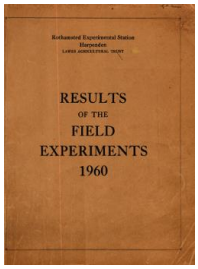
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ROTHAMSTED RESEARCH

Yields of the Field Experiments 1960

Full Table of Content



Long-term Experiments

Rothamsted Research

Rothamsted Research (1961) *Long-term Experiments ;* Yields Of The Field Experiments 1960, pp 21 - 82 **- DOI: https://doi.org/10.23637/ERADOC-1-180**

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60/B/1.1

SIX COURSE ROTATION EXPERIMENT

The 31st and last year

Seasonal effects of fertilisers - Rothamsted Long Hoos IV and Woburn Stackyard 1960.

For history, treatments, etc., see "Details of the Classical and Long Term Experiments" 1956. The experiment is now terminated.

In 1960 the cereals on the Woburn experiment were again combine-harvested the yields being estimated from 2 cuts.

Magnesium test (Woburn only): The 1959 magnesium test on potatoes was repeated in 1960.

Area of each plot (acres): Rothamsted - 0.0250; Woburn - 0.0265. Area harvested: Rothamsted - full area; Woburn - Sugar beet - full area; Barley, wheat, rye - 0.0190; Potatoes (sub plot) - 0.0095.

Cultivations, etc.:

Rothamsted

Sugar beet.
Ploughed twice: Aug 19 and Nov 27, 1959. Fertilisers applied: Apr 1, 1960. Seed drilled at 19 lb per acre: Apr 6. Sprayed with demeton methyl at 12 fluid oz in 60 gallons per acre: Apr 30. Singled: May 30 - June 1. Lifted: Nov 11. Harvested: Nov 15. Variety: Klein E.

Barley.
Sugar beet tops spread, ground chalk applied at 23 cwt per acre: Nov 17, 1959. Ploughed: Nov 27. Fertilisers applied: Mar 10, 1960. Seed drilled at 2¾ bushels per acre: Mar 18. Clover seed undersown: Apr 22. Harvested: Aug 17. Variety: Plumage Archer.

Clover.
Seed undersown in barley at 40 lb per acre: Apr 29, 1959. Autumn fertilisers applied: Oct 3. Sulphate of ammonia applied: Mar 23, 1960. Cut: June 27. Variety: S123 Late Flowering Red.

Wheat.
Ploughed three times: June 23, Aug 11 and Sept 9, 1959. Autumn fertilisers applied: Oct 3. Seed drilled at 2¾ bushels per acre: Oct 12. Sulphate of ammonia applied: Mar 23, 1960. Sprayed with CMPP, 6 pints in 40 gallons per acre: Apr 21. Harvested: Aug 5. Variety: Yeoman.

Potatoes.
Ploughed: Aug 19, 1959. Ridged, fertilisers applied: Apr 21, 1960. Potatoes planted: Apr 22. Earthed up: June 20. Sprayed twice with copper fungicide: July 16 and Aug 10. Sprayed with sulphuric acid, 15% BOV at 100 gallons per acre: Aug 31. Haulms destroyed mechanically: Sept 21. Lifted: Oct 6. Variety: Majestic.

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Rye.
Ground chalk applied at 23 cwt per acre: Oct 3, 1959. Ploughed: Oct 7. Autumn fertilisers applied: Oct 12. Seed drilled at 3 bushels per acre: Oct 13. Sulphate of ammonia applied: Mar 23, 1960. Sprayed with CMPP at 6 pints in 40 gallons per acre: Apr 21. Harvested: Aug 5. Variety: King II

Woburn

Sugar beet.
Ploughed twice: Sept 1 and Nov 28, 1959. Fertilisers applied, seed drilled at 13 lb per acre: Apr 13, 1960. Sprayed against flea beetle with miscible DDT at 3 pints in 40 gallons per acre: May 6; and with demeton methyl at 12 oz in 40 gallons per acre: June 1. Singled: May 27 - June 3. Lifted: Oct 7. Variety: Klein E.

Barley.
Ground chalk applied at 18 cwt per acre: Nov 16, 1959. Ploughed: Nov 20. Fertilisers applied: Mar 8, 1960. Seed drilled at 2½ bushels per acre: Mar 14. Sprayed with TCB/MCPA at 4 pints in 40 gallons per acre: May 6. Combine harvested: Aug 13. Variety: Herta.

Clover.
Ground chalk applied at 20 cwt per acre: Sept 1, 1959. Ploughed twice: Sept 2 and Nov 25. Fertilisers applied: Mar 25, 1960. Seed broadcast at 40 lb per acre: Mar 28. Sprayed against weevil and miscible DDT at 3 pints in 40 gallons per acre: May 6. Crop discarded owing to pigeon damage and weed infestation.

Wheat.
Ploughed twice: June 3 and Sept 1, 1959. Autumn fertilisers applied: Oct 19. Seed drilled at 3 bushels per acre: Oct 23. Sulphate of ammonia applied: Mar 28, 1960. Sprayed with CMPP at 6 pints in 40 gallons per acre: Apr 19. Combine harvested: Aug 18. Variety: Yeoman.

Potatoes.
Ploughed twice: Sept 2 and Nov 25, 1959. Ridged, fertilisers applied and potatoes hand planted: Apr 28, 1960. Earthed up: June 14. Sprayed twice with copper fungicide at 5 lb in 40 gallons per acre: July 15 and July 29. Haulms destroyed mechanically: Aug 27. Lifted: Sept 29. Variety: Majestic.

Rye.
Ground chalk applied at 18 cwt per acre: Oct 1, 1959. Ploughed: Oct 2. Fertilisers applied: Oct 19. Seed drilled at 3 bushels per acre: Oct 23. Sulphate of ammonia applied: Mar 25, 1960. Sprayed with CMPP at 6 pints in 40 gallons per acre: Apr 19. Combine harvested: Aug 20. Variety: King II.

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Summary of Results

Mean yields per acre and responses in yield per cwt of N, P_2O_5 and K_2O

	Rothamsted	Woburn	Rothamsted	Woburn
	Sugar Beet, roots (washed): tons per acre		Barley, grain: cwt per acre	
Mean	11.13	9.42	25.6*	30.1*
Response to: N	+5.31	+4.48	+8.5	+16.6
P	+1.40	-1.35	-2.5	-6.0
K	-0.45	+2.30	+2.2	-4.7
Mean dry matter % as harvested:			80.9	81.0
	Sugar Beet, sugar percentage		Barley, straw: cwt per acre	
Mean	16.5	16.6	28.5*	23.0*
Response to: N	-0.5	0.0	+8.6	+13.5
P	+0.3	+0.5	-1.5	+2.5
K	+0.7	+1.4	-0.4	+0.8
Mean dry matter % as harvested:			81.9	66.2
	Sugar Beet, total sugar: cwt per acre		Clover, hay, dry matter: cwt per acre	
Mean	36.7	31.4	19.4	
Response to: N	+16.5	+14.7	+18.5	(Crop
P	+5.3	-3.7	-0.9	discarded)
K	0.0	+10.2	-0.4	
Mean dry matter % as harvested:			76.0	
	Sugar Beet, tops: tons per acre		Wheat, grain: cwt per acre	
Mean	7.75	6.41	34.9*	27.5*
Response to: N	+5.61	+3.73	+0.9	+26.8
P	+0.59	-3.21	+1.7	-0.7
K	-0.01	+0.79	-1.0	+2.5
Mean dry matter % as harvested:			83.0	80.3
	Sugar Beet, plant number: thousands per acre		Wheat, straw: cwt per acre	
Mean	27.6	**	58.9*	33.2*
Response to: N	+1.5		-3.7	+31.5
P	-1.6		+5.3	+3.9
K	+1.8		+3.8	+6.4
Mean dry matter % as harvested:			86.6	81.1

*(At 85% dry matter). **Not recorded

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Mean yields per acre and responses in yield per cwt of N, P_2O_5 and K_2O

	Rothamsted	Woburn		Rothamsted	Woburn
	Potatoes, total tubers: tons per acre			Rye, grain: cwt per acre	
		Without Mg	With Mg		
Mean	12.00	9.33	10.46	26.2*	28.9*
Response to: N	+3.64	+6.71	+6.45	+8.0	+20.5
P	+0.10	-2.55	-1.64	-0.7	-4.6
K	+3.54	-0.31	+1.74	-3.2	-0.9
Mean dry matter % as harvested:				82.2	79.2
	Potatoes, percentage ware			Rye, straw: cwt per acre	
	(1)	Without (2) Mg	With Mg		
Mean	91.5	81.1	83.9	38.5*	29.5*
Response to: N	+3.3	+31.3	+19.0	+21.9	+14.8
P	-7.7	-9.6	-5.7	+4.3	+2.7
K	+2.8	+7.8	+11.3	-2.3	-0.6
Mean dry matter % as harvested:				86.9	62.8

*(At 85% dry matter)

Riddle: (1) $1\frac{1}{2}$"; (2) $1\frac{5}{8}$".

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60/B/2.1

LEY AND ARABLE ROTATIONS

Highfield and Fosters Field 1960 - the 12th year.

For details of treatments, rotations, etc. see "Details of the Classical and Long Term Experiments" 1956.

Second year lucerne: Three applications of sodium molybdate were made as a foliar spray to small areas before each cut. These areas were harvested separately.
Rate of application: 4 oz of sodium molybdate in 700 gallons per acre, applied to same area for each cut.

In 1960 yields of arable hay, cut grass and silage were estimated (except where otherwise stated in "Cultivations, etc.") from samples cut by a flail action forage harvester. Two sample strips 40" wide were cut from each sub-plot.

Cultivations, etc.:

HIGHFIELD

1st year Treatment Crops

Cut grass. Ploughed twice: Sept 2, 1959 and Feb 16, 1960. Basal PK compound applied; 'Nitro-Chalk' applied: Apr 7. Seeds sown at 33 lb per acre: Apr 12. Cut by mower: July 7. Cut 4 times: July 7, Aug 3, Sept 28, Dec 16. 'Nitro-Chalk' applied after every cut except the last.

Grazed ley. Ploughed twice: Sept 2, 1959 and Feb 16, 1960. Basal PK compound applied; 'Nitro-Chalk' applied: Apr 7. Seed sown at 44 lb per acre: Apr 12. 'Nitro-Chalk' applied: July 20. Grazed: 8 circuits, June 20 - Oct 16.

Lucerne. Ploughed twice: Sept 2, 1959 and Feb 16, 1960. Basal PK compound applied: Apr 7. Seed drilled at 28 lb per acre: Apr 12. Cut twice: July 21, Sept 26. Variety: Du Puits.

Hay. Seeds undersown in barley at 28 lb per acre: Apr 29, 1959. Basal PK compound applied: Jan 18, 1960. 'Nitro-Chalk' applied: Mar 25. Cut: May 27.

2nd year Treatment Crops

Cut grass. Basal PK compound applied: Jan 18, 1960. Nitrogen and potash applied as compound fertilizer (16% N, 16% K_2O): Apr 4 and after every cut except the last. Cut 5 times: May 18, June 22, Aug 3, Sept 27, Dec 16.

Grazed ley. Basal PK compound applied: Feb 11, 1960. 'Nitro-Chalk' applied: Mar 30 and July 18. Grazed: 9 circuits, Apr 22 - Oct 4.

Lucerne. Basal PK compound applied: Feb 11, 1960. Molybdenum spray applied 3 times: Apr 28, June 17, Aug 2. Molybdenum strips cut: May 25, July 14, Sept 22. Cut 3 times: May 30, July 15, Sept 24.

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Potatoes. Ploughed 3 times: June 18, Sept 3, 1959 and Feb 16, 1960. Ridged, basal PK compound applied: Apr 25. Sulphate of ammonia and dung applied; potatoes planted: Apr 27. For later cultivations see Potato Test Crop.

3rd year Treatment Crops

Cut grass. Basal PK compound applied: Jan 18, 1960. Nitrogen and potash applied as compound fertilizer (16% N, 16% K_2O): Apr 4, and after every cut, except the last. Cut 4 times: May 19, June 22, Aug 4, Sept 27.

Grazed ley. Basal PK compound applied: Feb 11, 1960. 'Nitro-Chalk' applied: Mar 30 and July 22. Grazed: 7 circuits, Apr 26 - Sept 18.

Lucerne. Basal PK compound applied: Feb 11, 1960. Cut 3 times: May 30, July 15, Sept 26.

Oats. Ploughed: Oct 8, 1959. 'Nitro-Chalk' applied: Mar 4. Seed drilled at $3\frac{1}{2}$ bushels per acre with basal PK compound: Mar 5. Sprayed with CMPP at 6 pints in 40 gallons per acre: May 7. Combine harvested: Aug 15.

1st Test Crop, Wheat

Ploughed: Sept 16, 1959. Seed combine drilled at $2\frac{3}{4}$ bushels per acre with basal PK compound: Oct 14. 'Nitro-Chalk' applied: Apr 1, 1960. Sprayed with CMPP at 6 pints in 40 gallons per acre: Apr 21. Combine harvested: Aug 23. Variety: Cappelle.

2nd Test Crop, Potatoes

Ploughed twice: Sept 3, 1959 and Feb 16, 1960. Ridged, basal PK compound applied: Apr 25. Sulphate of ammonia, additional P and K and dung applied, potatoes planted: Apr 28. Earthed up: June 21. Sprayed twice with copper fungicide at 5 lb in 40 gallons per acre: July 15 and Aug 10. Sprayed with undiluted BOV at 15 gallons per acre: Sept 13. Haulm destroyed mechanically: Sept 19. Lifted: Oct 14.

3rd Test Crop, Barley

Ground chalk applied to blocks 2 and 3: Oct 7, 1959. Ploughed twice: Oct 8 and Feb 15, 1960. Additional P and K applied: Feb 8. Seed combine drilled at $2\frac{1}{2}$ bushels per acre with basal PK compound: Mar 7. 'Nitro-Chalk' applied: Mar 8. Sprayed with CMPP at 6 pints in 40 gallons per acre: May 7. Combine harvested: Aug 15. Variety: Proctor.

Permanent grasses. Basal PK compound applied to all plots: Feb 11, 1960.

10th year reseeded, 10th experimental year of permanent grass, Block 9 - 12.

Blocks 10 and 12. 'Nitro-Chalk' applied: Mar 30, 1960. 2nd dressing of 'Nitro-Chalk' applied to reseeded plots: July 18 and to permanent grass plot: July 20. Grazed: 7 circuits, Apr 30 - Oct 8.

Blocks 9 and 11. 'Nitro-Chalk' applied: Mar 25, 1960. Cut for silage: May 27. 2nd dressing of 'Nitro-Chalk' applied to permanent grass plots: July 25 and to reseeded plots: July 28. Grazed: 5 circuits, June 28 - Oct 24.

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11th year reseeded, 11th experimental year of permanent grass,
Blocks 5 - 8.
Blocks 7 and 8. 'Nitro-Chalk' applied: Mar 30, 1960. 2nd dressing of 'Nitro-Chalk' applied to permanent grass plots: July 18, and to reseeded plots: July 20. Grazed: 8 circuits, Apr 22 - Oct 28.
Blocks 5 and 6. 'Nitro-Chalk' applied: Mar 25, 1960. Cut for silage: May 27. 2nd dressing of 'Nitro-Chalk' applied to permanent grass plots: July 25 and to reseeded plots: July 27. Grazed: 5 circuits, June 24 - Oct 20.

12th year reseeded, 12th experimental year of permanent grass,
Blocks 1 and 3. 'Nitro-Chalk' applied: Mar 30, 1960. 2nd dressing of 'Nitro-Chalk' applied: July 15. Grazed: Permanent grass plots - 8 circuits, reseeded plots 5 and 6 - 7 circuits each, 31 and 32 - 8 circuits, each; Apr 26 - Oct 28.
Blocks 2 and 4. 'Nitro-Chalk' applied: Mar 25, 1960. Cut for silage: May 27. 2nd dressing of 'Nitro-Chalk' applied: July 18 - 25. Grazed: Permanent grass plots - 5 circuits, reseeded plots 13 and 14 - 5 circuits each, 39 and 40 - 6 circuits. each; June 20 - Oct 16.

FOSTERS

1st year Treatment Crops

Cut grass. Ploughed twice: Aug 22, 1959 and Feb 11, 1960. Basal PK compound and 'Nitro-Chalk' applied: Apr 7. Seeds sown at 33 lb per acre: Apr 12. Cut by mower: July 7. Cut 4 times: July 7, Aug 3, Sept 27, Dec 16. 'Nitro-Chalk' applied after every cut except the last.
Grazed ley. Ploughed twice: Aug 22, 1959 and Feb 11, 1960. Basal PK compound and 'Nitro-Chalk' applied: Apr 7. Seeds sown at 44 lb per acre: Apr 12. 2nd dressing of 'Nitro-Chalk' applied: July 25. Grazed: 6 circuits, June 18 - Oct 15.
Lucerne. Ploughed twice: Aug 22, 1959 and Feb 11, 1960. Basal PK compound applied: Apr 7. Seeds sown at 28 lb per acre: Apr 12. Cut twice: July 21 and Sept 26.
Hay. Seeds undersown in barley at 28 lb per acre: Apr 29, 1959. Basal PK applied: Jan 19, 1960. 'Nitro-Chalk' applied: Mar 25. Cut: May 27.

2nd year Treatment Crops

Cut grass. Basal PK compound applied: Jan 19, 1960. Nitrogen and potash applied as compound fertiliser (16% N, 16% K_2O): Apr 2 and after every cut except the last. Cut 5 times: May 18, June 22, Aug 3, Sept 27, Dec 16.
Grazed ley. Basal PK compound applied: Feb 10, 1960. 'Nitro-Chalk' applied: Mar 28 and July 22. Grazed: 7 circuits, Apr 24 - Oct 7.

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Lucerne. Basal PK compound applied: Feb 10, 1960. Molybdenum spray applied 3 times: Apr 28, June 17, Aug 2. Molybdenum strips cut: May 25, July 14, Sept 22. Cut 3 times: May 30, July 14, Sept 26.

Potatoes. Ploughed three times: June 18 and Aug 22, 1959, Feb 11, 1960. Ridged, basal PK compound applied: Apr 25. Sulphate of ammonia applied: Apr 26. Dung applied and potatoes planted: Apr 27. For later cultivations see Potato Test Crop.

3rd year Treatment Crops

Cut grass. Basal PK compound applied: Jan 19, 1960. Nitrogen and potash applied as compound fertiliser (16% N, 16% K_2O): Apr 2 and after every cut except the last. Cut 4 times: May 18, June 22, Aug 3, Sept 26.

Grazed ley. Basal PK compound applied: Feb 10, 1960. 'Nitro-Chalk' applied: Mar 28 and July 27. Grazed: 5 circuits, Apr 23 - Sept 17.

Lucerne. Basal PK compound applied: Feb 10, 1960. Cut 3 times: May 30, July 14, Sept 26.

Oats. Ploughed twice: Oct 8, 1959, Feb 10, 1960. 'Nitro-Chalk' applied: Mar 4. Seed drilled at $3\frac{1}{2}$ bushels per acre with basal PK compound: Mar 5. Sprayed with TCB/MCPA at 4 pints in 40 gallons per acre: May 6. Combine harvested: Aug 15. Variety: Sun II.

1st Test Crop, Wheat

Ploughed: Sept 15, 1959. Seed drilled at $2\frac{3}{4}$ bushels per acre, with basl PK compound: Oct 14. 'Nitro-Chalk' applied: Apr 1, 1960. Sprayed with CMPP at 6 pints in 40 gallons per acre: Apr 21. Combine harvested: Aug 28. Variety: Cappelle.

2nd Test Crop, Potatoes

Ploughed twice: Aug 22, 1959 and Feb 11, 1960. Ridged, basal PK compound applied: Apr 25. Dung, additional P and K and sulphate of ammonia applied, potatoes planted: Apr 27. Earthed up: June 21. Sprayed twice with copper fungicide at 5 lb in 40 gallons per acre: July 16 and Aug 10. Sprayed with undiluted BOV at 15 gallons per acre: Sept 13. Haulm destroyed mechanically: Sept 20. Lifted: Oct 17. Variety: Majestic.

3rd Test Crop, Barley

Ploughed twice: Oct 8, 1959 and Feb 10, 1960. Part of additional P and K applied: Jan 20, 1960; remainder: Feb 10. Seed drilled at $2\frac{1}{2}$ bushels per acre with basal PK compound: Mar 5. 'Nitro-Chalk' applied: Mar 8. Sprayed with TCB/MCPA at 4 pints in 40 gallons per acre: May 6. Combine harvested: Aug 13. Variety: Proctor.

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Permanent grasses. Basal PK compound applied to all plots: Feb 10, 1960.

10th year reseeded grass, Blocks 6, 10, 11, 12.
Blocks 6 and 10. 'Nitro-Chalk' applied: Mar 28 and July 28, 1960. Grazed: 6 circuits, May 1 - Oct 11.
Blocks 11 and 12. 'Nitro-Chalk' applied: Mar 28, 1960. Cut for silage: May 27. 2nd dressing of 'Nitro-Chalk' applied: Aug 2. Grazed: 4 circuits, June 24 - Oct 23.

11th year reseeded grass, Blocks 5, 7, 8, 9.
Blocks 5 and 9. 'Nitro-Chalk' applied: Mar 28 and July 18 - 25, 1960. Grazed: Plots 47 and 48 - 8 circuits, Plots 81 and 82 - 7 circuits, Apr 23 - Oct 7.
Blocks 7 and 8. 'Nitro-Chalk' applied: Mar 28, 1960. Cut for silage: May 27. 2nd dressing of 'Nitro-Chalk' applied: July 25. Grazed: 5 circuits, June 22 - Oct 19.

12th year reseeded grass, Blocks 1 - 4.
Blocks 1 and 2. 'Nitro-Chalk' applied: Mar 28 and July 18 - 28, 1960. Grazed: Plots 7 and 8 - 8 circuits; plots 13 and 14 - 7 circuits, Apr 23 - Oct 27.
Blocks 3 and 4. 'Nitro-Chalk' applied: Mar 28, 1960. Cut for silage: May 27. 2nd dressing of 'Nitro-Chalk' applied: July 22. Grazed: 5 circuits, June 20 - Oct 15.

Standard errors per plot. **Test Crops.**

Wheat, grain (at 85% dry matter).		Highfield:	3.27 cwt per acre or 6.7% (14 d.f.)
		Fosters:	2.10 cwt per acre or 4.6% (14 d.f.)
Potatoes, total tubers.	Highfield	$\frac{1}{4}$ plot:	1.135 tons per acre or 5.6% (14 d.f.)
		$\frac{1}{8}$ plot:	0.974 tons per acre or 4.9% (20 d.f.)
	Fosters	$\frac{1}{4}$ plot:	0.946 tons per acre or 4.9% (14 d.f.)
		$\frac{1}{8}$ plot:	0.713 tons per acre or 3.7% (20 d.f.)
Barley, grain (at 85% dry matter).		Highfield:	2.07 cwt per acre or 4.4% (15 d.f.)
		Fosters:	2.06 cwt per acre or 4.4% (15 d.f.)

Errata to 'Results of the Field Experiments' 1959 pages 59/Bb/1.14 and 1.15.

Barley Fosters. N × Treatment crops 1954 - 56 table:-
Levels of N: cwt per acre should read '0.2 not 'None
0.4' 0.2'

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60/B/2.6

Summary of Results

Wheat 1st test crop

N: cwt per acre	Treatment crops 1957 - 1959 Lucerne	Ley	Cut grass	Arable with hay	Mean
Grain (at 85% dry matter): cwt per acre					
Highfield					
Mean	53.6	52.8	41.9	48.6	49.2
To test crop					
0.3	51.8	51.6	40.2	44.3	47.0
0.6	55.4	54.1	43.6	52.9	51.5
Difference (±2.31)	+3.6	+2.5	+3.4	+8.6	+4.5 (±1.16)
To treatment crops					
Single rate		53.3	41.2	45.9	46.8
Double rate		52.4	42.6	51.3	48.8
Difference (±2.31)		-0.9	+1.4	+5.4	+2.0 (±1.34)
Fosters					
Mean	52.4	44.9	43.2	42.0	45.7
To test crop					
0.3	51.5	44.5	41.6	38.3	44.0
0.6	53.4	45.4	44.9	45.8	47.4
Difference (±1.49)	+1.9	+0.9	+3.3	+7.5	+3.4 (±0.74)
To treatment crops					
Single rate		45.5	43.3	42.0	43.6
Double rate		44.4	43.2	42.1	43.2
Difference (±1.49)		-1.1	-0.1	+0.1	-0.4 (±0.86)

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Wheat 1st test crop

N: cwt per acre	Excluding Lucerne: N to previous treatment crop: Single rate	Excluding Lucerne: N to previous treatment crop: Double rate	Excluding Lucerne: Mean	Arable with hay only: Dung to potatoes 1958: tons per acre: None	Arable with hay only: Dung to potatoes 1958: tons per acre: 12	Arable with hay only: Mean
Grain (at 85% dry matter): cwt per acre						
Highfield						
To test crop	(±1.34)		(±0.94)	(±2.31)		(±1.64)
0.3	43.9	46.9	45.4	44.2	44.4	44.3
0.6	49.7	50.6	50.2	52.8	52.9	52.9
Mean	46.8	48.8	47.8			
	(±0.94)					
To previous treatment crops				(±2.31)		(±1.64)
Single rate				45.2	46.6	45.9
Double rate				51.9	50.8	51.3
Mean				48.5	48.7	48.6
				(±1.64)		
Mean dry matter % as harvested: 81.1						
Fosters						
To test crop	(±0.86)		(±0.61)	(±1.49)		(±1.05)
0.3	41.2	41.7	41.5	38.4	38.1	38.3
0.6	45.9	44.8	45.3	45.9	45.7	45.8
Mean	43.6	43.2	43.4			
	(±0.61)					
To previous treatment crops				(±1.49)		(±1.05)
Single rate				43.1	40.9	42.0
Double rate				41.3	42.9	42.1
Mean				42.2	41.9	42.0
				(±1.05)		
Mean dry matter % as harvested: 79.7						

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Wheat 1st test crop

N: cwt per acre	Treatment crops 1957 - 1959 Lucerne	Ley	Cut grass	Arable with hay	Mean
Straw (at 85% dry matter): cwt per acre					
Highfield					
Mean	51.0	45.7	35.1	41.0	43.2
To test crop					
0.3	49.8	44.2	33.6	36.8	41.1
0.6	52.2	47.3	36.6	45.2	45.3
Difference	+2.4	+3.1	+3.0	+8.4	+4.2
To treatment crops					
Single rate		45.4	36.0	39.0	40.1
Double rate		46.0	34.2	43.0	41.0
Difference		+0.6	-1.8	+4.0	+0.9
Fosters					
Mean	38.3	29.2	26.5	27.1	30.3
To test crop					
0.3	38.7	27.5	25.9	23.3	28.9
0.6	37.9	30.9	27.2	30.9	31.7
Difference	-0.8	+3.4	+1.3	+7.6	+2.8
To treatment crops					
Single rate		29.0	27.0	27.3	27.8
Double rate		29.4	26.1	26.9	27.4
Difference		+0.4	-0.9	-0.4	-0.4

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Wheat 1st test crop

N: cwt per acre	Excluding Lucerne: N to previous treatment crop Single rate	Excluding Lucerne: N to previous treatment crop Double rate	Excluding Lucerne: Mean	Arable with hay only: Dung to potatoes 1958: tons per acre None	Arable with hay only: Dung to potatoes 1958: tons per acre 12	Arable with hay only: Mean
Straw (at 85% dry matter): cwt per acre						
Highfield						
To test crop						
0.3	38.2	38.1	38.2	35.4	38.1	36.8
0.6	42.1	43.9	43.0	43.9	46.5	45.2
Mean	40.1	41.0	40.6			
To previous treatment crop						
Single rate				37.6	40.4	39.0
Double rate				41.8	44.3	43.0
Mean				39.7	42.3	41.0

Mean dry matter % as harvested: 66.2

Fosters

To test crop						
0.3	25.1	26.0	25.6	22.2	24.5	23.3
0.6	30.4	28.9	29.6	29.8	32.0	30.9
Mean	27.8	27.4	27.6			
To previous treatment crop						
Single rate				26.9	27.8	27.3
Double rate				25.1	28.8	26.9
Mean				26.0	28.3	27.1

Mean dry matter % as harvested: 85.5

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Potatoes 2nd test crop. Total tubers: tons per acre

	Treatment crops 1956-1958				
	Lucerne	Ley	Cut Grass	Arable with hay	Mean
Highfield					
Mean	21.13	20.59	20.28	18.35	20.09
N: cwt per acre					
0.5	20.85	20.25	20.16	17.98	19.81
1.0	21.41	20.93	20.41	18.71	20.36
Difference (±0.802)	+0.56	+0.68	+0.25	+0.73	+0.55 (±0.401)
Dung: tons per acre					
None	19.88	20.05	19.62	16.41	18.99
12	22.38	21.13	20.94	20.28	21.18
Difference (±0.802)	+2.50	+1.08	+1.32	+3.87	+2.19 (±0.401)
P_2O_5: cwt per acre*					
0.9	21.25	20.81	20.35	18.10	20.13
1.8	21.01	20.36	20.21	18.59	20.04
Difference (±0.487)	-0.24	-0.45	-0.14	+0.49	-0.09 (±0.244)
K_2O: cwt per acre*					
0.9	21.13	20.47	20.44	17.56	19.90
1.8	21.13	20.70	20.12	19.13	20.27
Difference (±0.487)	0.0	+0.23	-0.32	+1.57	+0.37 (±0.244)
Fosters					
Mean	19.59	19.57	19.36	18.63	19.28
N: cwt per acre					
0.5	19.15	19.36	19.33	18.38	19.06
1.0	20.02	19.77	19.38	18.88	19.51
Difference (±0.669)	+0.87	+0.41	+0.05	+0.50	+0.45 (±0.334)
Dung: tons per acre					
None	18.61	18.57	18.83	17.08	18.27
12	20.56	20.56	19.88	20.19	20.30
Difference (±0.669)	+1.95	+1.99	+1.05	+3.11	+2.03 (±0.334)
P_2O_5: cwt per acre*					
0.9	19.68	19.10	19.11	18.43	19.08
1.8	19.49	20.03	19.60	18.83	19.49
Difference (±0.356)	-0.19	+0.93	+0.49	+0.40	+0.41 (±0.178)
K_2O: cwt per acre*					
0.9	19.42	19.73	18.96	18.35	19.11
1.8	19.75	19.41	19.75	18.91	19.46
Difference (±0.356)	+0.33	-0.32	+0.79	+0.56	+0.35 (±0.178)

*Including basal dressing

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Potatoes 2nd test crop. Total tubers: tons per acre

Highfield

	Dung: tons per acre		P_2O_5: cwt* per acre		K_2O: cwt* per acre	
	None	12	0.9	1.8	0.9	1.8
N: cwt per acre						
0.5	18.44	21.18	19.84	19.78	19.65	19.97
1.0	19.54	21.18	20.41	20.31	20.15	20.57
	(±0.401)		(1) and (2)		(1) and (2)	
Dung: tons per acre						
None			19.02	18.96	18.61	19.37
12			21.23	21.13	21.19	21.17

Lucerne rotation only	K_2O: cwt per acre* 0.9	1.8	Mean
	(3) and (4)		
P_2O_5: cwt per acre*			
0.9	21.07	21.42	21.25
1.8	21.19	20.84	21.01
Mean	21.13	21.13	21.13

Fosters

	Dung: tons per acre		P_2O_5: cwt* per acre		K_2O: cwt* per acre	
	None	12	0.9	1.8	0.9	1.8
N: cwt per acre						
0.5	17.78	20.33	18.78	19.33	19.03	19.08
1.0	18.77	20.26	19.38	19.65	19.20	19.83
	(±0.334)		(1) and (2)		(1) and (2)	
Dung: tons per acre						
None			17.95	18.59	17.73	18.81
12			20.21	20.39	20.50	20.10

Lucerne rotation only	K_2O: cwt per acre* 0.9	1.8	Mean
	(3) and (4)		
P_2O_5: cwt per acre*			
0.9	19.50	19.86	19.68
1.8	19.35	19.64	19.49
Mean	19.42	19.75	19.59

*Including basal dressing

Highfield	Fosters	
(1) ±0.244	(1) ±0.178	for use in horizontal and interaction comparisons.
(2) ±0.332	(2) ±0.268	for use in all others.
(3) ±0.802	(3) ±0.669	for use only in testing the PK interaction.
(4) ±0.664	(4) ±0.536	for use in all other comparisons.

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Potatoes 2nd test crop. Percentage ware ($1\frac{1}{2}$" riddle)

	Treatment crops 1956–1958				
	Lucerne	Ley	Cut Grass	Arable with hay	Mean
Highfield					
Mean	94.5	94.4	93.6	94.2	94.2
N: cwt per acre					
0.5	94.3	94.2	93.9	94.3	94.2
1.0	94.8	94.6	93.3	94.0	94.2
Difference	+0.5	+0.4	-0.6	-0.3	0.0
Dung: tons per acre					
None	94.1	93.7	92.8	93.1	93.4
12	94.9	95.1	94.4	95.2	94.9
Difference	+0.8	+1.4	+1.6	+2.1	+1.5
P_2O_5: cwt per acre*					
0.9	95.0	94.8	93.7	94.6	94.5
1.8	94.1	94.1	93.5	93.7	93.8
Difference	-0.9	-0.7	-0.2	-0.9	-0.7
K_2O: cwt per acre*					
0.9	94.2	93.7	93.3	93.4	93.7
1.8	94.8	95.2	93.8	95.0	94.7
Difference	+0.6	+1.5	+0.5	+1.6	+1.0
Fosters					
Mean	95.2	95.5	95.7	94.7	95.3
N: cwt per acre					
0.5	95.2	94.9	96.0	94.9	95.2
1.0	95.2	96.2	95.3	94.6	95.3
Difference	0.0	+1.3	-0.7	-0.3	+0.1
Dung: tons per acre					
None	95.3	95.6	95.8	94.7	95.4
12	95.1	95.5	95.6	94.7	95.2
Difference	-0.2	-0.1	-0.2	0.0	-0.2
P_2O_5: cwt per acre*					
0.9	95.2	95.3	95.8	94.9	95.3
1.8	95.2	95.8	95.5	94.6	95.3
Difference	0.0	+0.5	-0.3	-0.3	0.0
K_2O: cwt per acre*					
0.9	95.0	95.4	95.8	94.2	95.1
1.8	95.4	95.7	95.6	95.3	95.5
Difference	+0.4	+0.3	-0.2	+1.1	+0.4

*Including basal dressing

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60/B/2.13

Potatoes 2nd test crop. Percentage ware ($1\frac{1}{2}$" riddle)

	Dung: tons per acre		P_2O_5: cwt per acre*		K_2O: cwt per acre*	
	None	12	0.9	1.8	0.9	1.8
Highfield						
N: cwt per acre						
0.5	93.4	95.0	94.5	93.8	93.5	94.8
1.0	93.5	94.9	94.5	93.8	93.8	94.6
Dung: tons per acre						
None			93.9	92.9	92.6	94.2
12			95.1	94.8	94.7	95.2

Lucerne rotation only

P_2O_5: cwt per acre*	K_2O: cwt per acre* 0.9	1.8	Mean
0.9	94.7	95.3	95.0
1.8	93.7	94.4	94.1
Mean	94.2	94.8	94.5

	Dung: tons per acre		P_2O_5: cwt per acre*		K_2O: cwt per acre*	
	None	12	0.9	1.8	0.9	1.8
Fosters						
N: cwt per acre						
0.5	95.2	95.3	95.5	95.0	94.9	95.5
1.0	95.5	95.2	95.1	95.6	95.2	95.5
Dung: tons per acre						
None			95.4	95.3	95.2	95.5
12			95.2	95.2	94.9	95.5

Lucerne rotation only

P_2O_5: cwt per acre*	K_2O: cwt per acre* 0.9	1.8	Mean
0.9	94.7	95.6	95.2
1.8	95.2	95.2	95.2
Mean	95.0	95.4	95.2

*Including basal dressing

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Barley 3rd test crop. Grain (at 85% dry matter): cwt per acre

	Treatment crops 1955-1957				
	Lucerne	Ley	Cut Grass	Arable with hay	Mean
Highfield					
Mean	47.5	43.6	48.6	49.1	47.2
N: cwt per acre					
None	50.4	44.5	48.7	47.1	47.6
0.2	44.7	42.7	48.5	51.2	46.8
Difference (±1.46)	-5.7	-1.8	-0.2	+4.1	-0.8 (±0.73)
Dung to potatoes 1959: tons per acre					
None	48.3	42.5	48.8	48.6	47.0
12	46.7	44.7	48.4	49.7	47.4
Difference (±1.46)	-1.6	+2.2	-0.4	+1.1	+0.4 (±0.73)
Fosters					
Mean	47.4	46.5	45.4	46.1	46.4
N: cwt per acre					
0.2	45.4	44.0	44.8	44.4	44.6
0.4	49.5	48.9	45.9	47.9	48.1
Difference (±1.46)	+4.1	+4.9	+1.1	+3.5	+3.5 (±0.73)
Dung to potatoes 1959: tons per acre					
None	46.8	46.1	44.1	46.5	45.9
12	48.1	46.8	46.7	45.8	46.8
Difference (±1.46)	+1.3	+0.7	+2.6	-0.7	+0.9 (±0.73)

	Highfield		Fosters	
	N: cwt per acre		N: cwt per acre	
	None	0.2	0.2	0.4
Dung to potatoes 1959: tons per acre	(±0.73)		(±0.72)	
None	46.8	47.2	44.2	47.6
12	48.4	46.3	45.1	48.6

Mean dry matter % as harvested:
Highfield: 77.0
Fosters: 79.5

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Barley 3rd test crop. Straw (at 85% dry matter): cwt per acre

	Treatment crops 1955–1957				
	Lucerne	Ley	Cut Grass	Arable with hay	Mean
Highfield					
Mean	37.3	38.6	34.9	32.3	35.8
N: cwt per acre					
None	35.3	36.6	33.6	29.2	33.7
0.2	39.4	40.5	36.1	35.4	37.9
Difference	+4.1	+3.9	+2.5	+6.2	+4.2
Dung to potatoes 1959: tons per acre					
None	35.1	38.6	33.7	31.2	34.6
12	39.6	38.5	36.1	33.4	36.9
Difference	+4.5	-0.1	+2.4	+2.2	+2.3
Fosters					
Mean	33.9	32.2	31.0	33.0	32.5
N: cwt per acre					
0.2	31.9	30.4	27.8	30.8	30.2
0.4	36.0	34.1	34.2	35.2	34.9
Difference	+4.1	+3.7	+6.4	+4.4	+4.7
Dung to potatoes 1959: tons per acre					
None	33.7	31.0	29.3	31.8	31.5
12	34.2	33.4	32.7	34.1	33.6
Difference	+0.5	+2.4	+3.4	+2.3	+2.1

	Highfield		Fosters	
	N: cwt per acre		N: cwt per acre	
	None	0.2	0.2	0.4
Dung to potatoes 1959: tons per acre				
None	32.5	36.8	28.7	34.2
12	34.8	38.9	31.7	35.5

Mean dry matter % as harvested:
Highfield: 88.5
Fosters: 85.0

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Treatment crops Arable and Hay rotation

(values based on mean of 2 sub plots only)

	Highfield N: cwt per acre applied in 1960			Fosters N: cwt per acre applied in 1960		
	Single rate	Double rate	Mean	Single rate	Double rate	Mean
Hay (dry matter): cwt per acre						
No dung	43.1	48.9	46.0	31.9	40.3	36.1
Dung in 1958	47.6	49.4	48.5	33.8	39.5	36.6
Mean	45.4	49.1	47.2	32.9	39.9	36.4
Potatoes, total tubers: tons per acre						
No dung	18.61	18.04	18.32	18.51	18.68	18.60
Dung in 1960	20.14	19.80	19.97	20.97	20.38	20.68
Mean	19.38	18.92	19.15	19.74	19.53	19.64
Potatoes, percentage ware ($1\frac{1}{2}$" riddle)						
No dung	95.1	93.6	94.4	94.5	95.0	94.8
Dung in 1960	96.2	96.4	96.2	94.2	94.4	94.3
Mean	95.6	95.0	95.3	94.4	94.7	94.5
Oats						
	None	0.2		0.2	0.4	
Grain (at 85% dry matter): cwt per acre						
No dung	33.6	34.4	34.0	37.6	42.8	40.2
Dung in 1959	38.7	37.3	38.0	38.7	41.4	40.1
Mean	36.2	35.9	36.0	38.2	42.1	40.1
Straw (at 85% dry matter): cwt per acre						
No dung	28.8	27.8	28.3	27.2	33.4	30.4
Dung in 1959	34.8	33.2	34.0	28.9	32.1	30.5
Mean	31.8	30.5	31.2	28.1	32.8	30.4

Highfield, Oats, Mean dry matter % as harvested Grain: 73.8 Straw: 76.8
Fosters, Oats, Mean dry matter % as harvested Grain: 79.2 Straw: 73.8

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Cut grass. Dry matter: cwt per acre

1st year	Highfield N to previous 3 test crops: Single rate	Highfield N to previous 3 test crops: Double rate	Highfield Dung to potatoes 1958: tons per acre: None	Highfield Dung to potatoes 1958: tons per acre: 12	Highfield: Mean	Fosters N to previous 3 test crops: Single rate	Fosters N to previous 3 test crops: Double rate	Fosters Dung to potatoes 1958: tons per acre: None	Fosters Dung to potatoes 1958: tons per acre: 12	Fosters: Mean
N (1) to cut grass (4 cuts)										
Single rate	63.1	58.2	60.5	60.8	60.6	56.4	55.4	58.3	53.4	55.8
Double rate	66.1	66.1	63.8	68.4	66.1	61.5	62.6	63.0	61.1	62.0
N to test crops										
Single rate			63.0	66.2	64.6			60.4	57.4	58.9
Double rate			61.2	63.0	62.1			60.8	57.0	59.0
Mean			62.1	64.6	63.4			60.6	57.2	58.9

	Highfield N to cut grass (1): Single rate	Highfield N to cut grass (1): Double rate	Highfield: Mean	Fosters N to cut grass (1): Single rate	Fosters N to cut grass (1): Double rate	Fosters: Mean
2nd year (5 cuts)	66.8	91.1	78.9	51.7	70.4	61.0
3rd year (4 cuts)	51.1	74.2	62.7	47.4	67.6	57.5

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Lucerne. Dry Matter: cwt per acre

1st year (2 cuts)	Highfield N to 3 previous test crops Single rate	Highfield N to 3 previous test crops Double rate	Highfield Mean	Fosters N to 3 previous test crops Single rate	Fosters N to 3 previous test crops Double rate	Fosters Mean
Dung to potatoes 1958						
None	42.1	47.4	44.7	44.0	58.3	51.1
12 tons	41.6	54.0	47.8	44.7	44.0	44.3
Mean	41.9	50.7	46.3	44.3	51.1	47.7
2nd year (3 cuts)			94.2			115.9
3rd year (3 cuts)			80.0			117.4

Grazed Ley. Dry matter: cwt per acre (estimated from sample cuts)

	Highfield N: cwt per acre (yearly) 0.15	Highfield N: cwt per acre (yearly) 0.30	Highfield Mean	Fosters N: cwt per acre (yearly) 0.15	Fosters N: cwt per acre (yearly) 0.30	Fosters Mean
1st year	42.4	38.2	40.3	37.9	37.1	37.5
2nd year	33.7	42.5	38.1	24.8	31.2	28.0
3rd year	27.6	35.9	31.7	20.1	24.7	22.4

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Reseeded Grass. Dry matter: cwt per acre

	Cut for silage N			Grazed Estimated from sampling cuts N		
	Single rate	Double rate	Mean	Single rate	Double rate	Mean
Highfield						
10th exptl. year						
Blocks 10 and 12				25.3*	33.3*	29.3*
Blocks 9 and 11	20.1	24.1	22.1	22.8*	28.4*	25.6*
11th exptl. year						
Blocks 7 and 8				28.2*	36.7*	32.5*
Blocks 5 and 6	28.3	30.8	29.6	23.0*	22.0*	22.5*
12th exptl. year						
Blocks 1 and 3				28.4*	31.0*	29.7*
Blocks 2 and 4	30.0	35.7	32.8	22.2*	27.3*	24.7*
Fosters						
10th exptl. year						
Blocks 6 and 10				27.9*	35.1*	31.5*
Blocks 11 and 12	15.2	16.6	15.9	31.5*	34.7*	33.1*
11th exptl. year						
Blocks 5 and 9				35.1*	38.8*	37.0*
Blocks 7 and 8	24.7	28.6	26.6	20.4*	25.6*	23.0*
12th exptl. year						
Blocks 1 and 2				28.8*	32.1*	30.4*
Blocks 3 and 4	30.2	33.3	31.7	20.2*	21.1*	20.6*

Permanent Grass. Dry matter: cwt per acre

Highfield						
10th exptl. year						
Blocks 10 and 12				20.7*	30.8*	25.7*
Blocks 9 and 11	24.6	27.3	26.0	24.4*	28.4*	26.4*
11th exptl. year						
Blocks 7 and 8				28.2*	39.2*	33.7*
Blocks 5 and 6	22.6	27.7	25.1	20.9*	25.3*	23.1*
12th exptl. year						
Blocks 1 and 3				26.4*	37.5*	32.0*
Blocks 2 and 4	25.7	27.0	26.4	27.0*	32.3*	29.7*

*Aftermath grazing

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60/B/3.1

REFERENCE PLOTS

The effects of N,P,K and Dung on a sequence of five arable crops and on permanent grass - Rothamsted (R) Great Field IV and Woburn (W) Stackyard Series C 1960.

In 1960 additional plots were laid down at Rothamsted to provide information on the effects of Mg, Ca, S and trace elements in the presence of N,P,K (equivalent to N_2,P,K treatment of the original plots) on an unlimed continuation of the original site in Great Field IV. The same sequence of crops (wheat, kale, barley, clover-grass ley, potatoes) is followed. The turf was removed from the site before hand digging.

At Woburn soft fruit was also grown, and the site selected was old arable, shown by soil analysis to be acid and to be low in available P & K. The cultivated areas received 27 cwt per acre hydrated lime before digging on February 10, 1960. All arable crops are spring sown.

Great Field IV (R): Additional plots:-

Design: 5 rows of a 7 × 7 Latin square, one row in each crop.
Area of each plot: 0.0013 acres.
Treatments:-

1. Nil
2. N_2,P,K
3. N_2,P,K Ca Mg
4. N_2,P,K Ca - S
5. N_2,P,K - Mg S
6. N_2,P,K Ca Mg S
7. N_2,P,K Ca Mg S + trace elements.

Rates and forms of manuring:

All N as urea.
All P and part K as potassium dihydrogen phosphate.
Remaining K as muriate of potash where sulphur omitted or sulphate of potash where sulphur added.
Ca as calcium carbonate
Mg as magnesium chloride
S as potassium sulphate
Trace elements: Iron, manganese, copper, zinc, boron, molybdenum and cobalt applied as foliar spray to crops known to benefit; as under:

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Levels of application:

	Winter wheat	Kale	Barley	Grass & clover	Potatoes
			cwt per acre		
N*	1.2	2.0	0.9	0.3	1.2
P_2O_5	1.0	1.0	1.0	1.0	1.0
K_2O	1.4	1.4	1.4	1.4	1.4
MgO	1.0	1.0	1.0	1.0	1.0
CaO	1.0	1.0	1.0	1.0	1.0
S	0.25	0.25	0.25	0.25	0.25
			lb per acre		
Fe+	-	-	-	-	20
$MnSO_4$	5	-	-	5	5
$CuSO_4$	2	-	2	-	-
$ZnSO_4$	2	-	2	-	2
NaB_4O_7	-	10	-	5	-
$NaMoO_4$	-	0.5	-	0.125	-
$CoSO_4$	-	-	-	0.125	-

*For winter wheat, potatoes and kale nitrogen divided into two equal applications - one early, one late.

+Iron applied as iron chelate (12% Fe).

Stackyard Series C (W)

Design: Each crop - 1 randomised block of 12 plots. Rotation: Oats, sugar beet, barley, clover-grass ley, potatoes.

Area of each plot: 0.0014 acres.

Treatments: All combinations of:-
Nitrogen: None, N_1 (for rates see below)
Phosphate: None, 0.5 cwt P_2O_5 per acre as triple superphosphate.
Potash: None, 1.0 cwt K_2O per acre as potassium bicarbonate,
and the following additional treatments:
N_2,P,K; dung; dung and N_1,P,K; dung and N_2,P,K.
Rates of nitrogen (all as ammonium nitrate):
N_1: Potatoes and fruit bushes, 0.6; barley, 0.45; oats, 0.3; sugar beet, 0.75; grass and clover ley, 0.15; permanent grass, 1.0 cwt N per acre; N_2 double N_1 in each case.
Dung: 20 tons per acre to potatoes and beet; 10 tons to permanent grass and, in 1960 only, 7 tons to barley and oats and 3 tons to clover-grass ley.

Basal dressing, to permanent grass and fruit bushes only: 0.25 cwt N per acre as ammonium nitrate.

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Cultivations, etc.:

Great Field IV (R):- Original plots:

Winter wheat: Dug by hand: Sept 14, 1959. P,K applied, seed drilled: Oct 23. First N dressing applied: Mar 7, 1960. Second N dressing applied: Apr 28. Harvested: Aug 10. Variety: Cappelle.

Kale: Dung applied, plots dug by hand: Nov 11, 1959. N,P & K applied, seed sown: Apr 6, 1960. Harvested: Nov 24. Variety: Thousand Head.

Barley: Dug by hand: Nov 23, 1959. N,P & K applied, seed sown: Mar 18, 1960. Harvested: Aug 5. Variety: Proctor.

Grass-clover ley: Undersown in barley: Apr 2, 1959. N,P & K applied: Mar 7, 1960. Cut 3 times: May 16, July 27 and October 11, 1960. Varieties: S22 Ryegrass and S151 Late Flowering Red Clover.

Potatoes: Dung applied, plots dug by hand: Nov 23, 1959. N, P&K applied on flat, setts planted: Apr 6, 1960. Harvested: Sept 12. Variety: King Edward.

Permanent grass: Dung applied: Nov 23, 1959. First N dressing and P,K applied: Mar 7, 1960. Second N dressing: May 16. Cut twice: May 16 and Oct 10.

Great Field IV (R):- Additional plots:

Winter wheat: Dug by hand: Oct 2, 1959. Seed drilled: Oct 23. P,K,Ca and S applied to wheat: Nov 17. Mg and half N applied: Mar 7, 1960. Half N applied: Apr 28. Trace element spray applied: May 18. Harvested: Aug 10. Variety: Cappelle.

Kale: Dug by hand: Jan 4, 1960. Half N and P,K,S,Mg and Ca applied: Mar 14. Rotovated and seed sown: Apr 6. Half N applied: Apr 28. Trace element spray applied: May 25. Harvested: Nov 24. Variety: Thousand Head.

Barley: Dug by hand: Jan 5, 1960. N, P,K,S,Mg and Ca applied: Mar 14. Rotovated, seed sown: Mar 18. Trace element spray applied: May 18. Harvested: Aug 5. Variety: Proctor.

Grass-clover ley: Dug by hand: Jan 4, 1960. N,P,K,S,Mg and Ca applied: Mar 14. Rotovated and seed sown: Mar 18. Trace element spray applied: May 25. Cut twice: July 26 and Oct 11. Varieties: S22 Ryegrass and Dorset Marl Broad Red Clover.

Potatoes: Dug by hand: Jan 5, 1960. Half N and P,K,S,Mg and Ca applied: Mar 14. Rotovated, setts planted: Apr 6. Half N applied: Apr 28. Trace element spray applied: May 25. Harvested: tops - Aug 2, tubers - Aug 15. Variety: King Edward.

Stackyard Series C (W):-

Oats: Hand dug, dung applied: Feb 15, 1960. N,P,K applied, seed sown: Mar 23. Harvested: Aug 9. Variety: Condor.

Sugar beet: Hand dug, dung applied: Feb 15, 1960. N,P,K applied, seed sown: Mar 25. Harvested: Oct 13. Variety: Klein E.

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Barley: Hand dug, dung applied: Feb 15, 1960. N,P,K applied, seed sown: Mar 23. Harvested: Aug 9. Variety: Proctor.
Grass-clover ley: Hand dug, dung applied: Feb 16, 1960. N,P,K applied, seed sown: Mar 24. Cut twice: July 26 and Oct 5. Varieties: S22 Italian Ryegrass and Dorset Marl Broad Red Clover.
Potatoes: Hand dug, dung applied: Feb 16, 1960. N,P,K applied, potatoes planted: Mar 25. Harvested: Sept 15. Variety: King Edward.
Permanent grass: Hand dug, dung applied: Feb 16, 1960. P,K and three-quarters of N applied, seed sown: Mar 24. Basal N applied: May 26. One-quarter N applied: July 26. Cut twice: July 26 and Oct 5. Variety: Complex grass and clover mixture.
Fruit bushes: Blackcurrants planted: Feb 8, 1960. Hand dug: Feb 16. Gooseberries planted: Mar 2. Lime applied to surface soil: Mar 15. N,P,K applied: Mar 24. Strawberries planted: Apr 22. Dung applied to surface soil: Apr 29. Basal N applied: June 2. Varieties: Blackcurrants - Wellington XXX; Gooseberry - Careless; Strawberry - Cambridge Vigour.

For details of the previous years results for Great Field IV (R) see "Results of the Field Experiments" 59/Bc/1 and 58/Bc/1, in which the rates of N, P & K are given.

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Summary of Results

Great Field IV (R): Original plots

Treatment	cwt per acre Winter wheat Grain (at 85% D.M)	Straw	tons per acre Kale total weight	cwt per acre Barley Grain (at 85% D.M)	Straw	cwt per acre Ley: dry matter 1st cut	2nd cut	3rd cut	Total	tons per acre Potatoes total tubers	cwt per acre Permanent grass: dry matter 1st cut	2nd cut	Total
None	40.6	45.8	6.04	20.8	17.8	13.7	17.6	7.1	38.4	4.30	6.8	34.9	41.7
N_1	47.1	50.5	13.11	27.3	24.0	19.5	14.5	4.9	38.9	4.47	13.1	31.9	45.0
P	48.4	58.0	7.77	28.0	21.2	17.7	19.9	15.7	53.3	4.12	6.0	31.8	37.8
N_1P	49.1	55.1	13.16	42.0	36.5	23.7	15.2	9.7	48.6	4.90	19.8	40.1	59.9
K	47.2	55.9	5.88	19.2	16.5	21.3	29.6	14.2	65.1	10.62	7.5	31.8	39.3
N_1K	53.5	61.3	9.14	31.8	28.9	25.8	23.0	15.4	64.2	10.29	20.2	37.4	57.6
PK	48.0	63.2	6.75	27.4	22.8	26.8	37.0	20.1	83.9	10.51	11.4	40.0	51.4
N_1PK	58.9	73.2	14.26	40.6	38.1	24.4	28.3	17.6	70.3	14.96	22.6	34.2	56.8
N_2PK	59.1	76.4	21.92	50.0	46.7	33.9	24.2	20.0	78.1	14.08	33.0	40.5	73.5
D	51.4	67.9	14.00	35.6	35.4	23.3	32.5	16.5	72.3	19.04	17.4	33.4	50.8
N_1PKD	59.6	80.6	20.18	46.2	44.8	31.5	29.6	20.2	81.3	22.68	34.0	38.5	72.5
N_2PKD	56.5	82.7	25.80	48.5	55.8	34.5	22.1	20.3	76.9	25.60	38.9	42.8	81.7
Mean dry matter % as harvested:	78.7	66.2		78.3	46.8	22.8	28.2	18.2	23.1		24.2	26.8	25.5

60/B/3.5

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Great Field IV (R): Additional plots

Treatment	cwt per acre Winter wheat Grain (at 85% D.M)	Straw	tons per acre Kale total weight	cwt per acre Barley Grain (at 85% D.M)	Straw	cwt per acre Ley: dry matter 1st cut	2nd cut	total	tons per acre Potatoes total tubers
None	15.6	18.5	10.42	18.1	12.2	14.3	14.2	28.5	5.28
N_2PK	42.7	45.5	22.18	41.6	34.7	31.9	20.0	51.9	13.13
N_2PK Mg Ca S	45.2	52.5	18.60	35.5	35.4	29.1	18.2	47.3	15.00
N_2PK Mg Ca S TE	41.1	50.1	19.42	40.7	34.7	29.2	18.1	47.3	13.62
N_2PK Mg Ca	39.6	49.8	21.16	40.7	34.2	28.7	18.3	47.0	14.45
N_2PK Mg S	42.2	44.2	20.86	37.3	31.5	25.2	16.6	41.8	14.98
N_2PK Ca S	52.1	63.8	21.10	39.2	37.4	30.6	17.9	48.5	14.93
Mean dry matter % as harvested:	79.2	70.6		83.7	59.3	23.5	14.3	18.9	

60/B/3.6

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Stackyard Series C (W)

Treatment	cwt per acre Oats Grain (at 85% D.M)	Straw	tons per acre Sugar beet roots (washed)	tops	cwt per acre Barley Grain (at 85% D.M)	Straw	cwt per acre Ley: dry matter 1st cut	2nd cut	Total	tons per acre Potatoes total tubers	cwt per acre Permanent grass: dry matter 1st cut	2nd cut	Total
None	8.8	12.8	14.96	7.10	12.2	10.2	25.5	21.1	46.6	6.65	16.7	13.1	29.8
N_1	19.2	23.3	17.52	12.96	17.9	18.9	25.0	23.8	48.8	12.12	23.9	16.2	40.1
P	9.2	12.0	14.12	6.48	9.3	9.3	25.6	22.8	48.4	7.30	18.7	14.8	33.5
N_1P	19.8	24.4	19.03	10.95	19.1	17.3	27.4	22.4	49.8	11.36	23.2	15.6	38.8
K	9.8	13.5	12.82	6.17	10.4	9.2	28.1	27.3	55.4	6.56	14.1	13.6	27.7
N_1K	24.6	28.4	20.81	11.72	20.7	18.9	25.3	22.8	48.1	11.07	25.7	16.4	42.1
PK	13.2	20.0	13.47	6.02	9.6	10.1	30.3	23.2	53.5	7.70	19.6	15.9	35.5
N_1PK	19.1	24.5	19.46	10.18	21.3	21.4	30.1	24.2	54.3	12.60	28.7	16.5	45.2
N_2PK	22.1	29.4	18.84	18.20	22.7	27.9	29.0	22.4	51.4	16.16	36.2	23.7	59.9
D	11.9	17.2	17.62	8.33	11.9	11.9	24.2	24.3	48.5	12.14	18.4	16.1	34.5
N_1PKD	22.2	27.3	25.72	13.58	26.5	25.4	29.8	27.0	56.8	16.72	32.5	19.8	52.3
N_2PKD	24.5	33.3	27.62	21.28	27.4	30.4	31.7	26.6	58.3	22.15	35.4	24.5	59.9
Mean dry matter % as harvested:	68.0	38.6			74.5	50.3	15.2	12.5	13.8		18.8	15.4	17.1

60/B/3.7

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60/E/4.1

GREEN MANURING EXPERIMENT

Woburn Stackyard - 1960, the 7th year of the revised scheme.

For history, treatments etc., see "Details of the Classical and Long Term Experiments" 1956.

Area of each plot (acres): 0.0406. Area harvested: Potatoes - 0.0221; barley - 0.0295.

Cultivations, etc.:

Green manures after barley 1959 (for early potatoes 1960): Trefoil at 30 lb per acre, ryegrass at 40 lb per acre, undersown: May 12, 1959, failed and resown: Aug 7. Varieties: Trefoil - English; Ryegrass - Western Wolths.

Early potatoes: Straw applied ("fallow" plots): Aug 31, 1959. "Fallow" plots ploughed: Sept 2 and Nov 24. Straw applied (green manure plots): Feb 11, 1960. All plots ploughed: Feb 23. Basal fertiliser applied: Apr 4. 'Nitro-Chalk' applied, potatoes mechanically planted: Apr 5. Earthed up: June 13. Sprayed with copper fungicide at 5 lb in 40 gallons per acre: July 16. Haulm destroyed mechanically: July 25. Lifted: July 26 and Aug 2. Variety: Ulster Chieftain.

Green manures after early potatoes 1959 (for barley 1960): Ground chalk applied at 15 cwt per acre: July 22, 1959. Trefoil at 30 lb per acre, ryegrass at 40 lb per acre, sown: Aug 1. Varieties: Trefoil - English; Ryegrass - Western Wolths.

Barley: "Fallow" plots and "early" green manure plots ploughed: Nov 23. "Late" green manure plots ploughed: Feb 10, 1960. 'Nitro-Chalk' applied: Mar 10. Seed drilled at 2½ bushels per acre: Mar 18. Trefoil and ryegrass undersown: Apr 27. Combine harvested: Aug 18. Variety: Herta.

Standard errors per plot.

Potatoes. Total tubers: 0.944 tons per acre or 8.7% (18 d.f.)

Barley. Grain (at 85% D.M.): 2.65 cwt per acre or 10.6% (20 d.f.)

Estimates of produce (roots and tops) of green manure crops: cwt per acre

	Green manures	Ploughed in	Dry matter	Nitrogen
For early potatoes	Trefoil		2.6 (7.9)	0.085 (0.146)
	Ryegrass		10.3 (4.1)	0.160 (0.077)
For barley	Trefoil	Early	15.9	0.494
	Ryegrass	Early	11.6	0.312
	Trefoil	Late	15.3	0.408
	Ryegrass	Late	13.0	0.286

Note. The figures in brackets are additional amounts derived from self-sown barley.

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Summary of Results

Early potatoes, total tubers: tons per acre

	Straw: tons per acre		N: cwt per acre (including basal)		Dung to cabbages 1952: tons per acre		Mean
	None	1½	0.6	1.2	None	10	
Excluding plots fallow under old scheme							
Undersown green manures for potatoes	(±0.334)		(±0.334)		(±0.334)		(±0.236)
None	10.43	11.12	10.20	11.34	9.92	11.63	10.78
	(±0.472)		(±0.472)		(±0.472)		(±0.334)
Trefoil	11.65	10.41	10.66	11.40	10.56	11.51	11.03
Ryegrass	10.76	11.48	10.52	11.72	10.26	11.98	11.12
Straw: tons per acre			(±0.334)		(±0.334)		(±0.236)
None			10.34	11.29	9.81	11.83	10.82
1½			10.46	11.61	10.52	11.55	11.03
N: cwt per acre (including basal)							
0.6					9.58	11.21	10.40
1.2					10.74	12.16	11.45
Mean (±0.236)					10.16	11.69	10.92
Plots fallow under old scheme							
Straw: tons per acre			(±0.667)		(±0.667)		(±0.472)
None			10.49	10.25	9.94	10.80	10.37
1½			9.80	10.61	9.60	10.81	10.20
N: cwt per acre (including basal)							
0.6					9.60	10.69	10.14
1.2					9.94	10.92	10.43
Mean (±0.472)					9.77	10.80	10.28

	Undersown green manures for potatoes				
	None	None	Trefoil	Ryegrass	Mean
Old scheme	Fallow	Excluding fallow			
	10.28 (±0.334)	10.78 (±0.236)	11.03 (±0.334)	11.12	10.79

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Barley, Grain (at 85% dry matter): cwt per acre

	Green manures: In barley for potatoes: None	Green manures: In barley for potatoes: Undersown	Green manures: After potatoes for barley: Trefoil	Green manures: After potatoes for barley: Ryegrass	N: cwt per acre (including basal): 0.23	N: cwt per acre (including basal): 0.46	Dung to cabbages 1953: tons per acre: None	Dung to cabbages 1953: tons per acre: 10	Mean
Excluding plots fallow under old scheme									
	(±0.94)		(±0.94)		(±0.94)		(±0.94)		(±0.66)
Green manures ploughed in									
Early	22.7	25.8	26.7	21.8	22.7	25.9	23.1	25.5	24.3
Late	25.3	29.3	28.1	26.5	27.3	27.4	27.1	27.5	27.3
Green manures in barley for potatoes									
None			26.7	21.4	22.4	25.6	24.2	23.9	24.0
Undersown			28.2	26.9	27.5	27.6	26.0	29.1	27.6
Green manures after potatoes for barley									
Trefoil					27.2	27.7	27.3	27.6	27.4
Ryegrass					22.7	25.6	22.9	25.4	24.1
N: cwt per acre (including basal)									
0.23							24.0	26.0	25.0
0.46							26.2	27.0	26.6
Mean (±0.66)							25.1	26.5	25.8

Old scheme	Green manures after potatoes for barley: None Fallow	Green manures after potatoes for barley: Trefoil (Excluding fallow)	Green manures after potatoes for barley: Ryegrass (Excluding fallow)	Mean
	21.3 (±0.937)	27.4	24.1 (±0.66)	24.9

Mean dry matter % as harvested: 81.0

Plots fallow under old scheme

N: cwt per acre (including basal)		(±1.87)	(±1.33)
0.23	20.4	18.4	19.4
0.46	24.0	22.3	23.1
Mean (±1.33)	22.2	20.3	21.3

60/B/4.3

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LEY AND ARABLE ROTATIONS

Woburn Stackyard 1960 - the 23rd year.

For history, treatments etc., see "Details of the Classical and Long Term Experiments" 1956.

Note: On the plots of the alternating rotations the hay and carrot crops were accidentally interchanged.

Cultivations, etc.,

Treatment crops

Ley rotations

Ley 1st year. Ploughed twice: Sept 1 and Nov 30, 1959. PK fertilisers and 'Nitro-Chalk' applied: Apr 13, 1960. Seed sown at 40 lb per acre: Apr 15. 'Nitro-Chalk' applied: 2nd dressing - June 29; 3rd dressing - Aug 28. Grazed 7 circuits: June 21 - Oct 29. Seeds mixture: 20 lb S24 Perennial Ryegrass, 11 lb S143 Cocksfoot, 6 lb Late Flowering Red Clover, 3 lb S100 White Clover per acre.

Ley 2nd year. Potash and nitrogen fertiliser applied: Mar 18, June 17 and Sept 5. Grazed 9 circuits: Apr 22 - Oct 21.

Ley 3rd year. Potash and nitrogen fertiliser applied: Mar 18, June 27 and Sept 13. Grazed 6 circuits: May 2 - Oct 12.

Lucerne 1st year. Ploughed twice: Sept 1 and Nov 30, 1959. PK fertiliser applied: Apr 13, 1960. Seed sown at 25 lb per acre: Apr 15. Sprayed with miscible DDT at 3 pints in 40 gallons per acre (against weevil): May 6. Cut twice: July 28, Sept 26. Variety: Du Puits.

Lucerne 2nd year. Muriate of potash applied: Mar 24, 1960. Cut 3 times: June 7, July 28, Sept 26.

Lucerne 3rd year. Muriate of potash applied: Mar 24, 1960. No yields taken. Treated for control of stem eelworm:- Sprayed with diquat at 1½ lb in 80 gallons per acre: July 9. Ploughed: July 19. Plots 37 and 38 split for fumigation with undiluted metham sodium ("Vapam") at 1 pt to 50 sq. ft: Oct 27.

Arable rotations

Potatoes 1st course. Ploughed twice: Sept 1 and Nov 30, 1959. Compound fertiliser applied; potatoes machine planted: Apr 12, 1960. Earthed up: June 14. Sprayed with copper fungicide at 5 lb in 40 gallons per acre: July 15. Haulm destroyed mechanically: Aug 27. Lifted: Sept 30. Variety: Majestic.

Rye 2nd course. Ploughed: Oct 2, 1959. Seed drilled at 3 bushels per acre: Oct 23. 'Nitro-Chalk' applied: Mar 24,1960. Seeds hay mixture undersown on 4 plots: Apr 7. Combine harvested: Aug 20. Variety: King II.

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Seeds hay 3rd course. Seeds undersown at 30 lb per acre in rye: Apr 7, 1959. Ground chalk applied at 20 cwt per acre: Sept 1. Potash and nitrogen fertiliser applied: Mar 18,1960. 'Nitro-Chalk' applied: June 10. Cut twice: June 7 and Aug 30. Seeds mixture: 19 lb S24 Perennial Ryegrass, 9 lb Late Flowering Red Clover, 2 lb Alsike American per acre.

Carrots 3rd course. Ground chalk applied at 20 cwt per acre: Sept 1, 1959. Ploughed twice: Sept 3 and Nov 30. Potash and nitrogen fertilisers applied: Apr 29, 1960. Seed drilled at 5 lb per acre: Apr 30. Sprayed with demeton methyl at 12 fluid oz in 40 gallons per acre: June 1. Crop failed, re-drilled: June 18. Thinned: Aug 18. Sprayed with demeton methyl at 12 fluid oz in 40 gallons per acre: July 18. Lifted: Oct 17. Variety: Scarlet Intermediate.

Test crops

Sugar beet 1st test crop. Dung applied: Dec 2, 1959. Ploughed: Dec 2. Treatment fertilisers and basal compound fertilisers applied: Apr 12, 1960. Seed drilled at 12 lb per acre: Apr 13. Singled: May 26 to June 9. Sprayed with miscible DDT at 3 pints in 40 gallons per acre (against flea beetle): May 6. Sprayed with demeton methyl at 12 fluid oz in 40 gallons per acre: June 1. Lifted: Oct 11. Variety: Klein E.

Barley 2nd test crop. Ground chalk applied at 18 cwt per acre: Nov 27, 1959. Ploughed: Nov 28. Muriate of potash applied to sub plots to equalise treatment dressings to 1959 sugar beet test crop: Mar 10, 1960. Seed drilled at $2\frac{1}{2}$ bushels per acre: Mar 18. Combine harvested: Aug 15. Variety: Herta.

Standard errors per plot. Test crops.

Sugar beet.	Total sugar.	Whole plot:	6.05 cwt per acre or 11.4% (4 d.f.)
		$\frac{1}{2}$ plot:	4.07 cwt per acre or 7.6% (4 d.f.)
		$\frac{1}{8}$ plot:	4.76 cwt per acre or 8.9% (24 d.f.)
	Tops.	Whole plot:	1.875 tons per acre or 12.0% (4 d.f.)
		$\frac{1}{2}$ plot:	0.709 tons per acre or 4.5% (4 d.f.)
		$\frac{1}{8}$ plot:	1.223 tons per acre or 7.8% (24 d.f.)
Barley.	Grain (at 85% dry matter).	Whole plot:	4.95 cwt per acre or 16.0% (4 d.f.)
		$\frac{1}{2}$ plot:	0.64 cwt per acre or 2.1% (4 d.f.)

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Summary of Results

Treatment crops

Ley, sheep days of grazing per acre

1st year	2nd year	3rd year
1458	2253	1397

Lucerne, dry matter: cwt per acre

	1st cut	2nd cut	3rd cut	Total
1st year				
Dung in 1958: tons per acre				
None	14.0	15.1		29.1
15	20.1	21.3		41.4
Difference	+6.1	+6.2		+12.3
Previous rotation				
Lucerne	15.6	17.0		32.6
Arable with hay	18.4	19.4		37.8
Mean	17.0	18.2		35.2
2nd year				
Dung in 1957: tons per acre				
None	25.5	20.5	18.3	64.3
15	28.5	24.8	20.4	73.7
Difference	+3.0	+4.3	+2.1	+9.4
Previous rotation				
Lucerne	27.3	22.1	18.7	68.1
Arable with roots	26.7	23.2	20.0	69.9
Mean	27.0	22.6	19.4	69.0

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Treatment crops

	Potatoes		Rye	
	Total tubers: tons per acre	Percentage ware ($1\frac{5}{8}$" riddle)	Grain: (at 85% D.M.) cwt per acre	Straw: cwt per acre
Dung: tons per acre				
None	12.86	94.2	39.4	45.6
15*	13.76	92.6	39.4	46.0
Difference	+0.90	-1.6	0.0	+0.4
Previous rotation				
Ley	15.36	94.4	39.8	47.7
Lucerne	14.85	96.6	39.8	45.2
Arable with hay	12.44	91.4	40.7	46.9
Arable with roots	10.60	91.1	37.2	43.4
Mean	13.31	93.4	39.4	45.8

Hay

Yield, dry matter: cwt per acre

	1st cut	2nd cut
Dung in 1956: tons per acre		
None	34.4	12.4
15	39.7	15.6
Difference	+5.3	+3.2
Previous rotation		
Ley	37.6	17.0
Arable with hay+	36.4	11.1
Mean	37.0	14.0

Carrots

	Roots washed: tons per acre	Tops tons per acre
Dung in 1956: tons per acre		
None	6.39	3.71
15	8.58	6.14
Difference	2.19	2.43
Previous rotation		
Lucerne	7.10	4.72
Arable with roots+	7.86	5.12
Mean	7.48	4.92

*Dung applied: Potatoes for test crop sugar beet in 1958.
Rye for test crop sugar beet in 1957.

+See note on page 60/B/5.1

Mean dry matter % as harvested: Rye, Grain: 78.4
Straw: 82.6

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1st Test crop

Sugar beet

	Previous rotation				
	Ley	Lucerne	Arable with hay	Arable with roots	Mean
Roots (washed): tons per acre					
Mean	17.30	16.51	14.62	16.63	16.26
Dung: tons per acre					
None	15.37	14.64	13.12	13.55	14.17
15	19.22	18.38	16.13	19.71	18.36
Difference	+3.85	+3.74	+3.01	+6.16	+4.19
Response to additional 0.72 cwt N per acre					
No dung	+0.28	+1.47	-0.75	+3.03	+1.00
Dung 15 tons per acre	-1.03	-1.67	-0.12	+1.68	-0.28
Response to additional 0.9 cwt K_2O per acre					
No dung	+0.32	-1.33	+0.32	-0.67	-0.34
Dung 15 tons per acre	+1.67	+0.07	+0.04	+0.67	+0.61
Sugar Percentage					
Mean	16.3	16.4	16.4	16.5	16.4
Dung: tons per acre					
None	16.4	16.3	16.6	16.6	16.5
15	16.2	16.5	16.2	16.3	16.3
Difference	-0.2	+0.2	-0.4	-0.3	-0.2
Response to additional 0.72 cwt N per acre					
No dung	-0.6	-0.5	-0.5	-0.3	-0.5
Dung 15 tons per acre	-0.9	-0.5	-0.5	-0.6	-0.7
Response to additional 0.9 cwt K_2O per acre					
No dung	0.0	+0.3	+0.1	-0.1	+0.1
Dung 15 tons per acre	-0.3	+0.5	-0.3	+0.4	+0.1

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1st Test Crop

Sugar beet

Previous rotation

	Ley	Lucerne	Arable with hay	Arable with roots	Mean
Total sugar: cwt per acre					
Mean (±4.28)	56.5	54.3	47.9	54.6	53.3
Dung: tons per acre					
None (±4.74)*	50.4	47.8	43.4	45.0	46.6
15	62.7	60.7	52.4	64.2	60.0
Difference (±4.07)	+12.3	+12.9	+9.0	+19.2	+13.4
					(±2.03)
Response to additional 0.72 cwt N per acre		(±3.37)			(±1.68)
No dung	-0.7	+3.4	-4.0	+9.1	+1.9
Dung 15 tons per acre	-7.1	-7.1	-2.2	+2.9	-3.4
Response to additional 0.9 cwt K_2O per acre		(±3.37)			(±1.68)
No dung	+0.8	-3.2	+1.3	-2.7	-0.9
Dung 15 tons per acre	+3.8	+1.9	-0.9	+3.5	+2.0
Tops: tons per acre					
Mean (±1.326)	18.60	13.51	16.19	14.21	15.63
Dung: tons per acre					
None (±1.372)*	16.72	10.87	14.24	12.51	13.58
15	20.48	16.15	18.14	15.90	17.67
Difference (±0.709)	+3.76	+5.28	+3.90	+3.39	+4.09
					(±0.354)
Response to additional 0.72 cwt N per acre		(±0.865)			(±0.432)
No dung	+3.71	+6.02	+3.79	+6.27	+4.95
Dung 15 tons per acre	+2.72	+3.32	+3.77	+3.75	+3.39
Response to additional 0.9 cwt K_2O per acre		(±0.865)			(±0.432)
No dung	+0.91	-0.25	+1.19	+0.47	+0.58
Dung 15 tons per acre	+0.97	+0.11	-0.93	-0.33	-0.05

*For use in horizontal and diagonal comparisons only.

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1st Test Crop

Sugar beet

Plots receiving no additional N or K

Dung: tons per acre		Previous rotation: Ley	Lucerne	Arable with hay	Arable with roots	Mean
Roots (washed): tons per acre						
Mean		16.90	17.22	14.58	16.30	16.25
None		15.11	14.83	13.22	13.53	14.17
15		18.68	19.61	15.94	19.07	18.33
Difference		+3.57	+4.78	+2.72	+5.54	+4.16
Sugar percentage						
Mean		16.7	16.3	16.6	16.7	16.5
None		16.7	16.1	16.7	16.8	16.6
15		16.8	16.4	16.4	16.5	16.5
Difference		+0.1	+0.3	-0.3	-0.3	-0.1
Total sugar: cwt per acre						
Mean	(±3.93)	56.8	56.1	48.2	54.3	53.8
None	(±5.25)*	50.5	47.8	44.1	45.6	47.0
15		63.1	64.3	52.3	63.0	60.7
Difference	(±5.79)	+12.6	+16.5	+8.2	+17.4	+13.7
Tops: tons per acre						
Mean	(±1.105)	16.81	11.63	14.47	11.93	13.71
None	(±1.474)*	14.36	8.01	11.99	9.63	10.99
15		19.26	15.25	16.96	14.23	16.42
Difference	(±1.274)	+4.90	+7.24	+4.97	+4.60	+5.43

*For use in horizontal and diagonal comparisons only.

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2nd Test Crop

Barley

Previous rotation

Dung in 1959: tons per acre		Ley	Lucerne	Arable with hay	Arable with roots	Mean
Grain (at 85% dry matter): cwt per acre						
None	(±3.51)*	33.5	32.9	26.7	29.6	30.6
15		32.4	33.7	27.8	31.6	31.4
Mean	(±3.50)	32.9	33.3	27.3	30.6	30.9
Difference	(±0.64)	-1.1	+0.8	+1.1	+2.0	+0.8 (±0.32)
Straw (at 85% dry matter): cwt per acre						
None		26.2	22.7	21.3	22.4	23.1
15		26.4	26.3	23.0	24.9	25.1
Mean		26.3	24.5	22.1	23.6	24.1
Difference		+0.2	+3.6	+1.7	+2.5	+2.0

*For use in horizontal and diagonal comparisons only.

Mean dry matter % as harvested: Grain 80.1
Straw 77.4

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60/B/6.1

WOBURN MARKET GARDEN EXPERIMENT

Organic manures and nitrogen - Lansome Field 1960, the 19th year.

For treatments etc., see "Details of the Classical and Long Term Experiments" 1956.

Note: The results for the 1960-61 leeks will be included in the 1961 report.

Area of each plot (acres): 0.0125. Area harvested: Leeks - 0.0104; globe beet - 0.0113; early potatoes - 0.0070.

Cultivations, etc.:

Leeks 1959-60. Organic manures applied: July 16, 1959. Ploughed: July 17. 'Nitra-Shell' and basal fertilisers applied: July 27. Planted: July 27 - 29. Second dressing of 'Nitra-Shell' applied: Oct 7. Harvested: Mar 4 - Apr 26, 1960. Variety: Musselburgh.

Early potatoes. Ploughed: Sept 4, 1959. Organic manures applied, ploughed second time: Jan 8, 1960. Fertilisers applied on the flat: Apr 4. Machine planted: Apr 5. Earthed up: May 17. Lifted: July 12. Variety: Arran Pilot.

Globe beet. Ground chalk applied at 18 cwt per acre: May 2, 1960. Organic manures applied, ploughed: May 3. 'Nitro-Chalk' and basal fertilisers applied: May 12. Seed drilled at 14 lb per acre: May 16. Sprayed with miscible DDT at 3 pints in 40 gallons per acre: May 30. Second dressing of 'Nitro-Chalk' applied: June 28. Harvested: Aug 4 - Sept 7. Variety: Detroit. There was no singling owing to poor stand.

Standard errors per plot:

Leeks 1959-60.	Saleable produce:	0.476 tons per acre or 6.6%	(17 d.f.)
Early potatoes.	Total tubers:	0.565 tons per acre or 6.2%	(17 d.f.)
Globe beet.	Saleable bulbs:	1.006 tons per acre or 14.7%	(17 d.f.)

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Summary of Results

Organic manures	Level of manuring: tons per acre	N: cwt per acre None	0.3	0.6	0.9	Mean
Leeks 1959-60. Saleable produce: tons per acre						
			(±0.336)			(±0.238)
None		5.37	6.70	6.90	6.57	6.04*
Dung	10	7.45	7.67			7.56
	20	8.35	8.14			8.24
Sludge compost	10	7.40	7.28			7.34
	20	6.87	7.50			7.18
Sludge	10	7.11	6.81			6.96
	20	6.43	7.27			6.85
Vegetable compost	10	7.69	7.98			7.84
	20	7.81	7.62			7.72
Mean (±0.119)		7.39+	7.54+			7.25**
Leeks 1959-60. Percentage saleable (by number)						
None		98.4	98.7	98.8	99.2	98.6*
Dung	10	99.5	98.8			99.2
	20	98.9	99.1			99.0
Sludge compost	10	98.9	99.2			99.1
	20	98.3	98.5			98.4
Sludge	10	99.4	98.7			99.0
	20	98.5	98.8			98.6
Vegetable compost	10	99.5	99.6			99.6
	20	99.0	99.2			99.1
Mean		99.0+	99.0+			99.0**
Early potatoes. Total tubers: tons per acre						
			(±0.400)			(±0.282)
None		6.25	7.16	8.35	9.27	6.70*
Dung	10	9.40	10.80			10.10
	20	10.39	10.69			10.54
Sludge compost	10	8.68	8.96			8.82
	20	9.41	9.20			9.30
Sludge	10	8.19	8.78			8.48
	20	9.22	9.25			9.23
Vegetable compost	10	8.87	10.78			9.83
	20	9.32	9.52			9.42
Mean (±0.141)		9.19+	9.75+			9.12**

*Mean over None and 0.3 cwt N per acre only. **General mean.
+Excluding 'no organics'.

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Globe beet

Organic manures	Level of manuring: tons per acre	N: cwt per acre None	0.3	0.6	0.9	Mean
Saleable bulbs: tons per acre						
			(±0.711)			(±0.503)
None		1.46	3.31	5.60	4.23	2.39*
Dung	10	5.62	8.66			7.14
	20	10.64	11.01			10.82
Sludge compost	10	4.98	6.93			5.95
	20	7.20	7.75			7.47
Sludge	10	6.42	5.19			5.80
	20	5.20	8.14			6.67
Vegetable compost	10	6.80	8.60			7.70
	20	8.34	10.90			9.62
Mean (±0.252)		6.90+	8.40+			6.85**
Total produce (whole plants): tons per acre						
None		3.61	7.04	10.52	8.34	5.33*
Dung	10	8.86	14.39			11.62
	20	17.45	17.52			17.49
Sludge compost	10	9.31	13.18			11.24
	20	13.79	13.54			13.66
Sludge	10	11.57	10.33			10.95
	20	11.47	15.89			13.68
Vegetable compost	10	11.26	13.36			12.30
	20	12.70	17.97			15.34
Mean		12.05+	14.52+			12.10**
Plant number: thousands per acre						
None		86.6	116.8	119.3	113.5	101.7*
Dung	10	80.4	126.2			103.3
	20	117.8	105.7			111.8
Sludge compost	10	83.7	137.5			110.6
	20	133.9	68.4			101.2
Sludge	10	92.3	92.1			92.2
	20	131.7	134.5			133.1
Vegetable compost	10	102.3	97.0			99.7
	20	62.7	102.8			82.8
Mean		100.6+	108.0+			105.3**

*Mean over None and 0.3 cwt N per acre only. **General mean.
+Excluding 'no organics'.

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60/B/7.1.

IRRIGATION EXPERIMENT

Revised 1960 (the 10th year)

The effects of irrigation and nitrogen - Woburn Butt Close 1960.

For details of previous cropping, treatments etc. see "Details of the Classical and Long Term Experiments" 1956.

The 3 course rotation is now as follows:-
1st year: early potatoes (following 1959 sugar beet).
2nd year: barley (following 1959 spring beans).
3rd year: winter beans (following 1959 spring wheat).

The fourth series carries a long term ryegrass ley for cutting.

Area of each whole plot (acres): Winter beans: 0.0555.
Sub plots (acres): Grass: 0.0264; remainder: 0.0277.
Area harvested (acres): Early potatoes: 0.0075; barley: 0.0110; winter beans: 0.0177; grass: 0.0165.

Design: 4 series (1 in each crop) each containing 12 whole plots.
The bean plots are no longer split for the application of dung.

Treatments.
Early potatoes: all combinations of:-
Whole plots: Irrigation: None (0); full (C).
Weed control: normal cultivations after planting (no spray); simazine spray at 2 lb in 40 gallons per acre (used as pre-emergence weedkiller) without cultivations.
Sub plots: Nitrogen*: None, 0.6 cwt N per acre as sulphate of ammonia.

Note: After the early potatoes are lifted certain plots are sown with trefoil as a green manure for barley. Provision is made for a comparison of none v. irrigation applied to the trefoil. No irrigation was applied in 1960.

Barley: All combinations of:-
Whole plots: Irrigation: None (0), full (C).
Sub plots: Nitrogen*: None, 0.2 cwt N per acre as 'Nitro-Chalk'.

Winter beans:
Whole plots: Irrigation: None (0), three systems (A, B, C - see below).

Grass: all combinations of:-
Whole plots: Irrigation: None (0), full (C).
Potash*: None, 0.6 cwt K_2O per acre as muriate of potash applied after the 1st cut and once again in mid-season.
Sub plots: Nitrogen*: None, 0.3 cwt N per acre as 'Nitro-Chalk' in spring and after each cut except the last.

*Note: In addition to basal dressing.

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Rainfall and Irrigation: inches

Week ending	Rain-fall	Grass C	Barley C	Potatoes C	Beans A	Beans B	Beans C
May 2	0.13	0.50	0.50	0.50	-	0.50	0.50
9	0.02	0.50	-	-	-	0.50	0.50
16	0.89	0.62	-	-	-	0.50	0.50
23	0.23	-	0.50	-	-	0.50	0.50
30	0.01	0.50	0.50	0.50	-	0.67	0.67
June 6	-	0.67	0.50	0.50	0.67	0.67	0.67
13	1.26	-	-	-	-	-	-
20	0.68	-	-	-	0.20	-	0.20
27	1.68	0.50	-	0.75	-	-	-
July 4	0.01	-					
11	1.23	-					
18	1.19	-					
25	0.37	-					
Aug 1	0.38	-					
8	0.23	-					
15	0.88	-					
22	0.16	-					
29	0.87	0.50					
Sept 5	1.60	-					
12	0.16	-					
19	1.52	-					
26	(0.63)	-					
Oct 3	(0.64)	-					
Total	14.77	3.79	2.00	2.25	0.87	3.34	3.54

Basal dressings (per acre):

Early potatoes: 0.60 cwt N as sulphate of ammonia; 0.75 cwt P_2O_5 and 1.50 cwt K_2O as compound fertiliser (14% P_2O_5, 28% K_2O).

Barley: 0.2 cwt N, 0.2 cwt P_2O_5 and 0.3 cwt K_2O as compound fertiliser (12% N, 12% P_2O_5, 18% K_2O).

Winter beans: 0.3 cwt P_2O_5, 0.6 cwt K_2O placement drilled as compound fertiliser (10% P_2O_5, 20% K_2O).

Grass: 0.3 cwt N as 'Nitro-Chalk' in spring and again after each cut except the last, and 0.6 cwt P_2O_5 and 1.2 cwt K_2O as compound fertiliser (14% P_2O_5, 28% K_2O).

Cultivations, etc.:

Early potatoes: Ploughed: Nov 20, 1959. PK compound applied: Apr 4, 1960. Sulphate of ammonia applied: Apr 6. Machine planted: Apr 7. Appropriate plots sprayed with simazine: Apr 15. Earthed up (except simazine plots): June 4. Haulm destroyed mechanically: July 13. Lifted: July 15. Trefoil sown at 30 lb per acre: July 21. Variety: Arran Pilot.

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Barley: Ground chalk applied at 3 tons per acre: Sept 8, 1959. Ploughed: Sept 9 and Nov 21. Seed drilled at 2¼ bushels per acre: Mar 19, 1960. Fertilisers applied: Mar 21. Sprayed with DNBP at 10 pints in 80 gallons per acre: May 16. Combine harvested: Aug 13. Variety: Proctor.

Winter beans: Ploughed: Sept 7, 1959. Seed placement drilled at 275 lb per acre with PK compound: Nov 5. Harvested: Aug 10 and Aug 26, 1960. Variety: Rothamsted S.Q.

Grass: Ground chalk applied at 18 cwt per acre: Sept 23, 1959. Seed sown at 30 lb per acre: Oct 20. 'Nitro-Chalk' and PK compound applied: Apr 1, 1960. Cut 8 times (all plots): May 10, May 31, June 22, July 18, Aug 8, Aug 30, Sept 23, Nov 8. 'Nitro-Chalk' applied after each cut except the last. Muriate of potash applied to appropriate plots after 1st and 4th cuts. Variety: S22 Italian ryegrass.

Standard errors per plot.

Early potatoes. Total tubers
- Whole plot: 0.708 tons per acre or 7.2% (4 d.f.)
- Sub plot: 0.630 tons per acre or 6.4% (8 d.f.)

Barley, (grain at 85% dry matter)
- Whole plot: 2.51 cwt per acre or 10.2% (8 d.f.)
- Sub plot: 2,25 cwt per acre or 9.1% (10 d.f.)

Winter bean, (grain at 85% dry matter)
- Whole plot: 2.80 cwt per acre or 9.5% (6 d.f.)

Cut grass, dry matter

1st cut:
- Whole plot: 0.58 cwt per acre or 7.3% (6 d.f.)
- Sub plot: 1.44 cwt per acre or 18.2% (8 d.f.)

Total of cuts 2-4
- Whole plot: 2.03 cwt per acre or 4.2% (6 d.f.)
- Sub plot: 1.98 cwt per acre or 4.1% (8 d.f.)

Total of cuts 5-8
- Whole plot: 1.48 cwt per acre or 3.7% (6 d.f.)
- Sub plot: 2,59 cwt per acre or 6.6% (8 d.f.)

Total of all 8 cuts
- Whole plot: 2.55 cwt per acre or 2.7% (6 d.f.)
- Sub plot: 3.96 cwt per acre or 4.1% (8 d.f.)

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Summary of Results

Early potatoes, Total tubers: tons per acre

Weed control	Irrigation 0	Irrigation C	Weed control: Normal cultivation	Weed control: Simazine spray	Mean
Normal cultivation	9.73	11.97			
Simazine spray	7.88	9.56			
N: cwt per acre including basal					
	(±0.483)**		(±0.257)*		
0.6	8.12	9.65	9.98	7.79	8.89
1.2	9.50	11.88	11.71	9.66	10.69
Mean	8.81	10.76	10.85	8.72	9.79
	(±0.289)				
Difference (±0.364)	1.38	2.23	1.73	1.87	1.80 (±0.257)

Barley, (Grain at 85% dry matter): cwt per acre

N: cwt per acre including basal	Irrigation 0	Irrigation C	Mean
	(±1.21)		
0.2	19.2	23.3	21.3
0.4	26.8	29.4	28.1
Mean (±1.03)	23.0	26.4	24.7
Difference (±1.30)	7.6	6.1	6.8 (±0.92)

Winter beans, (Grain at 85% dry matter): cwt per acre

Irrigation 0	A	B	C	Mean
22.6	26.3	34.5	34.2	29.4
	(±1.61)			

* For use in vertical and interaction comparisons only.

** For use in horizontal and diagonal comparisons only.

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Cut grass, Dry matter: cwt per acre

1st cut

K_2O: cwt per acre (including basal) in 1959	Irrigation 0	Irrigation C	K_2O: cwt per acre including basal 1.2	K_2O: cwt per acre including basal 2.4	Mean
	(±0.33)				
1.2	7.4	7.5			
2.4	4.8	11.8			
N: cwt per acre			1.2	2.4	Mean
	(±0.48)*		(±0.48)*		
0.3	5.8	9.5	8.0	7.3	7.7
0.6	6.4	9.7	6.9	9.2	8.0
Mean (±0.24)	6.1	9.6	7.4	8.3	7.9
Difference (±0.83)	+0.6	+0.2	-1.1	+1.9	+0.3 (±0.59)

Total of cuts 2 - 4

K_2O: cwt per acre including basal	Irrigation 0	Irrigation C	K_2O: cwt per acre including basal 1.2	K_2O: cwt per acre including basal 1.8	Mean
	(±1.17)				
1.2	41.4	51.5			
1.8	44.5	55.7			
N: cwt per acre			1.2	1.8	Mean
	(±1.01)*		(±1.01)*		
0.3	41.7	48.7	44.2	46.3	45.2
0.6	44.1	58.4	48.6	53.9	51.3
Mean (±0.83)	42.9	53.6	46.4	50.1	48.3
Difference (±1.14)	2.4	9.7	4.4	7.6	6.1 (±0.81)

*For use in horizontal and diagonal comparisons only.

Mean dry matter % as cut:

1st cut:	20.9
Total of cuts 2 - 4:	19.0

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Cut grass, Dry matter: cwt per acre

Total of cuts 5 - 8

K_2O: cwt per acre including basal	Irrigation 0	Irrigation C	K_2O: cwt per acre including basal 1.2	K_2O: cwt per acre including basal 2.4	Mean
	(±0.85)				
1.2	38.9	35.4			
2.4	40.8	43.1			
N: cwt per acre					
	(±0.96)*		(±0.96)*		
0.3	36.7	36.9	35.0	38.7	36.8
0.6	43.0	41.5	39.3	45.2	42.3
Mean (±0.60)	39.9	39.2	37.2	41.9	39.5
Difference (±1.50)	+6.3	+4.6	+4.3	+6.5	+5.5 (±1.06)

Total of cuts 1 - 8

K_2O: cwt per acre including basal	Irrigation 0	Irrigation C	K_2O: cwt per acre including basal 1.2	K_2O: cwt per acre including basal 2.4	Mean
	(±1.47)				
1.2	87.7	94.3			
2.4	90.1	110.6			
N: cwt per acre					
	(±1.55)*		(±1.55)*		
0.3	84.2	95.2	87.1	92.3	89.7
0.6	93.5	109.7	94.9	108.3	101.6
Mean (±1.04)	88.9	102.5	91.0	100.3	95.7
Difference (±2.29)	9.3	14.5	7.8	16.0	11.9 (±1.62)

*For use in horizontal and diagonal comparisons only.

Mean dry matter % as cut:
Total of cuts 5 - 8: 15.0
Total of cuts 1 - 8: 17.3

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60/B/8.1

CONCENTRATED FERTILISER ROTATION

Concentrated compound fertiliser and forms of N - West Barnfield I 1960.

Rotation: Kale, ryegrass, barley.

Design (each crop): 2 randomised blocks of 14 plots each.

Area of each plot (acres): 0.0174. Area harvested: Kale - 0.0086, Ryegrass - 0.0056, barley - 0.0116.

Treatments (per acre):
- No fertiliser. (0)
- P_2O_5 and K_2O each at 0.3 cwt to barley and each at 0.1 cwt to kale and ryegrass, as triple superphosphate and potassium bicarbonate. (B)
- Compound fertiliser, 20% N, 10% P_2O_5, 10% K_2O at 0.3(1), 0.6(2) cwt N to barley and 1.0(1), 2.0(2) to kale and ryegrass. (F)
- Sulphate of ammonia, granular superphosphate and muriate of potash at rates equivalent to treatments F (1) and (2) (P)
- PK as treatment B plus
  - Sulphate of ammonia (S)
  - Calcium nitrate (C)
  - Urea (U)
  - Ammonium nitrate (A)

  each at rates 1 and 2 of N.

Basal dressing: None.

Cultivations, etc.: Ploughed: Oct 30 - Nov 2, 1959. Fertilisers broadcast for barley, barley drilled at 2½ bushels per acre: Mar 26, 1960. Fertilisers broadcast for ryegrass: Mar 31. Ryegrass sown at 30 lb per acre; fertilisers applied for kale: Apr 1. Kale drilled at 3 lb per acre: Apr 8. Barley sprayed with CMPP at 6 pints in 40 gallons per acre: May 23. Grass cut: July 20. Barley combine harvested: Aug 17. Grass cut second time: Oct 3. Kale harvested: Nov 8 - 16. Varieties: Kale - Thousand head; ryegrass - S22; barley - Proctor. Previous crop: Oats.

Standard errors per plot.
- Kale, fresh weight: 1.339 tons per acre or 6.0% (13 d.f.)
- Ryegrass dry matter:
  - 1st cut 2.59 cwt per acre or 9.2% (13 d.f.)
  - 2nd cut 1.95 cwt per acre or 15.9% (13 d.f.)
  - Total of 2 cuts 3.31 cwt per acre or 8.2% (13 d.f.)
- Barley, grain (at 85% dry matter): 1.38 cwt per acre or 3.8% (13 d.f.)

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Summary of Results

Fertiliser	Kale fresh weight tons per acre	Ryegrass dry matter cwt per acre 1st cut	2nd cut	Total of 2 cuts	Barley (at 85% dry matter) cwt per acre Grain	Straw
	(±0.946)	(±1.83)	(±1.38)	(±2.34)	(±0.98)	
0	12.21	7.1	6.4	13.5	27.9	15.7
B	14.91	11.3	6.9	18.2	28.0	16.0
F_1	22.18	30.8	9.5	40.3	34.8	21.8
F_2	26.56	34.5	17.4	51.9	40.6	29.2
P_1	22.44	27.7	9.5	37.2	35.3	20.5
P_2	25.21	33.8	18.7	52.5	38.5	22.9
S_1	21.58	25.2	9.5	34.7	37.1	25.2
S_2	24.82	33.3	18.2	51.5	39.0	22.8
C_1	23.71	30.7	8.3	39.0	35.1	22.8
C_2	24.43	31.0	18.1	49.0	38.2	24.3
U_1	21.45	27.2	8.1	35.3	34.1	21.2
U_2	24.49	32.9	13.6	46.5	38.0	25.9
A_1	22.04	32.5	10.3	42.8	35.1	23.4
A_2	24.75	34.8	17.7	52.5	39.9	27.3
Mean	22.20	28.0	12.3	40.3	35.8	22.8
Mean dry matter % as harvested:		16.3	20.7	18.5	82.2	69.2

Treatments

0 = No fertiliser
B = P_2O_5 and K_2O each at 0.3 cwt to barley and each at 0.1 cwt to kale and ryegrass, as triple superphosphate and potassium bicarbonate
F = Compound fertiliser, 20% N, 10% P_2O_5, 10% K_2O at 0.3(1), 0.6(2) cwt N to barley and 1.0(1), 2.0(2) to kale and ryegrass
P = Sulphate of ammonia, granular superphosphate and muriate of potash at rates equivalent to treatments F (1) and (2).
S = Sulphate of ammonia. Plus PK as treatment B
C = Calcium nitrate. " " " "
U = Urea. " " " "
A = Ammonium nitrate. " " " "

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60/B/9.1

RESIDUAL PHOSPHATE ROTATIONS

The long term and residual effects of a number of phosphate fertilisers compared with superphosphate - Great Field IV and Sawyers I 1960.

Design: Great Field IV: 1 randomised block of 12 plots per crop.
Sawyers I: 2 randomised blocks of 12 plots each per crop.

Rotation: Potatoes, Barley, Swedes.

Area of each plot (acres):
Great Field IV: 0.0193. Area harvested: Potatoes and Barley - 0.0129, Swedes - 0.0096.
Sawyers I: 0.0212. Area harvested: Potatoes and Barley - 0.0141, Swedes - 0.0106.

Treatments:
Granular superphosphate treatments broadcast in spring before sowing or ridging:-
1. No phosphate.
2. 0.25 cwt P_2O_5 per acre per year.
3. 0.50 cwt P_2O_5 per acre per year.
4 & 5. No phosphatic fertiliser in 1960 or 1961, but later at rates to be decided.

Phosphate fertilisers ploughed in (to a depth not exceeding 6 inches) at 3.0 cwt P_2O_5 per acre in September 1959 and rotary hoed in in spring:-

6. Nitrophosphate I (17.1% P_2O_5, none water soluble)
7. Nitrophosphate II (18.8% P_2O_5, one quarter water soluble)
8. Nitrophosphate III (22.4% P_2O_5, half water soluble)
9. Gafsa rock phosphate (28.9% P_2O_5)
10. Bessemer basic slag (15.2% P_2O_5)
11. Potassium metaphosphate* (57.9% P_2O_5, 38.8% K_2O)
12. Granular superphosphate (20.4% P_2O_5)

*Note. To balance the K_2O content of potassium metaphosphate, all the other treatments included 2.0 cwt K_2O per acre as sulphate of potash in autumn 1959.

Basal dressings per acre: Broadcast in spring before sowing or ridging:
N as 'Nitro-Chalk' 21:-
To potatoes: 1.2 cwt; to barley: 0.6 cwt; to swedes: 0.5 cwt.
K_2O as sulphate of potash:-
To potatoes: 1.0 cwt; to barley: 1.0 cwt; to swedes: 1.0 cwt.

Cultivations, etc. (both fields, except as indicated):
Phosphate fertilisers applied: Sept 23 - 24, 1959. Ploughed: Sept 25 - 26. Balancing potassium sulphate applied: Nov 3. Ploughed second time: Nov 9 - 27. Rotary hoed twice: Mar 7 - 8, 1960.

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Potatoes: Basal fertilisers and spring superphosphate applied: Apr 8, 1960. Planted: Apr 13. Earthed up: June 20 - 21. Sprayed with copper fungicide at 5 lb in 40 gallons per acre: July 16. Sawyers I sprayed with sulphuric acid, 15% BOV, at 100 gallons per acre: Aug 31; and again, 10% BOV, at 100 gallons per acre: Sept 13. Great Field IV sprayed with sulphuric acid, 15% BOV, at 100 gallons per acre: Sept 13. Haulm on Great Field IV destroyed mechanically: Sept 19. Lifted: Oct 4 - 5. Variety: Majestic.

Barley: Basal fertilisers and spring superphosphate applied, seed drilled at 2¼ bushels per acre: Mar 18, 1960. Sawyers I sprayed with TCB/MCPA at 4 pints in 40 gallons per acre: May 10. Great Field IV sprayed with CMPP at 6 pints in 40 gallons per acre: May 25. Combine harvested: Aug 17. Variety: Proctor.

Swedes: Basal fertilisers and spring superphosphate applied: May 10 - 11, 1960. Hand drilled at 3 lb per acre: May 16. Singled: June 16 - 19. Lifted: Oct 28 - 31. Variety: Wilhelmsburger.

Previous crop (both fields): Fallow.

Standard errors per plot.

Sawyers I

Potatoes, Total tubers: 0.927 tons per acre or 5.9% (13 d.f.)

Barley, Grain (at 85% dry matter): 2.06 cwt per acre or 5.6% (13 d.f.)

Swedes, roots: 3.597 tons per acre or 18.4% (13 d.f.)

Summary of Results

Potatoes

Phosphate	Total tubers: tons per acre — Great Field IV Mean	Increase	Sawyers I Mean	Increase	Percentage ware (1½" riddle) — Great Field IV Mean	Increase	Sawyers I Mean	Increase
			(±0.655)	(±0.757)				
None (1,4,5)	15.52		13.63(1)		95.8		95.4	
2	15.38	-0.14	13.69	+0.06	94.0	-1.8	93.4	-2.0
3	18.04	+2.52	14.20	+0.57	91.7	-4.1	94.5	-0.9
6	19.66	+4.14	17.80	+4.17	91.9	-3.9	92.7	-2.7
7	19.28	+3.76	17.38	+3.75	92.2	-3.6	92.1	-3.3
8	20.27	+4.75	17.97	+4.34	92.9	-2.9	93.1	-2.3
9	18.64	+3.12	15.90	+2.27	91.7	-4.1	93.8	-1.6
10	21.09	+5.57	16.67	+3.04	91.2	-4.6	93.2	-2.2
11	20.36	+4.84	17.44	+3.81	93.6	-2.2	94.2	-1.2
12	19.59	+4.07	17.85	+4.22	94.7	-1.1	92.9	-2.5
Mean	18.24		15.81		93.4		93.8	

(1) (±0.378)

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Phosphate	Great Field IV Mean	Great Field IV Increase	Sawyers I Mean	Sawyers I Increase	Great Field IV Mean	Great Field IV Increase	Sawyers I Mean	Sawyers I Increase
	Barley							
	Grain (at 85% dry matter) cwt per acre				Straw (at 85% dry matter) cwt per acre			
			(±1.46)	(±1.69)				
None (1,4,5)	31.3		30.2(1)		30.6		18.9	
2	33.0	+1.7	35.4	+5.2	28.3	-2.3	21.1	+2.2
3	33.1	+1.8	36.1	+5.9	29.7	-0.9	20.7	+1.8
6	33.9	+2.6	37.7	+7.5	31.9	+1.3	23.5	+4.6
7	37.5	+6.2	35.5	+5.3	35.7	+5.1	26.9	+8.0
8	33.5	+2.2	39.0	+8.8	37.4	+6.8	27.3	+8.4
9	35.4	+4.1	41.4	+11.2	37.1	+6.5	22.8	+3.9
10	35.0	+3.7	42.6	+12.4	36.8	+6.2	25.3	+6.4
11	37.7	+6.4	41.5	+11.3	35.3	+4.7	24.1	+5.2
12	40.2	+8.9	39.8	+9.6	39.6	+9.0	24.0	+5.1
Mean	34.4		36.6		33.6		22.7	
Mean dry matter % as harvested:	82.4		79.7		62.8		67.4	

(1) (±0.84)

Swedes, Roots: tons per acre

			(±2.543)	(±2.937)
None (1,4,5)	10.97		10.53(1)	
2	19.08	+8.11	15.18	+4.65
3	18.97	+8.00	18.40	+7.87
6	20.06	+9.09	23.41	+12.88
7	23.09	+12.12	23.81	+13.28
8	22.09	+11.12	21.54	+11.01
9	24.12	+13.15	24.13	+13.60
10	19.23	+8.26	27.17	+16.64
11	23.71	+12.74	25.25	+14.72
12	24.00	+13.03	24.57	+14.04
Mean	18.94		19.59	

(1) (±1.468)

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60/B/10.1

N LEVELS AND RESIDUES ROTATION

Direct and residual effects of sulphate of ammonia - Long Hoos III
1960 (preliminary year).

Rotation: Wheat, potatoes.

Design (each crop): 3 randomised blocks of 9 plots each.

Area of each plot (acres): 0.0212. Area harvested: Wheat - 0.0141;
Potatoes - 0.0035.

Treatments:
Nitrogen (applied as sulphate of ammonia).
To wheat: None; 0.5; 1.0 cwt per acre.
To potatoes: None; 0.75; 1.5 cwt per acre.
(Three plots per block for each treatment in 1960.)

Basal dressing (per acre):
To wheat: $2\frac{1}{2}$ cwt compound fertiliser, 12% P_2O_5, 24% K_2O combine drilled.
To potatoes: 6 cwt compound fertiliser, 12% P_2O_5, 24% K_2O, broadcast on the flat.

Cultivations, etc.: All land ploughed: Nov 3, 1959.
Wheat: Combine drilled with basal fertiliser, sulphate of ammonia broadcast by hand: Mar 19, 1960. Sprayed with TCB/MCPA at 4 pints in 40 gallons per acre: May 10. Combine harvested: Sept 13. Variety: Jufy I. Previous crop: Spring wheat.

Potatoes: Basal fertiliser and sulphate of ammonia broadcast on flat: Apr 13, 1960. Ridged, potatoes planted: Apr 14. Earthed up: June 21. Sprayed with copper fungicide at 5 lb in 40 gallons per acre: July 15 and Aug 9. Sprayed with undiluted BOV at 15 gallons per acre: Aug 31. Haulm destroyed mechanically: Sept 21. Lifted: Dec 1.* Variety: Ulster Supreme. Previous crop: Spring wheat.

*Hand dug. Harvested area very much reduced, because of wet conditions.

Standard errors per plot.
Wheat, grain (at 85% dry matter): 2.48 cwt per acre or 10.4% (22 d.f.)
Potatoes, total tubers: 0.942 tons per acre or 6.1% (22 d.f.)

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Summary of Results

Wheat, (grain at 85% dry matter): cwt per acre

N: cwt per acre			
None	0.5	1.0	Mean
16.4	24.8 (±0.83)	30.3	23.8

Mean dry matter % as harvested: 82.3

Potatoes

N: cwt per acre			
None	0.75	1.50	Mean
	Total tubers: tons per acre		
11.99	16.33 (±0.314)	17.71	15.34
	Percentage ware ($1\frac{1}{2}$" riddle)		
96.1	97.5	98.0	97.2

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60/B/11.1

TRIAZINE WEEDKILLER ROTATIONS

The direct and residual effects of triazine weedkillers - Rothamsted (R) Great Knott II and Woburn (W) Great Hill I and II 1960.

Owing to the unsuitability of the Rothamsted site this experiment is discontinued. The Woburn experiment will be continued in 1961 in an altered form.

Rotations: Great Knott II (R): Winter beans, winter wheat, potatoes, barley.
Great Hill I and II (W): Potatoes, barley.

Design (each field): 2 randomised blocks of 9 plots each per crop.

Area of each plot (acres):
Great Knott II (R): 0.0636
Great Hill I and II (W): 0.0482

Area harvested (acres):
Winter beans - 0.0139, winter wheat - 0.0150, potatoes - 0.0035, barley - 0.0139.
Potatoes - 0.0107, barley - 0.0115.

Treatments.

Great Knott II (R): All plots were ploughed and received normal cultivations before planting. The potato plots were also rotary cultivated. Cultivations described below were carried out after planting.

To potatoes and beans:
- No cultivations (0)
- Normal weed control cultivations (N)
- No cultivations, 1 lb simazine+ (1)
- No cultivations, 2 lb simazine+ (2)

To potatoes only:
- 2 lb simazine+, then potatoes grubbed and earthed up (2E)
- Potatoes grubbed and earthed up and later 2 lb simazine+ applied before crop emergence (2L)

To beans only:
- Normal weed control cultivations, 1 lb simazine+ in autumn and 1 lb simazine+ in spring (2D)

The barley and wheat plots were split* for 0 v. hormone spray for weed control.

Great Hill I and II (W):

To potatoes only:
As above (excluding treatment 2D) except that the plots were not rotary cultivated.

The barley plots were split* for 0 v. hormone spray for weed control.

*1 plot per block was not split, but received hormone spray only. It was intended that it should be followed by a "No weed control" treatment. The yields from these plots are not presented.

+In 40 gallons per acre

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Note: 2 plots for each of treatments 1, 2, N, 2D were included in each block to accommodate a comparison between ploughing and no ploughing in later seasons.

Basal dressings per acre:

Great Knott II (R):

Beans: 4½ cwt compound fertiliser (12% P_2O_5, 24% K_2O) placement drilled.

Wheat: 2½ cwt compound fertiliser (6% N, 15% P_2O_5, 15% K_2O) combine drilled: 3½ cwt sulphate of ammonia top dressed.

Potatoes: 10 tons dung: 8 cwt compound fertiliser (10% N, 10% P_2O_5, 18% K_2O).

Barley: 3 cwt compound fertiliser (16% N, 9% P_2O_5, 9% K_2O) combine drilled.

Great Hill I and II (W):

Potatoes: 14 tons dung: 12 cwt compound fertiliser (10% N, 10% P_2O_5, 18% K_2O).

Barley: 4 cwt compound fertiliser (16% N, 9% P_2O_5, 9% K_2O) combine drilled.

Cultivations, etc.:

Great Knott II (R):

Beans: Ground chalk applied at 2 tons per acre: Oct 1, 1959. Ploughed: Oct 3. Seed placement drilled at 275 lb per acre with basal fertiliser: Oct 16. Simazine applied to appropriate plots: Oct 30 and Mar 22, 1960. Treatment N harrowed: Apr 4. Treatment N horse-hoed: Apr 12, Apr 29, May 2. Combine harvested: Aug 20. Variety S.Q. The crop was poor and on one block certain plots were discarded.

Wheat: Ground chalk applied at 2 tons per acre: Oct 1, 1959. Ploughed: Oct 3. Seed combine drilled at 2¾ bushels per acre with basal fertiliser: Oct 16. Top dressed with sulphate of ammonia: Apr 14, 1960. Appropriate sub plots sprayed with CMPP at 6 pints in 40 gallons per acre: Apr 22. Combine harvested: Aug 30. Variety: Cappelle.

Potatoes: Ploughed: Oct 3, 1959. Dung applied: Jan 15 - Feb 9, 1960. Ploughed 2nd time: Feb 10. Basal fertiliser applied: Mar 28. Rotary cultivated: Apr 14. Potatoes planted: Apr 19. Simazine applied (excluding treatment 2L): Apr 30. Treatments N and 2L tractor weeded: May 16 and May 25. Treatments N and 2L grubbed: May 26. Treatment 2L earthed up and sprayed with simazine: May 27. Treatments N and 2E grubbed: June 17. Treatments N and 2E earthed up: June 20. Sprayed with copper fungicide at 5 lb in 40 gallons per acre: July 16 and Aug 10. Sprayed with undiluted BOV at 15 gallons per acre: Aug 31. Haulm destroyed mechanically: Sept 22. Lifted*: Nov 30. Variety: Ulster Supreme.

*Hand dug. Harvested area much reduced owing to wet condition.

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Barley: Ploughed: Oct 3, 1959. Seed combine drilled at 2 bushels per acre with basal fertiliser: Mar 7, 1960. Appropriate sub plots sprayed with TCB/MCPA at 4 pints in 40 gallons per acre: May 10. Combine harvested: Aug 16. Variety: Proctor. Previous crop (whole area): Spring wheat

Great Hill I and II (W):

Potatoes: Dung applied at 14 tons per acre; ploughed: Feb 24, 1960. Basal fertiliser applied: Apr 19. Potatoes planted: Apr 20. Simazine applied (excluding 2L plots): May 2. Treatments N, 2L tractor weeded: May 7. Treatment 2L grubbed and earthed up and simazine applied: May 23. Treatment N tractor weeded: May 31. Treatment N grubbed: June 14. Treatment 2E grubbed, treatments N, 2E earthed up: June 18. Sprayed with zineb at 2 lb in 40 gallons per acre: July 15. Sprayed with copper fungicide at 5 lb in 40 gallons: July 26. Sprayed with undiluted BOV at 15 gallons per acre: Sept 8. Haulm destroyed mechanically: Sept 15. Lifted: Sept 26. Variety: Ulster Supreme. Previous crop: Barley

Barley: Ploughed: Jan 4 - 5, 1960. Seed combine drilled at 2¼ bushels per acre with basal fertiliser: Mar 25. Appropriate sub plots sprayed with TCB/MCPA at 4 pints in 40 gallons per acre: May 7. Combine harvested: Aug 22. Variety: Proctor. Previous crop: Potatoes.

Standard errors per plot.

Great Knott II (R).

Winter wheat, grain (at 85% dry matter): 3.23 cwt per acre or 8.3% (13 d.f.)

Potatoes, total tubers: 0.615 tons per acre or 5.3% (11 d.f.)

Barley, grain (at 85% dry matter): 0.87 cwt per acre or 2.5% (15 d.f.)

Great Hill I and II (W).

Potatoes, total tubers: 2.142 tons per acre or 10.0% (11 d.f.)

Barley, grain (at 85% dry matter): 1.33 cwt per acre or 6.0% (15 d.f.)

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Summary of Results

Winter beans Great Knott II (R)

Treatment					
0	N	1	2	2D	Mean
Grain (at 85% dry matter): cwt per acre					
24.4	26.8	28.1	23.0	25.2	25.6

Mean dry matter % as harvested: 79.1

Winter wheat Great Knott II (R)

Hormone			
None	Sprayed	Mean	Difference
Grain (at 85% dry matter): cwt per acre			
38.8	39.3	39.0	+0.5 (±1.22)

Mean dry matter % as harvested: 79.7

Potatoes

	Treatment						
	0	N	1	2	2E	2L	Mean
Total tubers: tons per acre Great Knott II (R)							
Mean	8.71 (±0.435)	14.16	9.86 (±0.307)	11.86	11.84 (±0.435)	12.14	11.61
Increase		+5.45	+1.15 (±0.533)	+3.15	+3.13 (±0.615)	+3.43	
Total tubers: tons per acre Great Hill I and II (W)							
Mean	21.61 (±1.514)	24.24	19.56 (±1.071)	21.01	22.38 (±1.514)	19.15	21.42
Increase		+2.63	-2.05 (±1.906)	-0.60	+0.77 (±2.201)	-2.46	

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Potatoes

	Treatment 0	N	1	2	2E	2L	Mean
Percentage ware ($1\frac{1}{2}$" riddle) Great Knott II (R)							
Mean	96.0	97.8	96.4	97.0	96.8	98.0	97.0
Increase		+1.8	+0.4	+1.0	+0.8	+2.0	
Percentage ware ($1\frac{3}{8}$" riddle) Great Hill I and II (W)							
Mean	99.5	99.4	99.4	99.6	99.6	99.1	99.4
Increase		-0.1	-0.1	+0.1	+0.1	-0.4	

Barley

Grain (at 85% dry matter): cwt per acre

Hormone None	Sprayed	Mean	Difference
Great Knott II (R)			
34.8	33.9	34.3	-0.9 (±0.31)
Great Hill I and II (W)			
21.9	22.6	22.3	+0.7 (±0.47)

Mean dry matter % as harvested: Great Knott II (R) 81.2
Great Hill I and II (W) 79.0

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