

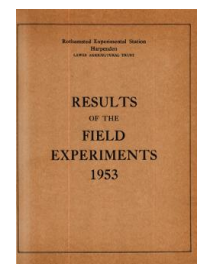
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53/BB/1 Deep Cultivation Rotation - Rothamsted

Rothamsted Research

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53/Bb/1.1

DEEP CULTIVATION ROTATION EXPERIMENT

The 10th year

Deep ploughing, fertilizers and dung - Long Hoos I and II 1953.

For details of rotation and treatments, etc., see "Results of the Field Experiments, 1939-47" Vol. I, Section Bc/1.

Area of each plot: 0.0312 acre. Area harvested: Sugar beet (sub plot), 0.0119 acre; barley, wheat, spring oats, 0.0265 acre; ley, 0.0275 acre; potatoes (sub plot), 0.0107 acre.

Cultivations, etc.:

Sugar beet (Series 5)

Dung and fertilizers for ploughing in deep applied: Sept 9, 1952. Ploughed 'deep' plots: Oct 7. Dung and fertilizers for ploughing in shallow applied: Oct 8. Ploughed 'shallow' plots: Oct 16. Fertilizers for surface application broadcast: Mar 18, 1953. Seed drilled at 18 lb per acre: Mar 26. Sprayed with D.D.T. emulsion, 3 pints in 10 gallons: May 11. Singled: June 7. Lifted: Nov 16. Variety: Klein E.

Barley (Series 1)

Ploughed: Jan 25, 1953. 20 cwt ground chalk per acre applied: Jan 30. Basic slag applied: Feb 25. Sulphate of ammonia applied: Feb 26. Seed drilled at 3 bushels per acre: Feb 27. Harvested: Aug 10. Variety: Plumage Archer.

Ley (Series 6)

Seeds undersown in barley: Apr 18, 1952. Cut: June 29, 1953. Seeds mixture (per acre): 18 lb S.24 perennial ryegrass, 8 lb Montgomery Red clover, 2 lb American Alsike clover.

Wheat (Series 2)

Ploughed 'deep' and 'shallow' plots: Oct 8, 1952. Seed drilled at 3 bushels per acre: Oct 30. $2\frac{1}{2}$ cwt sulphate of ammonia per acre applied: Apr 24, 1953. Harvested: Aug 15. Variety: Yeoman.

Potatoes (Series 3)

Dung and fertilizers for ploughing in deep applied: Sept 9, 1952. Ploughed 'deep' plots: Oct 7. Dung and fertilizers for ploughing in shallow applied: Oct 8. Ploughed 'shallow' plots: Oct 16. Ridged: Apr 20, 1953. Fertilizers applied in ridges, potatoes planted: Apr 21. Earthed up ridges: June 27. Sprayed with copper fungicide, $5\frac{1}{2}$ lb per acre: Aug 8. Lifted: Sept 25. Variety: Majestic.

53/Bb/1.2

Spring oats (Series 4)

Ploughed: Nov 11, 1952. 19 cwt ground chalk per acre applied:
Jan 30, 1953. Basal sulphate of ammonia drilled: Feb 26.
Seed drilled at $3\frac{1}{2}$ bushels per acre: Feb 27. Harvested: Aug 8.
Variety: Star.

Standard errors per plot:

Sugar beet,	Total sugar,	whole plot:	2.63	cwt per acre or 4.8%	(4 d.f.)
		sub-plot:	5.04	cwt per acre or 9.3%	(7 d.f.)
	Tops,	whole plot:	0.797	tons per acre or 7.6%	(4 d.f.)
		sub-plot:	0.861	tons per acre or 8.3%	(7 d.f.)
Barley,	Grain:		0.799	cwt per acre or 2.4%	(4 d.f.)
Ley,	Hay:		5.18	cwt per acre or 9.1%	(4 d.f.)
Wheat,	Grain:		0.707	cwt per acre or 1.6%	(4 d.f.)
Potatoes,	Total tubers,	whole plot:	1.702	tons per acre or 15.1%	(4 d.f.)
		sub-plot:	0.519	tons per acre or 4.6%	(7 d.f.)
Spring oats,	Grain:		1.89	cwt per acre or 7.3%	(4 d.f.)

53/Bb/1.3

Summary of Results

Series 5: Sugar Beet

Responses to treatments

Response to	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.

Roots (washed): Mean yield 15.49 tons per acre

Ploughing deep-shallow	+2.28	-	-	+1.77	+2.79	+1.80	+2.76	+2.58	+1.98
Dung	+2.85	+2.34	+3.36	-	-	+2.98	+2.72	+2.51	+3.19
Phosphate	+0.13	-0.35	+0.61	+0.26	0.00	-	-	+0.25	+0.01
Potash	+0.60	+0.90	+0.30	+0.26	+0.94	+0.72	+0.48	-	-

Sugar Percentage: Mean 17.59

Ploughing deep-shallow	-0.10	-	-	-0.08	-0.12	+0.07	-0.27	-0.06	-0.14
Dung	-0.29	-0.27	-0.31	-	-	-0.13	-0.45	-0.25	-0.33
Phosphate	+0.11	+0.28	-0.06	+0.27	-0.05	-	-	+0.15	+0.07
Potash	+0.17	+0.21	+0.13	+0.21	+0.13	+0.21	+0.13	-	-

Total Sugar: Mean yield 54.4 cwt per acre

	(±1.32)			(±1.86)					
Ploughing deep-shallow	+7.7	-	-	+6.1	+9.3	+6.4	+9.0	+8.8	+6.6
Dung	+9.2	+7.6	+10.8	-	-	+10.2	+8.2	+8.0	+10.4
Phosphate	+0.6	-0.7	+1.9	+1.6	-0.4	-	-	+1.2	0.0
Potash	+2.6	+3.7	+1.5	+1.4	+3.8	+3.2	+2.0	-	-

Tops: Mean yield 10.43 tons per acre

	(±0.399)			(±0.564)					
Ploughing deep-shallow	+1.32	-	-	+1.09	+1.55	+1.45	+1.19	+1.81	+0.83
Dung	+1.36	+1.13	+1.59	-	-	+1.24	+1.48	+0.71	+2.01
Phosphate	-0.01	+0.12	-0.14	-0.13	+0.11	-	-	+0.18	-0.20
Potash	+0.18	+0.67	-0.31	-0.47	+0.83	+0.37	-0.01	-	-

Plant Number: Mean 23.1 thousands per acre

Ploughing deep-shallow	+2.6	-	-	+1.7	+3.5	+1.9	+3.3	+2.7	+2.5
Dung	+0.7	-0.2	+1.6	-	-	+0.9	+0.5	+0.2	+1.2
Phosphate	-0.9	-1.6	-0.2	-0.7	-1.1	-	-	-0.3	-1.5
Potash	+0.0	+0.1	-0.1	-0.5	+0.5	+0.6	-0.6	-	-

Noxious Nitrogen: Mean 28.4 mg. per 100 g.

Ploughing deep-shallow	-0.6	-	-	+0.6	-1.8	+1.9	-3.1	-0.6	-0.6
Dung	0.0	+1.2	-1.2	-	-	-0.6	+0.6	+0.6	-0.6
Phosphate	+1.2	+3.7	-1.3	+0.6	+1.8	-	-	+0.6	+1.8
Potash	0.0	0.0	0.0	+0.6	-0.6	-0.6	+0.6	-	-

Series 5: Sugar Beet

	Phosphate			Potash			Mean
	None	Ploughed in	In seed bed	None	Ploughed in	In seed bed	
Roots (washed): tons per acre							
Shallow	14.53	13.86	14.49	13.90	15.18	14.42	14.35
Deep	16.33	17.61	16.27	16.48	16.66	16.90	16.63
No Dung	13.94	14.03	14.36	13.94	14.17	14.22	14.06
Dung	16.92	17.44	16.40	16.45	17.67	17.11	16.92
Mean	15.43	15.73	15.38	15.19	15.92	15.66	15.49

Sugar Percentage							
Shallow	17.50	17.91	17.64	17.53	17.98	17.50	17.63
Deep	17.57	17.36	17.65	17.48	17.42	17.78	17.54
No Dung	17.60	17.80	17.94	17.63	17.77	17.90	17.73
Dung	17.47	17.48	17.34	17.38	17.62	17.38	17.44
Mean	17.53	17.64	17.64	17.50	17.70	17.64	17.59

Total Sugar: cwt per acre							
	(a)	(b) and (c)		(a)	(b) and (c)		
Shallow	50.9	49.6	51.0	48.7	54.5	50.5	50.6
Deep	57.3	61.0	57.4	57.5	58.1	60.0	58.3
No Dung	49.1	49.8	51.5	49.1	50.2	50.9	49.9
Dung	59.2	60.8	56.9	57.1	62.3	59.5	59.0
Mean	54.1	55.3	54.2	53.1	56.3	55.2	54.4

Tops: tons per acre							
	(a)	(b) and (c)		(a)	(b) and (c)		
Shallow	9.71	9.62	10.03	9.43	10.10	10.11	9.76
Deep	11.16	11.25	10.78	11.24	10.70	11.17	11.09
No Dung	9.81	9.68	9.68	9.98	9.32	9.71	9.75
Dung	11.05	11.19	11.13	10.69	11.48	11.56	11.11
Mean	10.43	10.44	10.41	10.34	10.40	10.64	10.43

Total Sugar (a) ± 1.32 for use in comparisons other than horizontal.
 (b) ± 2.52 for use in horizontal comparisons.
 (c) ± 2.22 as (a).
 Tops (a) ± 0.399 for use in comparisons other than horizontal.
 (b) ± 0.430 for use in horizontal comparisons.
 (c) ± 0.502 as (a).

Series 5: Sugar Beet

	Phosphate			Potash			Mean
	None	Ploughed in	In seed bed	None	Ploughed in	In seed bed	
Plant Number: thousands per acre							
Shallow	22.6	20.9	21.0	21.7	21.7	21.9	21.8
Deep	24.5	23.8	24.7	24.4	23.7	25.0	24.4
No Dung	23.1	21.5	23.2	23.0	21.3	23.6	22.7
Dung	24.0	23.2	22.4	23.2	24.1	23.3	23.4
Mean	23.5	22.4	22.8	23.1	22.7	23.4	23.1

Noxious Nitrogen: mg. per 100 g.							
Shallow	26.9	28.8	32.5	28.8	27.5	30.0	28.8
Deep	28.8	30.0	25.0	28.1	28.8	27.5	28.1
No Dung	28.1	30.0	27.5	28.1	28.8	28.8	28.4
Dung	27.5	28.8	30.0	28.8	27.5	28.8	28.4
Mean	27.8	29.4	28.8	28.4	28.1	28.8	28.4

Series 1: Barley

Responses to treatments to previous Sugar Beet

Response to	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.

Grain: Mean yield 32.7 cwt per acre									
	(±0.40)	(±0.57)							
Floughing deep-shallow	+1.0	-	-	+1.3	+0.7	+1.6	+0.4	+1.5	+0.5
Dung	+0.2	+0.5	-0.1	-	-	-0.2	+0.6	-1.0	+1.4
Phosphate	+1.2	+1.8	+0.6	+0.8	+1.6	-	-	+2.4	0.0
Potash	+0.9	+1.4	+0.4	-0.3	+2.1	+2.1	-0.3	-	-

Straw: Mean yield 47.9 cwt per acre									
Floughing deep-shallow	+1.7	-	-	+1.8	+1.6	+0.2	+3.2	+2.7	+0.7
Dung	+5.4	+5.5	+5.3	-	-	+4.4	+6.4	+6.3	+4.5
Phosphate	-0.9	-2.4	+0.6	-1.9	+0.1	-	-	-0.4	-1.4
Potash	+2.2	+3.2	+1.2	+3.1	+1.3	+2.7	+1.7	-	-

Series 6: Ley

Responses to treatments to previous Sugar Beet

Response to	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Hay: Mean yield 56.7 cwt per acre									
	(±2.59)								
Ploughing deep-shallow	+1.1	-	-	+5.0	-2.8	+4.5	-2.3	+3.2	-1.0
Dung	+10.3	+14.2	+6.4	-	-	+8.8	+11.8	+15.3	+5.3
Phosphate	-1.0	+2.4	-4.4	-2.5	+0.5	-	-	-2.7	+0.7
Potash	+4.0	+6.1	+1.9	+9.0	-1.0	+2.3	+5.7	-	-

Series 2: Wheat*

Grain: Mean yield 45.1 cwt per acre

Response to	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Grain: Mean yield 45.1 cwt per acre									
	(±0.35)								
Ploughing deep-shallow	+1.1	-	-	+1.0	+1.2	+2.4	-0.2	+1.2	+1.0
Dung	+0.5	+0.4	+0.6	-	-	+1.2	-0.2	0.0	+1.0
Phosphate	0.0	+1.3	-1.3	+0.7	-0.7	-	-	+1.0	-1.0
Potash	+0.8	+0.9	+0.7	+0.3	+1.3	+1.8	-0.2	-	-

Straw: Mean yield 67.7 cwt per acre

Response to	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Straw: Mean yield 67.7 cwt per acre									
Ploughing deep-shallow	+2.3	-	-	+3.9	+0.7	+3.7	+0.9	+2.0	+2.6
Dung	+6.7	+8.3	+5.1	-	-	+7.3	+6.1	+7.5	+5.9
Phosphate	+1.1	+2.5	-0.3	+1.7	+0.5	-	-	+0.4	+1.8
Potash	+1.1	+0.8	+1.4	+1.9	+0.3	+0.4	+1.8	-	-

Series 3: Potatoes

Total tubers: Mean yield 11.27 tons per acre

Response to	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Total tubers: Mean yield 11.27 tons per acre									
	(±0.851)								
Ploughing deep-shallow	-0.05	-	-	+0.16	-0.26	+0.30	-0.40	-0.22	+0.12
Dung	+5.30	+5.51	+5.09	-	-	+4.40	+6.20	+7.39	+3.21
Phosphate	+1.56	+1.91	+1.21	+0.66	+2.46	-	-	+1.32	+1.80
Potash	+3.24	+3.07	+3.41	+5.33	+1.15	+3.00	+3.48	-	-

Percentage Ware (1½" riddle): Mean 81.8

Response to	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Percentage Ware (1½" riddle): Mean 81.8									
Ploughing deep-shallow	0.0	-	-	+1.0	-1.0	0.0	0.0	-1.5	+1.5
Dung	+6.7	+7.7	+5.7	-	-	+1.5	+11.9	+12.4	+1.0
Phosphate	-1.1	-1.1	-1.1	-6.3	+4.1	-	-	-2.7	+0.5
Potash	+7.4	+5.9	+8.9	+13.1	+1.7	+5.8	+9.0	-	-

*Cultivation treatments direct to wheat, remainder to previous sugar beet.

53/Bb/1.7

Series 3: Potatoes

	Phosphate			Potash			Mean
	None	Ploughed in	In ridges	None	Ploughed in	In ridges	
Total Tubers: tons per acre							
	(a)	(b) and (c)		(a)	(b) and (c)		
Shallow	10.34	12.04	12.45	9.76	12.17	13.49	11.29
Deep	10.64	11.90	11.79	9.53	12.47	13.42	11.24
No Dung	8.29	8.69	9.20	5.95	10.60	11.96	8.62
Dung	12.69	15.25	15.04	13.34	14.04	14.95	13.92
Mean	10.49	11.97	12.12	9.65	12.32	13.46	11.27
Percentage Ware (1½" riddle)							
Shallow	82.3	81.8	80.7	78.8	83.8	85.7	81.8
Deep	82.4	84.8	77.8	77.4	85.0	87.6	81.8
No Dung	81.6	78.8	71.9	71.9	83.4	86.6	78.4
Dung	83.1	87.8	86.6	84.3	85.4	86.8	85.2
Mean	82.3	83.3	79.3	78.1	84.4	86.6	81.8

Total tubers (a) ±0.851 for use in comparisons other than horizontal.
 (b) ±0.260 for use in horizontal comparisons.
 (c) ±0.871 as (a).

Series 4: Spring Oats

Responses to treatments to previous potatoes.

Response to	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Grain: Mean yield 26.0 cwt per acre									
Ploughing	(±0.94)	(±1.33)							
deep-shallow	-3.2	-	-	-1.7	-1.7	-2.2	-1.2	-2.1	-4.3
Dung	+1.0	+2.5	-0.5	-	-	-0.1	+2.1	+0.3	+1.7
Phosphate	+2.4	+3.4	+1.4	+1.3	+3.5	-	-	+0.2	+4.6
Potash	-0.5	+0.6	-1.6	-1.2	+0.2	-2.7	+1.7	-	-
Straw: Mean yield 38.1 cwt per acre									
Ploughing	-1.3	-	-	-2.5	-1.1	-0.3	-2.8	-0.9	-2.7
deep-shallow									
Dung	+2.8	+2.1	+3.5	-	-	+1.2	+4.4	+2.6	+3.0
Phosphate	+1.4	+2.4	+0.4	-0.2	+3.0	-	-	-0.6	+3.4
Potash	-0.3	+0.6	-1.2	-0.5	-0.1	-2.3	+1.7	-	-