	30	42.4	42.4			42.4
Vegetable compost	15	42.8	42.9			42.9
	30	42.6	43.0			42.8

\* Mean over None and 0.4 cwt N per acre only.

## Winter Cabbages

Organic manures	Level of manuring tons per acre	Sulphate of Ammonia cwt N per acre				Mean
		None	0.4	0.8	1.2	
		Marketable weight: tons per acre				
		( $\pm 0.468$ )				( $\pm 0.331$ )
None		3.70	5.90	7.47	8.15	4.80 <sup>*</sup>
Dung	15	6.30	7.80			7.05
	30	8.02	9.24			8.63
Sludge compost	15	6.26	7.06			6.66
	30	7.52	10.64			9.08
Sludge	15	8.16	10.30			9.23
	30	11.57	10.67			11.12
Vegetable compost	15	5.60	7.71			6.65
	30	7.82	9.70			8.76

		Plant number: thousands per acre				
		( $\pm 0.71$ )				( $\pm 0.51$ )
None		11.6	13.4	15.1	15.6	12.5 <sup>*</sup>
Dung	15	14.6	15.5			15.1
	30	15.6	16.2			16.0
Sludge compost	15	13.7	14.9			14.3
	30	15.3	16.0			15.7
Sludge	15	14.8	16.2			15.5
	30	16.2	15.8			16.0
Vegetable compost	15	12.8	15.2			14.0
	30	15.2	16.6			15.9

\*Mean over None and 0.4 cwt N per acre only.

## WHEAT

## Control of "Eyespot"

Sulphate of ammonia, seed rates and spraying - Little Hoos 1950.

System of replication: 3 x 3 x 3 x 2 design in 6 blocks of 9 plots, certain three factor interactions and the effect of spraying being confounded with block differences. Three extra plots with no sulphate of ammonia were added to each block.

Area of each plot: 0.0797 acre.

Treatments: All combinations of

Sulphate of ammonia: Rates:  $1\frac{1}{2}$ , 3,  $4\frac{1}{2}$  cwt per acre ( $N_1, N_2, N_3$ )

Times of application: First week in March and at 5 weekly intervals ( $T_1, T_2, T_3$ )

Rate of sowing:  $1\frac{1}{2}$ ,  $2\frac{1}{2}$ ,  $3\frac{1}{2}$  bushels per acre ( $R_1, R_2, R_3$ )

Spraying: 3 blocks sprayed with 12% B.O.V. at 100 gallons per acre, beginning of March.

The 3 plots per block receiving no sulphate of ammonia were sown one at each seed rate.

Basal Manuring: 3 cwt superphosphate and 1 cwt muriate of potash per acre drilled across the plots.

Cultivations, etc.: Ploughed: Oct 14-16. Harrowed: Oct 15-17. Seed drilled and harrowed in: Nov 1. Basal fertilizers applied: Nov 2. Sprayed with 12% B.O.V.: Mar 3. First application of sulphate of ammonia: Mar 10. Ring rolled: Apr 3. Second application of sulphate of ammonia: Apr 14. Third application: May 17. Harvested: Aug 8. Variety: Squareheads Master 13/4. Previous crop: Wheat.

Standard errors per plot:

Grain: unsprayed blocks:	2.86 cwt per acre	or 15.3%	(19 d.f.)
sprayed blocks:	2.29 cwt per acre	or 14.5%	(19 d.f.)
Straw: unsprayed blocks:	3.75 cwt per acre	or 14.4%	(19 d.f.)
sprayed blocks:	2.53 cwt per acre	or 11.1%	(19 d.f.)

## Summary of Results

Grain: cwt per acre

	Unsprayed				Mean	Sprayed				Mean	Effect of Spraying
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>			R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>			
		( $\pm 1.65$ )			( $\pm 0.95$ )		( $\pm 1.32$ )			( $\pm 0.76$ )	( $\pm 1.22$ ) <sup>SE</sup>
T <sub>1</sub>	16.2	20.3	21.3		19.3	16.6	16.2	18.6		17.1	-2.2
T <sub>2</sub>	20.7	20.7	21.8		21.1	17.8	18.5	21.3		19.2	-1.9
T <sub>3</sub>	18.4	19.5	21.1		19.7	13.0	18.0	16.8		15.9	-3.8
Mean	18.4	20.2	21.4		20.0	15.8	17.6	18.9		17.4	
		( $\pm 0.95$ )					( $\pm 0.76$ )				
	N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>			N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>			
		( $\pm 1.65$ )					( $\pm 1.32$ )				
T <sub>1</sub>	15.6	21.7	20.5			14.4	19.4	17.6			
T <sub>2</sub>	19.3	21.6	22.3			19.8	18.8	18.9			
T <sub>3</sub>	20.5	17.1	21.3			14.9	16.9	16.0			
	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>		N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>		
		( $\pm 1.65$ )			( $\pm 0.82$ )		( $\pm 1.32$ )			( $\pm 0.66$ )	( $\pm 1.06$ ) <sup>SE</sup>
R <sub>1</sub>	14.7	17.7	18.4	19.3	17.5	8.1	16.3	15.4	15.7	13.9	-3.6
R <sub>2</sub>	14.4	18.4	20.8	21.3	18.7	11.7	16.1	19.2	17.5	16.1	-2.6
R <sub>3</sub>	14.2	19.4	21.2	23.6	19.6	13.8	16.8	20.5	19.3	17.6	-2.0
Mean	14.4	18.5	20.1	21.4	18.6	11.2	16.4	18.3	17.5	15.9	
		( $\pm 0.95$ )					( $\pm 0.76$ )				
	Effect of Spraying ( $\pm 1.22$ ) <sup>SE</sup>					-3.2	-2.1	-1.8	-3.9		

<sup>SE</sup>Standard error for use in testing differences between effects of spraying only.



Straw: cwt per acre

	Unsprayed				Mean	Sprayed				Mean	Effect of spraying
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>			R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>			
		(±2.17)			(±1.25)		(±1.46)			(±0.84)	(±1.51) <sup>SE</sup>
T <sub>1</sub>	24.3	29.3	31.6		28.4	25.7	24.3	26.4		25.4	-3.0
T <sub>2</sub>	29.0	30.0	33.1		30.7	26.9	26.8	30.4		28.0	-2.7
T <sub>3</sub>	24.7	26.1	27.5		26.1	21.6	24.3	22.9		23.0	-3.1
Mean	26.0	28.5	30.7		28.4	24.7	25.1	26.6		25.5	
		(±1.25)					(±0.84)				
	N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>			N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>			
		(±2.17)					(±1.46)				
T <sub>1</sub>	22.7	31.7	30.7			20.5	28.7	27.1			
T <sub>2</sub>	25.9	31.5	34.7			27.0	28.6	28.4			
T <sub>3</sub>	26.7	22.9	28.9			19.9	24.2	24.8			
	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>		N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>		
		(±2.17)			(±1.08)		(±1.46)			(±0.73)	(±1.31) <sup>SE</sup>
R <sub>1</sub>	18.8	23.4	25.8	28.8	24.2	12.7	22.8	24.9	26.5	21.7	-2.5
R <sub>2</sub>	18.8	25.5	29.6	30.4	26.1	14.6	21.5	27.5	26.3	22.5	-3.6
R <sub>3</sub>	18.5	26.4	30.7	35.1	27.7	18.0	23.1	29.1	27.5	24.4	-3.3
Mean	18.7	25.1	28.7	31.4	26.0	15.1	22.5	27.2	26.8	22.9	
		(±1.25)					(±0.84)				

Effect of Spraying (±1.51)<sup>SE</sup>      -3.6   -2.6   -1.5   -4.6

<sup>SE</sup> Standard error for use in testing differences between effects of spraying only.

## WHEAT

Residual effect of dung - Sawyers III 1950.

System of replication: 4 randomized blocks of 12 plots each.

Area of each plot: 0.0394 acre.

## Treatments:

Dung: None, 5, 10, 15 tons per acre applied to potatoes 1948-9.

Methods of application: Ploughed in, in winter (1948); ploughed in, in spring (1949); placed in ridges (1949).

Basal manuring: 2 cwt sulphate of ammonia per acre.

Cultivations, etc.: Ploughed: Oct 18-24. Harrowed, seed drilled:

Nov 3. Harrowed in: Nov 4. Harrowed and tractor rolled: Mar 28.

Sulphate of ammonia applied: May 2. Sprayed with D.N.O.C: May 18.

Harvested: Aug 12. Variety: Bersee. Previous crop: Potatoes.

Standard error per plot: Grain: 2.70 cwt per acre or 10.1% (35 d.f.)

Summary of Results

Method of application	Dung applied to potatoes 1948-9: tons per acre				Mean
	0	5	10	15	
	Grain: cwt per acre				
			(+1.35)		(+0.78)
Ploughed in, in winter		25.6	27.4	27.3	26.7
Ploughed in, in spring		26.7	26.5	27.2	26.8
Placed in ridges		24.7	27.5	28.6	26.9
Mean ( $\pm 0.78$ )	26.3	25.7	27.1	27.7	26.7
	Straw: cwt per acre				
Ploughed in, in winter		33.5	36.4	38.6	36.2
Ploughed in, in spring		35.5	34.0	39.7	36.4
Placed in ridges		33.9	36.4	39.8	36.7
Mean	34.5	34.3	35.6	39.3	35.9

## Wireworm Experiment (1)

Residual effects of insecticides - Little Hoose 1950.

System of replication: 3 randomized blocks of 9 plots each.

Area of each plot: 0.0269 acre.

Treatments - applied 1948.

None

D.D. injected 400 lb per acre.

Ethylene Dibromide 41% solution, injected 15 gallons per acre.

D.D.T. dust combine drilled,  $\frac{3}{4}$  cwt per acre.

Gammexane: broadcast, 2 cwt per acre; combine drilled,  $\frac{3}{4}$  cwt per acre; applied as seed dressing.

Basal Manuring:  $1\frac{1}{2}$  cwt superphosphate per acre combine drilled;  
 $2\frac{1}{2}$  cwt sulphate of ammonia per acre as top dressing.

Cultivations, etc.: Ploughed: Oct 13-17. Springtined, seed and superphosphate drilled, harrowed in: Oct 31 - Nov 1. Harrowed: Mar 31. Rolled: Apr 3. Sulphate of ammonia applied: May 3. Sprayed with D.N.O.C.: May 11. Harvested: Aug 10. Variety: Squareheads Master 13/4. Previous crop: Wheat.

Standard errors per plot:

Grain: 2.16 cwt per acre or 13.6% (18 d.f.)

Straw: 3.26 cwt per acre or 12.9% (18 d.f.)

Summary of Results

	Treatments applied in 1948							Mean
	Un-treated	D.D In-jected	Ethylene Dibromide Injected	D.D.T. Dust Drilled	Gammexane Broad-cast	Gammexane Drilled	Dusted seed	
	Grain: cwt per acre							
Mean	15.5 <sup>(1)</sup>	16.9	18.8	18.0	16.1	15.0	11.7	15.9
(±1.25)								
Increase		1.4	3.3	2.5	0.6	-0.5	-3.8	
(±1.44)								
	Straw: cwt per acre							
Mean	25.0 <sup>(2)</sup>	27.0	27.8	27.1	25.8	23.0	20.9	25.2
(±1.88)								
Increase		2.0	2.8	2.1	0.8	-2.0	-4.1	
(±2.17)								

Standard errors (1) ±0.72  
(2) ±1.09

Note: Wireworm counts were made on all plots and are available.

## WHEAT

## Wireworm Experiment (2)

Residual effect of Gammexane - Little Hoos 1950.

System of replication: 3 incomplete randomized blocks of 6 plots each.

Area of each plot: 0.0269 acre.

Treatments 1948 and 1949: None, seed dusted with gammexane dressing in 1948 only, in 1949 only, and in 1948 and 1949. Gammexane dust  $\frac{1}{4}$ ,  $\frac{1}{2}$ , and 1 cwt per acre in 1948, combine drilled with seed (filler added where necessary to make total dressing of 1 cwt per acre).

Basal manuring:  $1\frac{1}{2}$  cwt superphosphate per acre, combine drilled;  $2\frac{1}{2}$  cwt sulphate of ammonia per acre as top dressing.

Cultivations, etc.: Ploughed: Oct 13-17. Springtined, seed and superphosphate drilled, harrowed in: Oct 31 - Nov 1. Harrowed: Mar 31. Rolled: Apr 3. Sulphate of ammonia applied: May 3. Sprayed with D.N.O.C.: May 11. Harvested: Aug 10. Variety: Squareheads Master 13/4. Previous crop: Wheat.

Standard errors per plot:

Grain: 2.55 cwt per acre or 22.0% (9 d.f.)

Straw: 3.91 cwt per acre or 21.1% (9 d.f.)

Note: Wireworm counts were made on all plots and are available.

Summary of Results

1948 1949	Untreated		Dusted Seed		Gammexane dust cwt per acre		Mean Difference	
	Un- treated	Dusted Seed	Un- treated	Dusted Seed	$\frac{1}{4}$ Untreated	$\frac{1}{2}$ Untreated		
	11.4	11.5	8.1	7.6	13.3	15.7	17.2	
Mean		9.7				15.4	11.6	5.7(±1.28)
	Grain: cwt per acre							
		(±1.47)				(±1.88)		
	18.7	19.8	14.7	13.0	20.0	22.8	24.6	
Mean		16.5				22.5	18.5	6.0(±1.95)
	Straw: cwt per acre							
		(±2.26)				(±2.89)		

## WHEAT

Late application of nitrogen - West Barnfield I 1950.

System of replication: 4 randomized blocks of 4 plots each.

Area of each plot: 0.0187 acre.

## Treatments:

Nitrochalk: None, none but plots walked over as for broadcasting,  
 $1\frac{1}{2}$ , 3 cwt per acre applied as a top dressing.

Basal manuring:  $1\frac{3}{4}$  cwt sulphate of ammonia and 1 cwt superphosphate  
 per acre.

Cultivations, etc.: Ploughed: Sept 45-19. Rolled and springtine  
 harrowed: Oct 14. Harrowed: Oct 15. Seed and superphosphate  
 drilled and harrowed in: Oct 17. Harrowed: Mar 28. Rolled:  
 Mar 31. Sulphate of ammonia drilled: May 3. Sprayed with low  
 volume 2, 4-D: May 18. Nitrochalk applied by hand: June 28.  
 Harvested: Aug 14. Variety: Squareheads Master  $13/4$ . Previous  
 crop: Wheat.

## Standard errors per plot.

Grain: 2.59 cwt per acre or 10.0% (9 d.f.)

Straw: 8.25 cwt per acre or 16.3% (9 d.f.)

Summary of Results

	Nitrochalk: cwt per acre as top dressing				Mean
	None	None plots walked over	$1\frac{1}{2}$	3	
	cwt per acre				
Grain ( $\pm 1.30$ )	24.5	27.6	25.9	25.5	25.9
Straw ( $\pm 4.12$ )	49.0	51.7	51.3	50.6	50.7

Note

Analytical results showing increases in crude protein due to late nitrogen are given on page 116 of the Station's Annual Report for 1950.

## BARLEY

Late application of nitrogen - Long Hoos V 1950.

System of replication: 4 randomized blocks of 3 plots each.

Area of each plot: 0.0192 acre.

Treatments:

Nitrochalk: None,  $1\frac{1}{2}$ , 3 cwt per acre applied as a top dressing.

Basal manuring:  $1\frac{1}{2}$  cwt sulphate of ammonia per acre.

Cultivations, etc.: Ploughed: Sept 27-Oct 3. Springtime harrowed: Mar 8 and 11. Harrowed: Mar 13. Sulphate of ammonia drilled: Mar 14. Seed drilled, harrowed in and ring rolled: Mar 16. Sprayed with high volume 2, 4-D: May 12. Nitrochalk applied by hand: June 27. Harvested: Aug 8. Variety: Plumage Archer. Previous crop: Beans.

Standard errors per plot:

Grain: 1.51 cwt per acre or 6.6% (6 d.f.)

Straw: 2.16 cwt per acre or 7.4% (6 d.f.).

Summary of Results

	Nitrochalk: cwt per acre as top dressing			Mean
	None	$1\frac{1}{2}$	3	
	cwt per acre			
Grain ( $\pm 0.76$ )	22.7	22.7	23.1	22.9
Straw ( $\pm 1.08$ )	28.2	29.6	29.5	29.1

Note

Analytical results showing increases in crude protein due to late nitrogen are given on page 116 of the Station's Annual Report for 1950.

## SPRING OATS

Late application of nitrogen - Great Harpenden II 1950.

System of replication: 4 randomized blocks of 3 plots each.

Area of each plot: 0.0192 acre.

## Treatments:

Nitrochalk: None,  $1\frac{1}{2}$ , 3 cwt per acre as a top-dressing.

Basal Manuring: 2 cwt sulphate of ammonia, and  $1\frac{1}{4}$  cwt superphosphate per acre.

Cultivations, etc.: Ploughed: Sept 12-30, and again Dec 6-8.

Springtine harrowed both ways: Mar 14-15. Sulphate of ammonia drilled: Mar 18. Seed and superphosphate drilled and harrowed in: Mar 21-22. Ring rolled: Mar 25. Nitrochalk applied by hand: June 27. Harvested: Aug 10. Variety: Sun II. Previous crop: Wheat.

## Standard errors per plot:

Grain: 2.16 cwt per acre or 7.2% (6 d.f.)

Straw: 2.06 cwt per acre or 3.8% (6 d.f.)

Summary of Results

	Nitrochalk: cwt per acre as top dressing			Mean
	None	$1\frac{1}{2}$	3	
	cwt per acre			
Grain ( $\pm 1.08$ )	31.4	30.0	28.8	30.1
Straw ( $\pm 1.03$ )	53.9	54.1	53.0	53.7

Note

Analytical results showing increases in crude protein due to late nitrogen are given on page 116 of the Station's Annual Report for 1950.



## SPRING BEANS

Fertilizer placement - West Barnfield II 1950.

System of replication: 2 randomized blocks of 16 plots each.

Area of each plot: 0.0137 acre. Area harvested: 0.0110 acre.

Treatments: None (quadruplicate plots) and all combinations of:

Levels of fertilizer: 2, 3, 4, 6 cwt per acre granular compound fertilizer (14%  $P_2O_5$ , 14%  $K_2O$ ).

Methods of placement: Drilled beside seed (duplicate plots).

Broadcast before ploughing (E); broadcast on seed bed and harrowed in (L); half broadcast before ploughing, half drilled; half broadcast on seed bed and harrowed in, half drilled.

Basal manuring: None.

Cultivations, etc: Ploughed: Sept 15.19. "E" fertilizers applied:

Mar 7. Ploughed: Mar 8. Harrowed twice, "L" fertilizers applied:

Mar 10. Beans and fertilizers drilled: Mar 11. Harrowed in:

Mar 13. Harrowed: Apr 20. Harvested: Aug 12. Previous crop: Wheat.

Standard errors per plot:

Yield, dry matter: 2.02 cwt per acre or 11.7% (20 d.f.)

Plant number: 8.06 thousands per acre or 6.9% (20 d.f.)

Summary of Results

Compound Fertilizer Cwt per acre	Drilled	Broad-cast before ploughing	Broad-cast on seed bed	Broad-cast before ploughing and drilled	Broad-cast on seed bed and drilled	Mean
Yield, dry matter: cwt per acre						
None	( $\pm 1.01$ )			( $\pm 1.43$ )		14.5 ( $\pm 0.71$ )
2.3	19.1	17.4	15.5	16.9	17.5	17.6
4.6	18.7	17.4	14.4	20.4	21.9	18.6
Mean ( $\pm 1.01$ )	18.9 <sup>(1)</sup>	17.4	15.0	18.7	19.7	17.2

Standard error (1)  $\pm 0.71$ 

Plant number: thousands per acre						
None	( $\pm 4.0$ )			( $\pm 5.7$ )		113 ( $\pm 2.9$ )
2.3	132	108	142	117	116	124
4.6	112	111	113	113	121	114
Mean ( $\pm 4.0$ )	122 <sup>(2)</sup>	109	128	115	118	118

Standard error (2)  $\pm 2.9$

## WINTER BEANS

Fertilizer placement - West Barnfield II 1950.

System of replication: 2 randomized blocks of 16 plots each.

Area of each plot: 0.0152 acre. Area harvested: 0.0121 acre.

Treatments: None (quadruplicate plots) and all combinations of:

Levels of fertilizer: 3.2, 6.4 cwt per acre granular compound fertilizer (13%  $P_2O_5$ , 13%  $K_2O$ ).

Methods of placement: Drilled 3" below soil surface and 2" to side of seed (duplicate plots); broadcast on the plough furrow and cultivated in (E); broadcast on seed bed and harrowed in (L); half broadcast on the plough furrow and cultivated in, half drilled; half broadcast on seed bed and harrowed in, half drilled.

Basal manuring: None.

Cultivations, etc: Ploughed: Sept 15-19. "E" fertilizers applied: Sept 30. Rolled and springtined: Oct 10. Disc and tooth harrowed: Oct 12. "L" fertilizers applied, beans and fertilizers drilled: Oct 12. Harrowed in: Oct 14. Harrowed: Apr 20. Harvested: July 31. Previous crop: Wheat.

Standard errors per plot:

Yield, dry matter: 1.14 cwt per acre or 5.9% (20 d.f.)

Plant number: 8.61 thousands per acre or 6.6% (20 d.f.)

Summary of Results

Compound Fertilizer Cwt per acre	Drilled	Broad- cast on plough furrow	Broad- cast on seed bed	Broad- cast on plough furrow and drilled	Broad- cast on seed bed and drilled	Mean	
Yield, dry matter: cwt per acre							
None	( $\pm 0.57$ )	(1)				( $\pm 0.80$ )	15.3 ( $\pm 0.40$ )
3.2	20.4	19.2	16.6	19.8	20.2	19.4 ( $\pm 0.33$ )	
6.4	22.2	22.4	20.0	22.7	22.2	21.9	
Mean ( $\pm 0.57$ )	21.3 <sup>(1)</sup>	20.8	18.3	21.3	21.2	19.3	
Standard error (1) $\pm 0.40$							

Plant number: thousands per acre							
None	( $\pm 4.3$ )	(2)				( $\pm 6.1$ )	127 ( $\pm 3.0$ )
3.2	132	122	128	135	128	130 ( $\pm 2.5$ )	
6.4	130	136	121	129	145	132	
Mean ( $\pm 4.3$ )	131 <sup>(2)</sup>	129	125	132	136	130	
Standard error (2) $\pm 3.0$							

## POTATOES

Application of dung - Sawyers I 1950.

System of replication: 4 randomized blocks of 12 plots each, plots being split into 2 for the application of N, P and K, the three 2-factor interactions being confounded with whole plot differences and certain high order interactions being confounded with block differences.

Area of each sub-plot: 0.0175 acre. Area harvested: 0.0140 acre.

Treatments:	All combinations of:
<u>Whole plots.</u>	Dung: None, 5, 10, 15 tons F.Y.M. per acre. Method of application: Ploughed in, in winter (W); ploughed in, in spring (S); or placed in the ridges (R).
<u>Sub-plots</u>	Sulphate of ammonia: None, 0.6 cwt N per acre. Superphosphate: None, 0.6 cwt $P_2O_5$ per acre. Muriate of potash: None, 1.0 cwt $K_2O$ per acre.

Basal Manuring: None.

Cultivations etc: Dung applied to "W" plots: Oct 24. Ploughed all plots: Oct 24-25. Dung applied to "S" plots: Mar 6. Ploughed all plots: Mar 9. Disced both ways and harrowed: Mar 29. Ring rolled: Mar 30. Ridged: Apr 11. Dung applied to "R" plots, artificials applied in the ridges, planted and covered in: Apr 11-13. Ring rolled ridges: Apr 14. Harrowed: May 11. Grubbed: May 24. Earthed up: June 29. Hand pulled weeds: various days July 30-Aug 24. Sprayed with Perenox: Aug 2-3. Sprayed with Coppesant: Aug 23-24. Sprayed with 15% B.O.V. to kill off haulm: Sept 25 and 28. Lifted: Oct 27-29. Variety: Majestic. Previous crop: Wheat.

Standard errors per plot:	Total clean tubers:
Whole plot:	0.727 tons per acre or 5.2% (32 d.f.)
Sub-plot:	1.16 tons per acre or 8.4% (29 d.f.)

Summary of Results

Total clean tubers: tons per acre

	Dung: tons per acre				Mean
	0	5	10	15	
Mean ( $\pm 0.210$ )	11.12	13.76	15.20	15.34	15.86
<u>Method of application</u>	$(\pm 0.363)$				$(\pm 0.210)$
Ploughed in, in winter		13.26	15.37	14.99	14.54
Ploughed in, in spring		13.86	15.61	15.23	14.90
Placed in ridges		14.16	14.61	15.80	14.86
Sulphate of ammonia		$(\pm 0.316)^{**}$			
None	10.31	12.89	14.11	14.14	12.86
0.6 cwt per acre N	11.93	14.63	16.29	16.55	14.85
Response to N ( $\pm 0.473$ )	1.62	1.74	2.18	2.41	1.99 (1)
Superphosphate		$(\pm 0.316)^{**}$			
None	11.55	13.47	14.72	14.70	13.61
0.6 cwt per acre $P_2O_5$	10.69	14.05	15.68	15.98	14.10
Response to P ( $\pm 0.473$ )	-0.86	0.58	0.96	1.28	0.49 (1)
Muriate of potash		$(\pm 0.316)^{**}$			
None	9.09	12.72	15.04	15.08	12.98
1.0 cwt per acre $K_2O$	13.15	14.80	15.36	15.61	14.73
Response to K ( $\pm 0.473$ )	4.06	2.08	0.32	0.53	1.75 (1)

Standard error (1)  $\pm 0.236$ 

\*\*Standard error for comparisons other than vertical.

Total clean tubers: tons per acre

	Method of application of dung		
	Ploughed in, in winter	Ploughed in, in spring	Placed in ridges
Sulphate of ammonia		( $\pm 0.316$ ) <sup>xx</sup>	
None	13.43	13.83	13.87
0.6 cwt per acre N	15.65	15.97	15.85
Response to N ( $\pm 0.473$ )	2.22	2.14	1.98
Superphosphate		( $\pm 0.316$ ) <sup>xx</sup>	
None	13.95	14.48	14.46
0.6 cwt per acre P <sub>2</sub> O <sub>5</sub>	15.13	15.32	15.26
Response to P ( $\pm 0.473$ )	1.18	0.84	0.80
Muriate of potash		( $\pm 0.316$ ) <sup>xx</sup>	
None	14.29	14.13	14.41
1.0 cwt per acre K <sub>2</sub> O	14.79	15.67	15.31
Response to K ( $\pm 0.473$ )	0.50	1.54	0.90

<sup>xx</sup>Standard error for comparisons other than verticalResponses to treatments ( $\pm 0.316$ )<sup>xxx</sup>

Response to:	Sulphate of ammonia		Superphosphate		Muriate of potash	
	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Sulphate of ammonia	-	-	1.87	2.11	1.69	2.29
Superphosphate	0.37	0.61	-	-	0.23	0.75
Muriate of potash	1.43	2.05	1.49	2.01	-	-

<sup>xxx</sup>Standard error of horizontal difference between two responses:  $\pm 0.420$

## Percentage Ware

	Dung: tons per acre				Mean
	0	5	10	15	
Mean	89.30	90.39	91.38	92.66	90.93
<u>Method of application</u>					
Ploughed in, in winter		91.18	91.79	91.51	91.49
Ploughed in, in spring		89.91	91.46	92.85	91.41
Placed in ridges		90.08	90.89	93.62	91.53
Sulphate of ammonia					
None	89.38	91.09	90.97	92.42	90.96
0.6 cwt per acre N	89.22	89.68	91.79	92.90	90.90
Response to N	-0.16	-1.41	0.82	0.48	-0.06
Superphosphate					
None	90.17	90.44	91.65	93.15	91.35
0.6 cwt per acre $P_2O_5$	88.43	90.33	91.11	92.18	90.51
Response to P	-1.74	-0.11	-0.54	-0.97	-0.84
Muriate of potash					
None	83.08	89.43	91.18	91.98	90.17
1.0 cwt per acre $K_2O$	90.52	91.34	91.58	93.34	91.70
Response to K	2.44	1.91	0.40	1.36	1.53



## Percentage Ware

	Method of application of dung		
	Ploughed in, in winter	Ploughed in, in spring	Placed in ridges
Sulphate of ammonia			
None	91.38	91.69	91.42
0.6 cwt per acre N	91.61	91.12	91.64
Response to N	0.23	-0.57	0.22
Superphosphate			
None	91.86	92.32	91.06
0.6 cwt per acre $P_2O_5$	91.12	90.49	92.00
Response to P	-0.74	-1.83	0.94
Muriate of potash			
None	90.69	91.05	90.85
1.0 cwt per acre $K_2O$	92.29	91.77	92.21
Response to K	1.60	0.72	1.36

## Responses to treatments

Response to:	Sulphate of ammonia		Superphosphate		Muriate of potash	
	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Sulphate of ammonia	--	--	-0.45	0.33	1.27	-1.39
Superphosphate	-1.23	-0.45	--	--	-1.93	0.25
Muriate of potash	2.86	0.20	0.44	2.62	--	--

## POTATOES

Time of planting and fertilizers - Sawyers I 1950.

System of replication: 4 randomized blocks of 16 plots each, certain high order interactions being confounded with block differences.

Area of each plot: 0.0218 acre. Area harvested: 0.0146 acre.

Treatments: All combinations of:-

Time of planting: Mar 31, Apr 21, May 12, May 31.

Dung: None, 15 tons FYM per acre ploughed in, in spring.

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

Superphosphate: None, 0.6 cwt  $P_2O_5$  per acre.

Muriate of potash: None, 1.0 cwt  $K_2O$  per acre.

Cultivations, etc.:

Whole experiment: Ploughed: Oct 24-25. Dung applied: Mar 9.

Ploughed: Mar 10. Disced both ways: Mar 29. Ring rolled:

Mar 30. Hand pulled weeds: July 30-Aug 14. Sprayed with

Perenox: Aug 2-3. Sprayed with Coppesan: Aug 23-24.

Lifted: Oct 17-18. Variety: Majestic. Previous crop:

Wheat.

1st planting; Ridged, applied artificials, potatoes planted and

covered in: Mar 31. Rolled down ridges: Apr 3. Harrowed

ridges: May 11. Grubbed: May 25. Earthed up: June 28.

2nd planting; Ridged: Apr 20. Applied artificials, potatoes

planted and covered in: Apr 21. Rolled ridges: Apr 24.

Harrowed ridges: May 11. Grubbed: May 25. Earthed up:

June 28.

3rd planting; Ridged, applied artificials potatoes planted and

covered in: May 11. Rolled ridges: May 12. Earthed up:

June 30.

4th planting; Cultivated: May 18. Ridged, applied artificials,

potatoes planted and covered in: May 31. Grubbed: July 13.

Earthed up: July 15.

Standard error per plot:

Total clean tubers: 1.44 tons per acre or 13.4% (35 d.f.)

Summary of Results

Total clean tubers: tons per acre

	Time of planting				Mean
	March 31st	April 21st	May 12th	May 31st	
Mean ( $\pm 0.360$ )	12.14	11.00	10.55	9.18	10.72
No Dung ( $\pm 0.509$ )	9.73	9.09	8.86	7.70	8.84
Dung	14.56	12.90	12.23	10.65	12.59
Response to Dung ( $\pm 0.720$ )	4.83	3.81	3.37	2.95	3.75 <sup>(1)</sup>
No Nitrogen ( $\pm 0.509$ )	10.70	10.16	9.65	8.09	9.65
Nitrogen	13.59	11.83	11.44	10.26	11.78
Response to Nitrogen ( $\pm 0.720$ )	2.89	1.67	1.79	2.17	2.13 <sup>(1)</sup>
No Phosphate ( $\pm 0.509$ )	12.05	10.33	10.05	8.35	10.19
Phosphate	12.24	11.66	11.05	10.01	11.24
Response to Phosphate ( $\pm 0.720$ )	0.19	1.33	1.00	1.66	1.05 <sup>(1)</sup>
No Potash ( $\pm 0.509$ )	9.65	9.99	9.31	8.63	9.39
Potash	14.64	12.00	11.78	9.73	12.04
Response to Potash ( $\pm 0.720$ )	4.99	2.01	2.47	1.10	2.65 <sup>(1)</sup>

Standard Error (1)  $\pm 0.360$ Responses to treatments ( $\pm 0.509$ )

Response to	Dung		Nitrogen		Phosphate		Potash	
	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Dung	-	-	4.04	3.44	4.20	3.28	5.74	1.74
Nitrogen	2.43	1.83	-	-	1.68	2.58	1.83	2.43
Phosphate	1.51	0.59	0.60	1.50	-	-	0.88	1.22
Potash	4.64	0.64	2.34	2.94	2.47	2.81	-	-

## Percentage ware

	Time of planting				Mean
	March 31st	April 21st	May 12th	May 31st	
Mean	86.71	86.42	88.88	84.37	86.60
No Dung	84.52	87.04	87.36	80.20	84.78
Dung	88.90	85.81	90.40	88.54	88.41
Response to Dung	4.38	-1.23	3.04	8.34	3.63
No Nitrogen	85.24	89.16	88.69	82.58	86.42
Nitrogen	88.19	83.69	89.08	86.16	86.78
Response to Nitrogen	2.95	-5.47	0.39	3.58	0.36
No Phosphate	87.06	85.34	89.08	85.02	86.62
Phosphate	86.36	87.51	88.69	83.71	86.57
Response to Phosphate	-0.70	2.17	-0.39	-1.31	-0.05
No Potash	84.05	86.36	88.28	81.91	85.15
Potash	89.38	86.49	89.49	86.82	88.04
Response to Potash	5.33	0.13	1.21	4.91	2.89

## Responses to Treatments

Response to	Dung		Nitrogen		Phosphate		Potash	
	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Dung	-	-	6.22	1.04	2.26	5.00	5.82	1.44
Nitrogen	2.95	-2.23	-	-	-2.68	3.40	2.35	-1.63
Phosphate	-1.43	1.31	-3.10	2.98	-	-	-0.75	0.63
Potash	5.08	0.70	4.88	0.90	2.20	3.58	-	-

## POTATOES

Methods of planting and fertilizers - Rothamsted Great Knott I and Woburn Butt Close 1950

System of replication:  $4 \times 2 \times 2$  design in 4 randomized blocks of 8 plots each, a high order interaction being confounded with block differences, plus 2 extra plots per block without fertilizer.

Area of each plot: 0.028 acre. Area harvested: 0.014 acre

Treatments: All combinations of Compound granular fertilizer (7% N, 7%  $P_2O_5$ , 10.5%  $K_2O$ ): 8, 16 cwt per acre.

Method of placement: A - Broadcast fertilizer on the flat, ridge, plant by dropper into ridges; B - Broadcast on the flat, plant by dropper on the flat, ridge; C - Ridge, broadcast on ridges, plant by hand in furrows, split back ridges (standard method); D - Ridge, broadcast on ridges, split back ridges, plant by dropper into ridge.

Depth of planting: Shallow; Deep.

The two plots per block receiving no fertilizer were planted by Method C, one at each depth.

Basal manuring: Rothamsted - 10-12 tons dung and compost per acre.  
Woburn - None

Cultivations, etc.:

## Rothamsted

Ploughed: Sept 8-12. Dung applied: Feb 6. Ploughed: various days: Feb 6-27. Cultivated: Mar 28-29. Disced: Mar 30. Fertilizers applied A and B plot: Apr 13. Potatoes planted and covered in on B plots: Apr 4. Ridged A, C and D plots: Apr 17. Fertilizers applied C and D plots, potatoes planted A, C and D plots and rolled ridges: Apr 21. Harrowed ridges: May 17. Grubbed: June 2. Earthed up: June 30. Weeded: various days, July 10-31. Sprayed with Perenox: July 31. Sprayed with Coppesan: Aug 21. Sprayed with 15% B.O.V. to kill off haulm: Sept 27. Lifted: Oct 12. Variety: Majestic. Previous crop: Linseed.

## Woburn

Ploughed: Sept 7-9, Oct 25-27 and Jan 2-6. Springtined: Mar 31. Fertilizers applied, potatoes planted and covered in, all plots: May 1-2. Rolled ridges: May 15-17. Harrowed and weeded: May 30-31. Grubbed: June 9-16. Ridged: June 26-27. Sprayed with Perenox: Aug 4. Sprayed with Coppesan: Aug 8. Weeded: Sept 4. Sprayed with 15% B.O.V. to kill off haulm: Oct 2-3. Lifted: Oct 12. Variety: Majestic. Previous crop: Wheat.

Standard errors per plot:

Total tubers, Rothamsted: 0.840 tons per acre or 5.6% (19 d.f.)

Woburn: 0.851 tons per acre or 5.8% (19 d.f.)

Summary of Results

Placement of fertilizers	On Flat		No Fertilizer	On Ridges		Mean
	In ridges A	On flat B	In furrows C	In furrows C	In ridges D	
Total tubers: tons per acre, Rothamsted						
Mean ( $\pm 0.297$ )	15.33	15.77	15.10	14.10	15.12	15.09
Fertilizer cwt per acre						
8 ( $\pm 0.420$ )	16.06	16.30		14.95	16.16	15.87
16 ( $\pm 0.420$ )	14.60	15.25		13.26	14.09	14.30
Difference ( $\pm 0.594$ )	-1.46	-1.05		-1.69	-2.07	-1.57 ( $\pm 0.297$ )
Planting						
Shallow ( $\pm 0.420$ )	14.78	15.88	14.79	13.61	15.19	14.85
Deep ( $\pm 0.420$ )	15.88	15.67	15.40	14.60	15.06	15.32
Difference ( $\pm 0.594$ )	1.10	-0.21	0.61	0.99	-0.13	0.47 ( $\pm 0.266$ )
Total tubers: tons per acre, Woburn						
Mean ( $\pm 0.301$ )	14.55	15.29	7.82	14.35	14.92	13.38
Fertilizer cwt per acre						
8 ( $\pm 0.426$ )	13.42	14.34		13.98	13.77	13.88
16 ( $\pm 0.426$ )	15.68	16.24		14.71	16.07	15.67
Difference ( $\pm 0.602$ )	2.26	1.90		0.73	2.30	1.79 ( $\pm 0.301$ )
Planting						
Shallow ( $\pm 0.426$ )	14.56	14.52	8.19	14.46	14.95	13.34
Deep ( $\pm 0.426$ )	14.53	16.06	7.45	14.24	14.89	13.43
Difference ( $\pm 0.602$ )	-0.03	1.54	-0.74	-0.22	-0.06	0.09 ( $\pm 0.269$ )
Percentage Ware, Woburn						
Mean	92.4	92.8	92.9	94.0	92.7	93.0
Fertilizer cwt per acre						
8	91.9	92.2		93.4	92.0	92.4
16	93.0	93.4		94.6	93.4	93.6
Difference	1.1	1.2		1.2	1.4	1.2
Planting						
Shallow	91.9	93.0	92.0	93.2	92.3	92.5
Deep	93.0	92.7	93.8	94.8	93.0	93.5
Difference	1.1	-0.3	1.8	1.6	-0.7	1.0

## KALE

Fertilizer placement - Stackyard 1950.

System of replication: 3 randomized blocks of 8 plots each.

Area of each plot: 0.0152 acre. Area harvested: 0.00505 acre.

Treatments: None (duplicate plots) together with all combinations of:  
Compound Granular PK fertilizer (14%  $P_2O_5$ , 14%  $K_2O$ ): 2.75,  
5.50 cwt per acre.

Methods of placement: Broadcast during preparation of seedbed and worked in by cultivators and harrows; drilled in a band 2" to side of seed and 3" below the soil surface; half dressing broadcast as above and half drilled beside the seed.

Basal manuring: 4 cwt sulphate of ammonia per acre.

Cultivations, etc.: Ploughed: Sept 20-22 and again Dec 8-10.  
18 cwt ground chalk per acre applied: Mar 12. Springtined:  
Mar 16 and again Mar 22. Fertilizer broadcast and harrowed in:  
Mar 24. Rolled, seed and fertilizer drilled: Mar 25. Sulphate  
of ammonia drilled: Mar 27. Harrowed in: Mar 28. Sprayed with  
Arkotine: Apr 21 and again May 2. Hoed: May 19 and 24.  
Harvested: Dec 4, 7, 12, 16, 19 and 21. Variety: Thousand Head.  
Previous crop: Mixed cereals.

Standard errors per plot:

Yield: 3.43 tons per acre or 13.3% (15 d.f.)  
Plant number: 9.74 thousands per acre or 17.6% (15 d.f.)

Summary of Results

## Method of Placement

Compound fertilizer cwt per acre	Broadcast	Drilled	Broadcast Drilled	Mean
	Yield: tons per acre ( $\pm 1.98$ )			
None				25.03 ( $\pm 1.40$ )
2.75	26.93	26.81	25.19	26.31 ( $\pm 1.14$ )
5.50	26.22	25.81	26.02	26.02
Mean ( $\pm 1.40$ )	26.58	26.31	25.60	25.88
Difference ( $\pm 2.80$ )	-0.71	-1.00	0.83	-0.29 ( $\pm 1.62$ )
	Plant number: thousands per acre ( $\pm 5.62$ )			
None				55.3 ( $\pm 3.97$ )
2.75	64.9	44.1	57.4	55.4 ( $\pm 3.25$ )
5.50	63.4	52.7	48.7	55.0
Mean ( $\pm 3.97$ )	64.2	48.4	53.0	55.2
Difference ( $\pm 7.95$ )	-1.5	8.6	-8.7	-0.4 ( $\pm 4.59$ )



## LUCERNE

Fertilizer placement - Long Hoos IV 1950

System of replication: 3 randomized blocks of 12 plots each.

Area of each plot: 0.00798 acre. Area harvested: 0.00644 acre.

Treatments: No fertilizer (duplicate plots); no fertilizer but plots drilled over (duplicate plots); and all combinations of:

Granular PK compound fertilizer (10%  $P_2O_5$ , 20%  $K_2O$ ): 2.5, 5.0 cwt per acre.

Method of placement: Broadcast during preparation of seed bed, drilled in bands 3" below soil surface and 2" to side of seed; half broadcast during preparation of seed bed and half to be broadcast on surface next year; half drilled beside seed, and half to be drilled beside rows of plants next year.

It will be noted that for 1950 there are duplicate plots per block with 2.5 cwt per acre fertilizer broadcast or drilled.

Basal dressing: 10 cwt ground chalk per acre

Cultivations, etc.: Springtined: Mar 8 and again Mar 11. Ground chalk applied: Mar 10. Fertilizers broadcast: Mar 23. Harrowed, seed and fertilizers drilled: Mar 27. Rolled: Mar 28. Ring rolled: Mar 29. Dusted with B.H.C.: May 4. Weeded: June 21-23. First cut: Aug 9. Second cut: Oct 12. Variety: Du Puits. Previous crop: Wheat.

Standard errors per plot:

Dry Matter, 1st cut: 2.43 cwt per acre or 10.5% (26 d.f.)  
2nd cut: 1.13 cwt per acre or 7.3% (26 d.f.)

Summary of Results

Lucerne, Dry Matter: cwt per acre

Method of placement	Compound Fertilizer: cwt per acre				Mean
	None	1.25	2.5	5.0	
	1st cut				
	(a)	(b)	(a)	(b)	(c)
Broadcast	22.5 <sup>+</sup>	27.3	25.0	25.8	25.8*
Drilled	21.4 <sup>+</sup>	22.8	20.1	23.4	21.6*
Mean	22.0 <sup>(c)</sup>	25.0 <sup>(a)</sup>	22.5 <sup>(c)</sup>	24.6 <sup>(a)</sup>	23.1
Difference	-1.1 <sup>(b)</sup>	-4.5 <sup>(d)</sup>	-4.9 <sup>(b)</sup>	-2.4 <sup>(d)</sup>	-4.2 <sup>(a)*</sup>
	2nd cut				
	(a)	(b)	(a)	(b)	(c)
Broadcast	15.5 <sup>+</sup>	15.2	15.7	16.5	15.8*
Drilled	14.9 <sup>+</sup>	15.6	15.0	16.2	15.5*
Mean	15.2 <sup>(c)</sup>	15.4 <sup>(a)</sup>	15.4 <sup>(c)</sup>	16.3 <sup>(a)</sup>	15.5
Difference	-0.6 <sup>(b)</sup>	0.4 <sup>(d)</sup>	-0.7 <sup>(b)</sup>	-0.3 <sup>(d)</sup>	-0.3 <sup>(a)*</sup>

Standard errors	1st cut	2nd cut
(a)	0.99	0.46
(b)	1.41	0.65
(c)	0.70	0.33
(d)	1.99	0.92

<sup>+</sup> See Treatment descriptions.

\* Excluding no fertilizer.

## PERMANENT GRASS

Fertilizer placement - Highfield 1950

System of replication: 3 randomized blocks of 6 plots each

Area of each plot: 0.0137 acre

Treatments: No fertilizer; no fertilizer but plots drilled over;  
and all combinations of:-

Compound granular PK fertilizer (13%  $P_2O_5$ , 15%  $K_2O$ ): 3.2, 6.4  
cwt per acre.

Method of placement: Broadcast; drilled in bands 10" apart and  
3" deep.

Basal manuring: 3 cwt sulphate of ammonia per acre

Cultivations, etc.:

Fertilizer broadcast and drilled: Apr 4. Sulphate of ammonia  
applied: Apr 6. 1st cut: June 8. 2nd cut: Aug 2.

Standard errors per plot:

Dry matter, 1st cut: 2.26 cwt per acre or 8.4% (10 d.f.)  
2nd cut: 1.36 cwt per acre or 11.4% (10 d.f.)

Summary of Results

Grass Dry Matter: cwt per acre

Method of Placement	Compound Fertilizer cwt per acre			Mean	Difference of levels
	None	3.2	6.4		
		(±1.31)		(±0.92)	(±1.85)
Broadcast	25.2 <sup>+</sup>	29.7	28.9	29.3*	-0.8
Drilled	23.5 <sup>+</sup>	25.4	28.0	26.7*	2.6
Mean (±0.92)	24.4	27.6	28.5	26.8	0.9 (±1.31)
Difference (±1.85)	-1.7	-4.3	-0.9	-2.6* (±1.31)	
			2nd Cut		
		(±0.79)		(±0.56)	(±1.11)
Broadcast	11.7 <sup>+</sup>	11.8	12.5	12.1*	0.7
Drilled	11.8 <sup>+</sup>	12.2	11.7	11.9*	-0.5
Mean (±0.56)	11.7	12.0	12.1	11.9	0.1 (±0.79)
Difference (±1.11)	0.1	0.4	-0.8	-0.2* (±0.79)	

<sup>+</sup> see Treatment descriptions.

\* excluding no fertilizer.

## SUGAR BEET

Irrigation and nitrogen - Kesgrave, Suffolk 1950

System of replication: 4 randomized blocks of 4 plots each, plots being split into 4 for the application of nitrogen.

Area of each plot: 0.0346 acre. Area harvested: 0.0145 acre.

## Treatments:

Whole plots. Irrigation: None - 0; as decided by farmer - A (2" July 1-2); based on weather data - B (1½" June 13-16 and ½" July 12, total 2") and C (2" June 13-16, 1" July 12, ¼" Aug 15 and ¾" Sept 13-14, total 4").

Sub-plots. Nitrogen: None, 0.4, 0.8, 1.2 cwt N per acre applied as nitrochalk.

Monthly rainfall in inches: May - 1.35; June - 1.47; July - 2.37; August - 2.32; September - 7.51.

Basal manuring: Salt: 4 cwt per acre

Potassic super (13.8% P<sub>2</sub>O<sub>5</sub>, 13.8% K<sub>2</sub>O): 6 cwt per acre.

Cultivations, etc.: Salt applied: early Feb. Potassic super applied: Mar 2. Nitrochalk applied: Mar 14. Seed drilled: Mar 28. Lifted: Oct 24-26. Variety: Klein E. Previous crop: 3 year ley.

## Standard errors per plot:

Total sugar:	whole plot,	2.25	cwt per acre or 3.8%
	sub-plot,	3.52	cwt per acre or 5.9%
Roots (washed):	whole plot,	0.607	tons per acre or 3.7%
	sub-plot,	0.845	tons per acre or 5.1%
Sugar percentage:	whole plot,	0.228	
	sub-plot,	0.497	
Tops:	whole plot,	0.408	tons per acre or 6.0%
	sub-plot,	0.600	tons per acre or 8.8%
Plant number:	whole plot,	0.883	thousands per acre or 2.7%
	sub-plot,	1.465	thousands per acre or 4.5%
Noxious Nitrogen:	whole plot,	7.88	mg per 100 gm.
	sub-plot,	7.38	mg per 100 gm.

All whole plot standard errors estimated from 9 d.f.

All sub-plot errors except Plant Number and Noxious Nitrogen estimated from 36 d.f. Plant Number and Noxious Nitrogen - 35 d.f.

Summary of Results

cwt N per acre	Irrigation: inches				Mean
	D None	A 2	B 2	C 4	
	Total sugar: cwt per acre (1) and (2)				(±0.88)
None	52.4	63.9	58.8	60.9	59.0
0.4	51.9	67.2	59.9	65.7	61.1
0.8	54.8	63.9	58.8	64.0	60.4
1.2	52.1	62.7	58.9	63.4	59.3
Mean (±1.13)	52.8	64.4	59.1	63.5	60.0
	Roots (washed): tons per acre (1) and (2)				(±0.211)
None	13.86	17.03	15.80	16.37	15.76
0.4	14.11	18.20	16.38	17.71	16.60
0.8	15.48	17.66	16.00	17.78	16.73
1.2	15.11	17.93	17.03	18.46	17.13
Mean (±0.303)	14.64	17.71	16.30	17.58	16.56
	Sugar Percentage (1) and (2)				(±0.124)
None	18.90	18.78	18.62	18.56	18.72
0.4	18.39	18.45	18.26	18.54	18.41
0.8	17.70	18.10	18.38	17.99	18.04
1.2	17.29	17.48	17.30	17.19	17.31
Mean (±0.114)	18.07	18.20	18.14	18.07	18.12

Standard errors of body of table:

(1) for use in vertical comparisons

(2) for use in all others

Total  
Sugar

1.76

1.90

Roots  
(washed)

0.423

0.475

Sugar  
percentage

0.249

0.244

cwt N per acre	Irrigation: inches				Mean
	0 None	A 2	B 2	C 4	
	Tops: tons per acre				
	(1) and (2)				(±0.150)
None	5.27	5.75	6.15	5.81	5.74
0.4	5.67	7.18	6.27	6.66	6.44
0.8	7.27	7.31	7.08	7.74	7.35
1.2	7.49	7.43	8.01	8.31	7.81
Mean (±0.204)	6.42	6.92	6.88	7.13	6.84
	Plant Number: thousands per acre				
	(1) and (2)				(±0.366)
None	32.6	32.2	32.1	33.4	32.6
0.4	32.4	32.8	32.8	32.8	32.7
0.8	33.5	33.3	32.8	32.4	33.0
1.2	31.8	31.9	31.7	33.8	32.3
Mean (±0.442)	32.6	32.6	32.4	33.1	32.7
	Noxious Nitrogen: mg per 100 gm				
	(1) and (2)				(±1.84)
None	24.5	18.0	21.8	16.8	20.2
0.4	21.8	30.8	30.8	18.2	25.4
0.8	43.2	31.8	30.5	24.2	32.4
1.2	41.8	39.5	43.2	35.8	40.1
Mean (±3.94)	32.8	30.0	31.6	23.8	29.5

Standard errors of body of table:

	Tops	Plant Number	Noxious Nitrogen
(1) for use in vertical comparisons	0.300	0.733	3.69
(2) for use in all others	0.330	0.773	5.07

## CHEMICAL ANALYSES OF MANURES USED IN THE THREE, FOUR AND SIX COURSE

## ROTATIONS 1950

Manures	% Organic Matter	% N	% P <sub>2</sub> O <sub>5</sub>	% K <sub>2</sub> O
Three Course Rotation				
Chaffed Straw	83.3	0.52	0.16	0.84
Adco	16.9	0.54	0.31	0.29
Sulphate of Ammonia	-	21.0	-	-
Nitrate of Soda	-	15.5	-	-
Superphosphate	-	-	19.5 (total)	-
Muriate of Potash	-	-	-	57.4 (1)
Sulphate of Potash	-	-	-	48.0 (2)

(1) For barley and sugar beet.

(2) For potatoes.

Four Course Rotation				
Chaffed Straw	83.3	0.52	0.16	0.84
Adco	16.9	0.54	0.31	0.29
Dung	21.5	0.67	0.28	1.12
Sulphate of Ammonia	-	21.0	-	-
Superphosphate	-	-	19.5 (total)	-
Mineral Phosphate	-	-	33.3	-
Muriate of Potash	-	-	-	57.4

Six Course Rotation				
Sulphate of Ammonia		21.0	-	-
Superphosphate		-	17.5 (total) (3)	-
			19.5 (total) (4)	-
Muriate of Potash		-	-	57.4 (5)
Sulphate of Potash		-	-	48.0 (6)

(3) For wheat, rye and clover.

(4) For potatoes, sugar beet and barley.

(5) For all crops except potatoes.

(6) For potatoes.



METEOROLOGICAL RECORDS ROTHAMSTED 1950

(Departure from Long period means in brackets)

Month	Total Hours of Sunshine	Mean Temperature (°F)				Rainfall (in) 1/100 acre Gauge	Rain Days (3)	Drainage through 20 in. Soil	Wind (4) m.p.h.	
		Air (1)	Dew Point	In Ground 1 ft	In Ground 4 ft					Ground Frosts (2)
Jan.	36 (-17)	38.3 (+0.9)	35.9	40.1	45.1	14	1.00 (-1.54)	15	0.33	4.7
Feb.	58 (-12)	41.7 (+3.3)	37.6	40.0	42.7	10	4.61 (+2.74)	22	4.11	5.7
Mar.	126 (+9)	44.5 (+3.2)	39.0	42.9	43.6	11	0.89 (-1.02)	15	-	4.2
Apr.	147 (-9)	45.3 (-0.5)	37.9	44.8	45.5	7	1.95 ( - )	19	0.14	6.0
May	153 (-45)	51.3 (-0.6)	45.5	51.3	48.1	3	2.03 (-0.12)	12	0.35	4.7
June	261 (+58)	60.8 (+3.5)	53.2	62.4	53.4	0	1.56 (-0.62)	10	0.06	3.2
July	189 (-7)	60.3 (-0.4)	53.6	62.3	57.1	0	5.50 (+2.96)	15	2.51	2.9
Aug.	165 (-21)	59.9 (-0.3)	54.5	61.2	58.6	0	3.54 (+1.00)	18	1.09	2.5
Sept.	115 (-32)	55.0 (-1.1)	50.1	55.6	57.4	0	3.33 (+0.98)	25	1.08	4.1
Oct.	104 (-1)	59.1 (+0.2)	44.8	50.1	54.5	5	0.62 (-2.41)	13	0.10	3.3
Nov.	56 (-7)	41.9 (-0.5)	39.2	42.9	49.5	10	5.39 (+2.64)	24	4.13	5.6
Dec.	41 (-4)	32.9 (-5.7)	30.3	36.4	44.6	21	1.71 (-0.88)	19	0.91	5.8
Year	1451 (-88)	48.4 (+0.1)	43.5	49.2	50.0	81	32.13 (+3.72)	207	14.81	4.4

(1) Mean of Maximum and Minimum. (2) Record for 30 days.

(2) Number of nights Grass Minimum was 30°F. or less.

(3) Number of days rainfall was 0.01 in. or more.

(4) At 2 metres above ground level.