

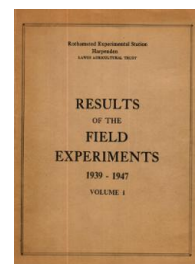
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# Yields of the Field Experiments 1939-1947 Volume 1

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## BC/1 Deep Cultivation Rotation

### Rothamsted Research

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Bc/1.1

DEEP CULTIVATION ROTATION EXPERIMENT

Long Hoos I and II (begun in 1944)

- (1) To compare deep ploughing (about 12 inches) with shallow ploughing (about 6 inches).
- (2) A test of dung ploughed in at different depths.
- (3) To compare ploughing in mineral fertilizers (superphosphate and muriate of potash) at different depths with applying them in the seed bed.

The crops of the six course rotation are sugar beet, barley, one year seeds, wheat, potatoes, oats. There are six series, one for each crop of the rotation. Each series has 16 main plots for the ploughing, dung, P and K treatments. The main plots are divided into two to test the depth of application of mineral fertilizers to sugar beet and potatoes. Each plot receives the same treatment throughout the experiment.

System of replication: 2 blocks of 8 plots each in each series, the four-factor interaction of main plot treatments being confounded with block differences.

Area of each whole plot: 0.0132 acre, before rejecting edge rows.

Treatments

Whole plots: All combinations of:-

- (1) Shallow (6") v. Deep (12") ploughing. Ploughing treatments on stubbles in Autumn for sugar beet and potatoes, on seeds aftermath for wheat.

(2) No dung v. dung ploughed in	Sugar Beet 10 tons	Potatoes 20 tons
(3) No phosphate v. superphosphate	0.6 cwt. $P_2O_5$	0.8 cwt. $P_2O_5$
(4) No potash v. muriate of potash	0.6 cwt. $K_2O$	1.0 cwt. $K_2O$

(all amounts per acre)

Half plots (Sugar beet and potatoes only):-

Minerals (PK combinations) ploughed in v. minerals in seed bed.

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



Basal Manuring (continued)	Bc/1.2					
	Sugar beet	Barley	Ley	Wheat	Potatoes	Spring Oats
Sulphate of Ammonia (cwt. N per acre)	0.8	0.3	-	0.5	0.6	0.2
Basic Slag (cwt. P <sub>2</sub> O <sub>5</sub> per acre)	-	0.6	-	-	-	-

Non-experimental Cultivations: These are carried out over the whole of any series, with the proviso that they must not be deeper than 6 inches except that deep ploughed plots may be worked to a depth of below 6 inches for the root crops.

Cropping: Series	Preliminary years		Years of complete cropping	
	1944	1945	1946	1947
1	Potatoes	Spring oats	Sugar beet	Barley
2	Sugar beet	Barley	Ley	Wheat
3	(Barley)	(Ley)	Wheat	Potatoes
4	(Wheat)	(Barley)	Potatoes	Spring oats
5	(Wheat)	Potatoes	Spring oats	Sugar beet
6	(Wheat)	Sugar beet	Barley	Ley

(Non-experimental crops in brackets)

The Physics Department has made observations on crop development from 1944 onwards.

Crop Notes

	Sugar beet	Barley	Ley	Wheat	Potatoes	Spring oats
1944						
Sown	Apr. 20				Apr. 5	
Harvested	Oct. 19				Sep. 27	
1945						
Sown	Apr. 13	Mar. 26			Apr. 4	Mar. 22
Harvested	Oct. 22	Aug. 11			Sep. 25	Aug. 16
1946						
Sown	Apr. 13	Mar. 21	27.3.45	Oct. 16	May 1	Mar. 21
Harvested	Oct. 24	Aug. 13	Jun. 24	Aug. 12	Oct. 1	Aug. 6
1947						
Sown	Apr. 25	Apr. 12	16.4.46	Oct. 18	May 2	Apr. 11
Harvested	Nov. 1	Aug. 11	Jun. 10	Aug. 1	Sep. 30	Aug. 5
Variety	Klein E	Plumage Archer	Mixture given below	Yeoman	Majestic	Star

Seeds mixture (all amounts per acre): 18 lb. Perennial ryegrass, 6 lb. late flowering red clover, 2 lb. Alsike clover.



Bc/1.4

Sugar Beet

Roots (washed): tons per acre

	Mean yield	Standard errors	
		per whole plot	per split plot
1944	10.83	0.890 or 8.2%	1.70 or 15.3%, 7 d.f.
1945	15.20	1.03 or 6.8%, 6 d.f.	0.781 or 5.1%, 7 d.f.
1946	16.21	1.19 or 7.4%, 10 d.f.	1.61 or 9.7%, 7 d.f.
1947	10.08	0.658 or 6.5%, 4 d.f.	0.418 or 4.1%, 7 d.f.

Responses to treatments

	Mean	Floughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
<u>1944</u>									
Floughing	±0.44					±0.63			
deep- shallow	0.39	-	-	0.45	0.33	0.59	0.19	0.90	-0.12
Dung	1.00	1.06	0.94	-	-	0.68	1.32	1.48	0.52
Phosphate	0.51	0.71	0.31	0.19	0.83	-	-	0.47	0.55
Potash	0.98	1.49	0.47	1.46	0.50	0.94	1.02	-	-
<u>1945</u>									
Floughing	±0.52					±0.73			
deep- shallow	0.53	-	-	0.80	0.26	1.04	0.02	0.65	0.41
Dung	1.00	1.27	0.73	-	-	1.23	0.77	1.50	0.50
Phosphate	0.61	1.12	0.10	0.84	0.38	-	-	0.34	0.88
Potash	0.21	0.33	0.09	0.71	-0.29	-0.06	0.48	-	-
<u>1946</u>									
Floughing	±0.60					±0.85			
deep- shallow	0.64	-	-	0.72	0.56	0.13	1.15	0.73	0.55
Dung	0.91	0.99	0.83	-	-	2.06	-0.24	1.49	0.33
Phosphate	0.44	-0.07	0.95	1.59	-0.71	-	-	0.13	0.75
Potash	0.79	0.88	0.70	1.37	0.21	0.48	1.10	-	-
<u>1947</u>									
Floughing	±0.33					±0.47			
deep- shallow	3.24	-	-	3.20	3.28	3.45	3.03	3.51	3.17
Dung	2.23	2.19	2.27	-	-	2.19	2.27	2.65	1.81
Phosphate	0.01	0.22	-0.20	-0.03	0.05	-	-	0.65	-0.63
Potash	0.20	0.27	0.13	0.62	-0.22	0.84	-0.44	-	-



Deep Cultivation Rotation Experiment

Ploughing: The plough used for deep cultivations was a Ransome Solotrac giving a depth of 12 inches at least, except in 1944 when a Massey Harris Grub Breaker was used. This could not be made to cut a 12 inch deep furrow at all satisfactorily, the actual depth in that year being 9-12 inches. Until 1947 the whole of the seeds area was ploughed 6" deep after the hay was carted, the deep ploughing being carried out subsequently at the same time as the stubbles were deep ploughed for roots. In autumn 1946 the second ploughing of the seeds could not be carried out owing to wet conditions, so there was no test of deep ploughing on wheat in 1947. In summer 1947 the deep and shallow ploughing treatments were carried out directly on the hay stubble and this will be continued.



Deep Cultivation Rotation Experiment

Sugar Beet

Roots (washed): tons per acre

Time of application of mineral fertilizers

		Superphosphate			Potash			Mean
		None	Ploughed in	In seed bed	None	Ploughed in	In seed bed	
Standard errors:		(a)	(b) & (c)		(a)	(b) & (c)		
<u>1944</u>	Shallow	10.28	10.73	11.25	9.89	11.37	11.41	10.64
	Deep	10.87	11.97	10.39	10.79	12.05	10.46	11.03
	No dung	10.23	10.20	10.61	9.60	11.22	10.88	10.32
	Dung	10.92	12.50	10.99	11.08	12.16	10.99	11.33
	Mean	10.58	11.35	10.81	10.34	11.70	10.94	10.83
<u>1945</u>	Shallow	14.37	15.54	15.43	14.76	15.28	14.91	14.93
	Deep	15.41	15.89	15.13	15.42	15.38	15.64	15.46
	No Dung	14.28	15.35	14.89	14.34	15.13	14.98	14.70
	Dung	15.50	16.09	15.63	15.84	15.53	15.57	15.69
	Mean	14.89	15.72	15.28	15.09	15.33	15.28	15.21
<u>1946</u>	Shallow	15.93	15.93	15.78	15.45	16.46	16.20	15.89
	Deep	16.05	17.03	16.97	16.18	16.51	17.23	16.53
	No dung	14.96	17.12	15.99	15.07	16.14	16.74	15.75
	Dung	17.02	15.85	16.77	16.56	16.83	16.69	16.66
	Mean	15.99	16.48	16.38	15.82	16.49	16.72	16.21
<u>1947</u>	Shallow	8.35	8.86	8.27	8.32	9.17	8.01	8.46
	Deep	11.79	11.50	11.70	11.63	12.04	11.48	11.69
	No dung	8.97	9.12	8.78	8.65	9.99	8.55	8.96
	Dung	11.16	11.24	11.19	11.30	11.23	10.93	11.19
	Mean	10.07	10.18	9.98	9.97	10.61	9.74	10.08
	Standard errors:		(a)	(b)	(c)			
			1944	0.44	0.85	0.74		
			1945	0.52	0.39	0.58		
			1946	0.60	0.80	0.83		
			1947	0.33	0.21	0.36		

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

N



Bc/1.6

Sugar Beet  
Sugar Percentage

	Mean	Standard errors	
		per whole plot	per split plot
1944	15.73	0.371, 9 d.f.	0.398, 7 d.f.
1945	19.09	0.728, 7 d.f.	1.12, 7 d.f.
1946	15.59	0.480, 10 d.f.	0.500, 7 d.f.

		Responses to treatments							
		Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
<u>1944</u>									
Ploughing	Mean $\pm 0.19$	$\pm 0.26$							
deep shallow	0.05	-	-	-0.24	0.34	-0.11	0.21	0.11	-0.01
Dung	-0.25	-0.54	0.04	-	-	-0.22	-0.28	-0.23	-0.27
Phosphate	0.13	-0.03	0.29	0.16	0.10	-	-	0.28	-0.02
Potash	0.38	0.44	0.32	0.40	0.36	0.53	0.23	-	-
<u>1945</u>									
Ploughing	Mean $\pm 0.36$	$\pm 0.51$							
deep-shallow	0.34	-	-	-0.17	0.85	0.18	0.50	0.40	0.28
Dung	-0.19	-0.70	0.32	-	-	-0.25	-0.13	0.02	-0.40
Phosphate	-0.31	-0.47	-0.15	-0.37	-0.25	-	-	-0.45	-0.17
Potash	0.39	0.45	0.33	0.60	0.18	0.25	0.53	-	-
<u>1946</u>									
Ploughing	Mean $\pm 0.24$	$\pm 0.34$							
deep shallow	0.16	-	-	-0.11	0.43	0.16	0.16	-0.24	0.56
Dung	-0.28	-0.55	-0.01	-	-	0.08	-0.64	-0.06	-0.50
Phosphate	0.33	0.33	0.33	0.69	-0.03	-	-	0.20	0.46
Potash	0.26	-0.14	0.66	0.48	0.04	0.13	0.39	-	-
<u>1947</u>									
Ploughing									
deep shallow	-0.31	-	-	-0.24	-0.38	-0.53	-0.09	-0.15	-0.47
Dung	-0.01	0.06	-0.08	-	-	-0.10	0.08	-0.23	0.21
Phosphate	-0.01	-0.23	0.21	-0.10	0.08	-	-	-0.10	0.08
Potash	0.32	0.48	0.16	0.10	0.54	0.23	0.41	-	-



Bc/1.7

Deep Cultivation Rotation Experiment

Sugar Beet  
Sugar percentage

Time of application of mineral fertilizers

	Superphosphate			Potash			Mean
	None	Ploughed in	In seed bed	None	Ploughed in	In seed bed	
Standard errors:	(a)	(b) &	(c)	(a)	(b) &	(c)	
<u>1944</u>							
Shallow	15.72	15.70	15.67	15.48	15.93	15.92	15.70
Deep	15.61	15.88	15.92	15.60	15.78	16.04	15.76
No dung	15.77	15.92	15.94	15.65	16.07	16.03	15.85
Dung	15.55	15.67	15.64	15.42	15.64	15.93	15.60
Mean	15.66	15.79	15.79	15.54	15.86	15.98	15.73
<u>1945</u>							
Shallow	19.16	18.62	18.76	18.70	18.67	19.62	18.92
Deep	19.34	19.39	18.97	19.10	19.77	19.08	19.26
No dung	19.38	18.87	19.13	18.89	19.01	19.96	19.19
Dung	19.12	19.14	18.60	18.90	19.43	18.74	19.00
Mean	19.25	19.01	18.86	18.90	19.22	19.35	19.09
<u>1946</u>							
Shallow	15.34	15.50	15.84	15.58	15.52	15.35	15.51
Deep	15.51	16.06	15.60	15.34	15.99	16.00	15.67
No dung	15.38	16.04	16.10	15.49	16.05	15.88	15.73
Dung	15.47	15.52	15.34	15.43	15.46	15.47	15.45
Mean	15.42	15.78	15.72	15.46	15.76	15.68	15.59
<u>1947</u>							
Shallow	20.47	20.03	20.45	20.11	20.38	20.82	20.36
Deep	19.94	20.14	20.17	19.97	20.10	20.16	20.05
No dung	20.26	20.14	20.17	20.16	20.07	20.44	20.21
Dung	20.16	20.02	20.45	19.92	20.40	20.54	20.20
Mean	20.21	20.08	20.31	20.04	20.24	20.49	20.20

Standard errors:	(a)	(b)	(c)
1944	±0.19	±0.20	±0.23
1945	±0.36	±0.56	±0.54
1946	±0.24	±0.25	±0.30

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

N



Bc/1.8

Sugar Beet

Total sugar: cwt. per acre

Standard errors

	Mean yield	per whole plot		per sub-plot	
1944	34.1	3.32 or 9.8%	9 d.f.	6.23 or 17.7%	7 d.f.
1945	58.0	3.87 or 6.7%	8 d.f.	4.37 or 7.5%	7 d.f.
1946	50.5	4.54 or 9.0%	10 d.f.	5.54 or 10.8%	7 d.f.
1947	40.7	2.37 or 5.8%	4 d.f.	1.26 or 3.1%	7 d.f.

Responses to treatments

	Mean	Floughing		Dung		Phosphate		Potash	
		Shallow	Deep	Absent	Present	Absent	Present	Absent	Present
<u>1944</u>									
Floughing	±1.66					±2.35			
deep-shallow	1.4	-	-	1.0	1.8	1.6	1.2	3.1	-0.3
Dung	2.6	2.2	3.0	-	-	1.7	3.5	4.2	1.0
Phosphate	2.0	2.2	1.8	1.1	2.9	-	-	2.2	1.8
Potash	3.9	5.6	2.2	5.5	2.3	4.1	3.7	-	-
<u>1945</u>									
Floughing	±1.94					±2.74			
deep-shallow	3.2	-	-	2.7	3.7	4.7	1.7	3.7	2.7
Dung	3.4	2.9	3.9	-	-	4.2	2.6	5.7	1.1
Phosphate	1.5	3.0	0.0	2.3	0.7	-	-	-0.2	3.2
Potash	1.9	2.4	1.4	4.2	-0.4	0.2	3.6	-	-
<u>1946</u>									
Floughing	±2.27					±3.21			
deep-shallow	2.5	-	-	2.0	3.0	0.9	4.1	1.4	3.6
Dung	1.8	1.3	2.3	-	-	6.4	-2.8	4.4	-0.8
Phosphate	2.5	0.9	4.1	7.1	-2.1	-	-	1.0	4.0
Potash	3.3	2.2	4.4	5.9	0.7	1.8	4.8	-	-
<u>1947</u>									
Floughing	±1.19					±1.68			
deep-shallow	12.4	-	-	12.5	12.3	12.8	12.0	12.9	11.9
Dung	9.0	9.1	8.9	-	-	8.6	9.4	10.1	7.9
Phosphate	0.1	0.5	-0.3	-0.3	0.5	-	-	2.5	-2.3
Potash	1.4	1.9	0.9	2.5	0.3	3.8	-1.0	-	-



Deep Cultivation Rotation Experiment

Sugar Beet

Total sugar: cwt. per acre

	Time of application of mineral fertilizers						Mean
	Superphosphate			Potash			
	None	Ploughed In seed		None	Ploughed In seed		
		in	bed		in	bed	
Standard error	(a)	(b) and (c)		(a)	(b) and (c)		Mean
<u>1944</u>							
Shallow	32.3	33.7	35.3	30.6	36.2	36.3	33.4
Deep	33.9	38.3	33.1	33.7	38.1	33.7	34.8
No dung	32.3	32.7	34.0	30.1	36.1	35.0	32.8
Dung	34.0	39.3	34.4	34.3	38.1	35.0	35.4
Mean	33.1	36.0	34.2	32.2	37.2	35.0	34.1
<u>1945</u>							
Shallow	54.8	57.9	57.9	55.2	57.1	58.1	56.4
Deep	59.6	61.7	57.4	58.9	60.9	59.6	59.6
No dung	55.1	57.9	57.0	54.2	57.5	59.3	56.3
Dung	59.3	61.7	58.3	59.9	60.5	58.3	59.6
Mean	57.2	59.8	57.6	57.0	59.0	58.8	58.0
<u>1946</u>							
Shallow	48.8	49.6	49.9	48.1	51.0	49.8	49.3
Deep	49.7	54.6	53.1	49.6	52.8	55.2	51.8
No dung	46.1	54.8	51.6	46.7	51.8	53.4	49.6
Dung	52.5	49.3	51.5	51.1	52.0	51.6	51.4
Mean	49.3	52.1	51.5	48.9	51.9	52.5	50.6
<u>1947</u>							
Shallow	34.2	35.5	33.9	34.5	37.4	33.4	34.4
Deep	47.0	46.3	47.2	46.4	48.4	46.3	46.9
No dung	36.3	36.7	35.3	34.9	40.0	34.8	36.2
Dung	44.9	45.0	45.7	45.0	45.8	44.8	45.1
Mean	40.6	40.9	40.5	39.9	42.9	39.8	40.7
Standard errors:							
		(a)	(b)	(c)			
	1944	1.66	3.12	2.76			
	1945	1.94	2.18	2.48			
	1946	2.27	2.77	3.00			
	1947	1.19	0.63	1.27			

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

W



Sugar Beet

Tops: tons per acre

	Mean Yield	Standard errors	
		per whole plot	per sub-plot
1944	16.85	1.32 or 7.9%, 9 d.f.	1.75 or 10.2%, 7 d.f.
1945	16.05	1.27 or 7.9%, 8 d.f.	1.32 or 8.2%, 7 d.f.
1946	18.89	1.08 or 5.7%, 7 d.f.	1.37 or 7.3%, 7 d.f.
1947	7.00	0.281 or 4.0%, 4 d.f.	0.612 or 8.6%, 7 d.f.

Responses to treatments

	Mean	Ploughing		Dung		Phosphate		Potash		
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	
Ploughing	$\pm 0.66$					$\pm 0.93$				
deep-shallow	-0.18	-	-	-0.70	0.34	-0.50	0.14	0.03	-0.39	
Dung	1.82	1.30	2.34	-	-	1.43	2.21	3.01	0.63	
Phosphate	-0.01	-0.33	0.31	-0.40	0.38	-	-	-0.25	0.23	
Potash	1.92	2.13	1.71	3.11	0.73	1.68	2.16	-	-	
<u>1945</u>										
Ploughing	$\pm 0.63$					$\pm 0.90$				
deep-shallow	1.66	-	-	1.20	2.12	1.02	2.30	2.28	1.04	
Dung	1.05	0.59	1.51	-	-	1.36	0.74	1.16	0.94	
Phosphate	0.44	-0.20	1.08	0.75	0.13	-	-	0.03	0.85	
Potash	0.13	0.75	-0.49	0.24	0.02	-0.28	0.54	-	-	
<u>1946</u>										
Ploughing	$\pm 0.54$					$\pm 0.76$				
deep-shallow	0.04	-	-	1.74	-1.66	0.44	-0.36	1.07	-0.99	
Dung	1.60	3.30	-0.10	-	-	0.25	2.95	1.43	1.77	
Phosphate	-0.40	0.00	-0.80	-1.75	0.95	-	-	-0.16	-0.64	
Potash	0.07	1.10	-0.96	-0.10	0.24	0.31	-0.17	-	-	
<u>1947</u>										
Ploughing	$\pm 0.14$					$\pm 0.20$				
deep-shallow	1.73	-	-	1.84	1.62	2.21	1.25	1.61	1.85	
Dung	1.69	1.80	1.58	-	-	1.90	1.48	2.22	1.16	
Phosphate	0.16	0.64	-0.32	0.37	-0.05	-	-	0.68	-0.36	
Potash	0.19	0.07	0.31	0.72	-0.34	0.71	-0.33	-	-	



Deep Cultivation Rotation Experiment

Bc/1.11

Sugar Beet

Tops: tons per acre

Time of application of mineral fertilizers

	Superphosphate			Potash			Mean
	None	Ploughed in	In seed bed	None	Ploughed in	In seed bed	
Standard errors:	(a)	(b) and (c)		(a)	(b) and (c)		
<u>1944</u>							
Shallow	17.11	16.00	17.56	15.88	17.28	18.74	16.94
Deep	16.61	16.77	17.07	15.91	17.44	17.80	16.76
No dung	16.14	14.94	16.55	14.39	16.68	18.32	15.94
Dung	17.57	17.82	18.08	17.40	18.04	18.22	17.76
Mean	16.86	16.38	17.32	15.90	17.36	18.27	16.85
<u>1945</u>							
Shallow	15.32	15.21	15.03	14.84	15.79	15.39	15.22
Deep	16.34	17.31	17.52	17.12	16.14	17.13	16.88
No dung	15.15	15.99	15.80	15.40	15.46	15.83	15.52
Dung	16.51	16.53	16.75	16.57	16.47	16.70	16.58
Mean	15.83	16.26	16.28	15.98	15.96	16.26	16.05
<u>1946</u>							
Shallow	18.87	18.34	19.38	18.32	19.37	19.45	18.87
Deep	19.30	19.30	17.71	19.38	19.09	17.76	18.90
No dung	18.96	17.61	16.80	18.14	18.73	17.33	18.08
Dung	19.21	20.02	20.30	19.57	19.74	19.87	19.69
Mean	19.09	18.82	18.55	18.85	19.23	18.60	18.88
<u>1947</u>							
Shallow	5.82	6.72	6.20	6.10	6.59	5.76	6.14
Deep	8.03	7.20	8.22	7.72	7.89	8.16	7.87
No dung	5.97	6.04	6.65	5.80	6.77	6.26	6.16
Dung	7.87	7.88	7.77	8.02	7.70	7.66	7.85
Mean	6.92	6.96	7.21	6.91	7.24	6.96	7.00

Standard errors:	(a)	(b)	(c)
1944	0.66	0.88	0.90
1945	0.63	0.66	0.79
1946	0.54	0.68	0.73
1947	0.14	0.31	0.26

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



Bc/1.12

Sugar Beet

Plant number: thousands per acre

Standard errors

Mean yield		per whole plot				per split plot			
1944	26.4	1.59 or 6.0%, 9 d.f.				0.990 or 3.7%, 7 d.f.			
1945	26.4	1.55 or 5.9%, 9 d.f.				1.25 or 4.7%, 7 d.f.			
1946	24.4	0.912 or 3.7%, 7 d.f.				0.760 or 3.1%, 7 d.f.			
1947	23.1								
Responses to treatments									
		Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
<u>1944</u>	Mean								
Ploughing	±0.80	±1.12							
deep-shallow	1.2	-	-	0.7	1.7	1.0	1.4	2.7	-0.3
Dung	-0.8	-1.3	-0.3	-	-	-1.4	-0.2	-0.9	-0.7
Phosphate	-0.2	-0.4	0.0	-0.8	0.4	-	-	0.2	-0.6
Potash	0.5	2.0	-1.0	0.4	0.6	0.9	0.1	-	-
<u>1945</u>	Mean								
Ploughing	±0.78	±1.10							
deep-shallow	0.3	-	-	1.0	-0.4	-0.1	0.7	0.4	0.2
Dung	-0.2	0.5	-0.9	0.9	-	-0.1	-0.3	-0.4	0.0
Phosphate	1.2	0.8	1.6	1.3	1.1	-	-	0.6	1.8
Potash	-0.4	-0.3	-0.5	-0.6	-0.2	-1.0	0.2	-	-
<u>1946</u>	Mean								
Ploughing	±0.46	±0.65							
deep-shallow	-0.2	-	-	0.3	-0.7	-0.4	0.0	-0.6	0.2
Dung	0.2	0.7	-0.3	-	-	1.2	-0.8	-0.7	1.1
Phosphate	-0.1	-0.3	0.1	0.9	-1.1	-	-	-0.2	0.0
Potash	1.0	0.6	1.4	0.1	1.9	0.9	1.1	-	-
<u>1947</u>	Mean								
Ploughing									
deep-shallow	0.2	-	-	-0.6	1.0	0.5	-0.1	-1.0	1.4
Dung	1.2	0.4	2.0	-	-	0.9	1.5	1.1	1.3
Phosphate	0.5	0.8	0.2	0.2	0.8	-	-	0.7	0.3
Potash	1.7	0.5	2.9	1.6	1.8	1.9	1.5	-	-

X minus

minus



K

Bc/1.13

Deep Cultivation Rotation Experiment:

Sugar Beet

Plant number: thousands per acre

Time of application of mineral fertilizers

	Superphosphate			Potash			Mean
	None	Ploughed in	In seed bed	None	Ploughed in	In seed bed	
Standard errors:	(a)	(b) & (c)		(a)	(b) & (c)		
<u>1944</u>							
Shallow	26.0	25.5	25.6	24.8	26.6	27.0	25.8
Deep	27.0	26.9	27.0	27.4	27.2	25.8	27.0
No dung	27.2	26.3	26.5	26.6	27.1	26.9	26.8
Dung	25.8	26.1	26.2	25.6	26.7	25.9	26.0
Mean	26.5	26.2	26.3	26.1	26.9	26.4	26.4
<u>1945</u>							
Shallow	25.9 <del>0</del>	26.4 <del>7</del>	27.0 <del>0</del>	26.4 <del>3</del>	25.9 <del>3</del>	26.1 <del>5</del>	26.3 <del>8</del>
Deep	25.7 <del>4</del>	27.5 <del>9</del>	27.3 <del>4</del>	26.8 <del>1</del>	25.7 <del>4</del>	26.9 <del>4</del>	26.6 <del>7</del>
No dung	25.9 <del>0</del>	26.9 <del>0</del>	27.5 <del>1</del>	26.9 <del>5</del>	26.2 <del>0</del>	26.3 <del>1</del>	26.6 <del>5</del>
Dung	25.7 <del>0</del>	27.0 <del>6</del>	26.8 <del>1</del>	26.4 <del>9</del>	25.5 <del>6</del>	27.0 <del>8</del>	26.3 <del>0</del>
Mean	25.8 <del>1</del>	26.9 <del>3</del>	27.2 <del>6</del>	26.6 <del>2</del>	25.8 <del>3</del>	26.6 <del>4</del>	26.4 <del>2</del>
<u>1946</u>							
Shallow	24.6	24.6	24.0	24.1	25.1	24.5	24.4
Deep	24.2	24.5	24.2	23.5	24.8	25.2	24.3
No dung	23.8	25.2	24.3	24.2	24.7	23.9	24.3
Dung	25.0	24.0	23.9	23.5	25.1	25.8	24.5
Mean	24.4	24.6	24.1	23.8	24.9	24.8	24.4
<u>1947</u>							
Shallow	22.6	23.3	23.5	22.8	23.7	22.7	23.0
Deep	23.1	21.8	24.9	21.8	25.1	24.3	23.2
No dung	22.4	21.5	23.7	21.8	23.7	22.8	22.5
Dung	23.3	23.5	24.7	22.8	25.1	24.1	23.7
Mean	22.9	22.5	24.2	22.3	24.4	23.5	23.1
Standard errors:		(a)	(b)	(c)			
	1944	0.80	0.50	0.87			
	1945	0.78	0.62	0.90			
	1946	0.46	0.38	0.53			

9

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

K



Bc/1.14

Barley - Residual Effects

Grain: cwt. per acre

	Mean yield	Standard error per plot
1945	29.2	1.43 or 4.9%, 7 d.f.
1946	36.4	1.79 or 4.9%, 7 d.f.
1947	31.2	0.903 or 2.9%, 4 d.f.

Responses to treatments

Mean	Ploughing		Dung		Phosphate		Potash		
	Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	
Grain: cwt. per acre									
<u>1945</u>									
Ploughing	±0.71				±1.01				
deep-shallow	-0.6	-	-	-0.9	-0.3	0.1	-1.3	-1.5	0.3
Dung	1.3	1.0	1.6	-	<del>0.3</del> 0.3	2.3	2.4	0.2	
Phosphate	0.8	1.5	0.1	-0.2	1.8	-	-	0.3	1.3
Potash	0.7	-0.2	1.6	1.8	-0.4	0.2	1.2	-	-
<u>1946</u>									
Ploughing	±0.90				±1.27				
deep-shallow	0.4	-	-	0.6	0.2	1.2	-0.4	1.0	-0.2
Dung	1.3	1.5	1.1	-	-	1.0	1.6	2.4	0.2
Phosphate	0.7	1.5	-0.1	0.4	1.0	-	-	0.6	0.8
Potash	0.0	0.6	-0.6	1.1	-1.1	-0.1	0.1	-	-
<u>1947</u>									
Ploughing	±0.45				±0.64				
deep-shallow	2.4	-	-	2.4	2.4	2.3	2.5	2.4	2.4
Dung	0.9	0.9	0.9	-	-	0.3	1.5	0.7	1.1
Phosphate	0.0	-0.1	0.1	-0.6	0.6	-	-	0.4	-0.4
Potash	0.4	0.4	0.4	0.2	0.6	0.8	0.0	-	-



Deep Cultivation Rotation Experiment

Barley - Residual Effects

Straw: cwt. per acre

	Mean Yield	Standard error per plot
1945	32.7	2.36 or 7.2%, 7 d.f.
1946	43.4	2.33 or 5.4%, 7 d.f.
1947	31.2	

	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
		Straw: cwt. per acre							
Ploughing	±1.18					±1.67			
deep-shallow	-0.7	-	-	-1.2	-0.2	0.4	-1.8	-3.1	1.7
Dung	3.3	2.8	3.8	-	-	2.8	3.8	4.3	2.3
Phosphate	-0.1	1.0	-1.2	-0.6	0.4	-	-	-0.6	0.4
Potash	1.7	-0.7	4.1	2.7	0.7	1.2	2.2	-	-
<u>1946</u>									
Ploughing	±1.16					±1.64			
deep-shallow	0.8	-	-	3.2	-1.6	2.5	-0.9	2.6	-1.0
Dung	5.1	7.5	2.7	-	-	6.1	4.1	10.4	-0.2
Phosphate	0.9	2.6	-0.8	1.9	-0.1	-	-	0.4	1.4
Potash	1.1	2.9	-0.7	6.4	-4.2	0.6	1.6	-	-
<u>1947</u>									
Ploughing									
deep-shallow	2.4	-	-	2.3	2.5	1.8	3.0	3.4	1.4
Dung	1.7	1.6	1.8	-	-	0.8	2.6	1.2	2.2
Phosphate	-0.8	-1.4	-0.2	-1.7	0.1	-	-	-0.4	-1.2
Potash	0.8	1.8	-0.2	0.3	1.3	1.2	0.4	-	-

N



X  
8

Wheat  
Straw: cwt. per acre

Bc/1.16

Hay: cwt. per acre - Residual effects

	1946	1947
Mean yield	82.2	54.2
Standard error per plot	3.54 or 4.3% (6 d.f.)	2.82 or 5.2% (4 d.f.)

Responses to treatments

	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
<u>1946</u>									
Ploughing	±1.77	-	-	-2.9	1.1	±2.519	-3.7	-1.9	0.1
deep-shallow	-0.9	-	-	-2.9	1.1	1.9	-3.7	-1.9	0.1
Dung	3.8	1.8	5.8	-	-	3.4	4.2	3.1	4.5
Phosphate	1.3	4.1	-1.5	0.9	1.7	-	-	-1.5	4.1
Potash	1.5	0.5	2.5	0.8	2.2	-1.3	4.3	-	-
<u>1947</u>									
Ploughing	±1.41					±1.99			
deep-shallow	0.5	-	-	-1.7	2.7	-1.4	2.4	2.0	-1.0
Dung	-1.0	-3.2	1.2	-	-	-1.3	-0.7	-1.1	-0.9
Phosphate	0.7	-1.2	2.6	0.4	1.0	-	-	1.2	0.2
Potash	1.7	3.2	0.2	1.6	1.8	2.2	1.2	-	-

N



Bc/1.18

Potatoes

Ware tubers: tons per acre

	Mean yield	Standard errors	
		per whole plot	per split plot
1944	10.82	0.863 or 8.0%, 9 d.f.	1.10 or 9.9%, 7 d.f.
1945	11.01	0.917 or 8.3%, 7 d.f.	0.531 or 4.8%, 7 d.f.
1946	11.30	0.640 or 5.7%, 6 d.f.	1.08 or 9.4%, 7 d.f.
1947	5.66	0.538 or 9.5%, 4 d.f.	0.397 or 6.8%, 7 d.f.

Responses to treatments

	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
<u>1944</u>									
Ploughing	±0.43					±0.61			
deep-shallow	0.17	-	-	-0.01	0.35	-0.69	1.03	0.26	0.08
Dung	1.27	1.09	1.45	-	-	1.29	1.25	1.29	1.25
Phosphate	0.38	-0.48	1.24	0.40	0.36	-	-	0.33	0.43
Potash	1.16	1.25	1.07	1.18	1.14	1.11	1.21	-	-
<u>1945</u>									
Ploughing	±0.46					±0.65			
deep-shallow	1.44	-	-	1.72	1.16	2.30	0.58	1.70	1.18
Dung	3.29	3.57	3.01	-	-	3.18	3.40	3.99	2.59
Phosphate	0.49	1.35	-0.37	0.38	0.60	-	-	-0.10	1.08
Potash	1.09	1.35	0.83	1.79	0.39	0.50	1.68	-	-
<u>1946</u>									
Ploughing	±0.32					±0.45			
deep-shallow	0.86	-	-	0.41	1.31	1.17	0.55	0.27	1.45
Dung	1.46	1.01	1.91	-	-	1.64	1.28	1.12	1.80
Phosphate	0.32	0.63	0.01	0.50	0.14	-	-	-0.23	0.87
Potash	0.69	0.10	1.28	0.35	1.03	0.14	1.24	-	-
<u>1947</u>									
Ploughing	±0.27					±0.38			
deep-shallow	0.04	-	-	0.01	0.07	0.34	-0.26	-0.46	0.54
Dung	1.64	1.61	1.67	-	-	1.61	1.67	2.41	0.87
Phosphate	0.16	0.46	-0.14	0.13	0.19	-	-	0.11	0.21
Potash	1.05	0.55	1.55	1.82	0.28	1.00	1.10	-	-



Deep Cultivation Rotation Experiment

Wheat

	Mean yield	Standard error per plot
Grain: cwt. per acre		
1946	29.0	3.56 or 12.3%, 13 d.f.
1947	26.8	2.25 or 8.4%, 4 d.f.
Straw: cwt. per acre		
1946	48.0	7.43 or 15.5%, 13 d.f.
1947	32.3	

Responses to treatments

1946		Grain		Straw			
Response to deep ploughing (deep-shallow)		2.2(±1.78)		1.1(±3.71)			
1947		Dung		Phosphate		Potash	
Residual Effects	Mean	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.

Grain: cwt. per acre

	±1.12			±1.59			
Dung	1.5	-	-	2.1	0.9	1.7	1.3
Phosphate	-0.9	-0.3	-1.5	-	-	-2.9	1.1
Potash	-0.1	0.1	-0.3	-2.1	1.9	-	-

Straw: cwt. per acre

Dung	3.2	-	-	3.7	2.7	3.6	2.8
Phosphate	-0.9	-0.4	-1.4	-	-	-3.9	2.1
Potash	-0.5	-0.1	-0.9	-3.5	2.5	-	-

There was no test of deep ploughing in this year.



Bc/1.20

Potatoes  
Percentage Ware

	Mean	Standard errors	
		per whole plot	per split plot
1944	78.1	1.07, 9 d.f.	1.43, 7 d.f.
1945	96.3	0.404, 5 d.f.	0.310, 7 d.f.
1946	95.3	1.17, 7 d.f.	1.87, 7 d.f.

Responses to treatments

	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
<u>1944</u>									
Ploughing									
deep-shallow	0.6	-	-	0.7	0.5	-0.9	2.1	1.6	-0.4
Dung	2.6	2.7	2.5	-	-	1.4	3.8	3.0	2.2
Phosphate	-3.0	-4.5	-1.5	-4.2	-1.8	-	-	-6.1	0.1
Potash	-2.4	-1.4	-3.4	-2.0	-2.8	-5.5	0.7	-	-
<u>1945</u>									
Ploughing	±0.20								
deep-shallow	1.0	-	-	1.2	0.8	0.9	1.1	1.0	1.0
Dung	0.5	0.7	0.3	-	-	0.6	0.4	0.7	0.3
Phosphate	-0.5	-0.6	-0.4	-0.4	-0.6	-	-	-0.4	-0.6
Potash	0.6	0.6	0.6	0.8	0.4	0.7	0.5	-	-
<u>1946</u>									
Ploughing	±0.58								
deep-shallow	0.5	-	-	0.5	0.5	0.8	0.2	1.0	0.0
Dung	-0.4	-0.4	-0.4	-	-	0.3	-1.1	-0.2	-0.6
Phosphate	-1.6	-1.3	-1.9	-0.9	-2.3	-	-	-1.7	-1.5
Potash	0.7	1.2	0.2	0.9	0.5	0.6	0.8	-	-
<u>1947</u>									
Ploughing									
deep-shallow	-0.3	-	-	-0.8	0.2	-0.4	-0.2	-0.7	0.1
Dung	2.2	1.7	2.7	-	-	2.1	2.3	3.6	0.8
Phosphate	-0.8	-0.9	-0.7	-0.9	-0.7	-	-	-1.0	-0.6
Potash	±2.2	±1.8	±2.6	±3.6	±0.8	2.0	2.4	-	-

X  
all five

N



Deep Cultivation Rotation Experiment

Potatoes

Ware tubers: tons per acre

Time of application of mineral fertilizers

	Superphosphate			Potash			Mean
	None	Ploughed in	In seed bed	None	Ploughed in	In seed bed	
Standard errors	(a)	(b) & (c)		(a)	(b) & (c)		
<u>1944</u>							
Shallow	10.98	11.01	9.97	10.11	11.33	11.38	10.75
Deep	10.29	10.89	12.16	10.37	10.98	11.90	10.91
No dung	9.99	10.24	10.52	9.59	10.56	11.00	10.18
Dung	11.28	11.66	11.61	10.89	11.76	12.29	11.46
Mean	10.64	10.95	11.06	10.24	11.16	11.64	10.82
<u>1945</u>							
Shallow	9.62	10.76	11.17	9.61	10.86	11.07	10.29
Deep	11.92	11.16	11.93	11.32	11.47	12.82	11.73
No dung	9.18	9.22	9.88	8.47	9.94	10.58	9.37
Dung	12.36	12.69	13.22	12.46	12.39	13.32	12.66
Mean	10.77	10.96	11.55	10.47	11.16	11.95	11.01
<u>1946</u>							
Shallow	10.56	10.87	11.51	10.83	10.10	11.75	10.88
Deep	11.73	11.21	12.27	11.10	12.22	12.53	11.73
No dung	10.33	10.06	11.59	10.40	10.04	11.46	10.57
Dung	11.96	12.03	12.18	11.52	12.28	12.81	12.03
Mean	11.14	11.04	11.89	10.96	11.16	12.14	11.30
<u>1947</u>							
Shallow	5.40	5.47	6.26	5.36	5.36	6.46	5.63
Deep	5.75	5.20	6.01	4.90	5.71	7.19	5.68
No dung	4.77	4.57	5.23	3.93	5.04	6.45	4.84
Dung	6.38	6.11	7.04	6.34	6.03	7.20	6.48
Mean	5.58	5.34	6.13	5.13	5.54	6.82	5.66
Standard errors:	(a)	(b)		(c)			
	1944	0.43		0.55	0.58		
	1945	0.46		0.27	0.50		
	1946	0.32		0.54	0.50		
	1947	0.27		0.20	0.30		

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



Bc/1.21

X

Deep Cultivation Rotation Experiment

Potatoes  
Percentage ware

Time of application of mineral fertilizers

	Superphosphate			Potash			Mean
	None	Ploughed In seed in bed		None	Ploughed In seed in bed		
	(a)	(b) & (c)		(a)	(b) & (c)		
<u>Standard errors:</u>							
<u>1944</u>							
Shallow	80.0	76.3	74.8	78.5	76.9	77.48	77.8
Deep	79.2	77.4	78.1	80.2	76.2	77.4	78.5
No dung	77.8	76.4	75.7	77.8	75.7	76.1	76.8
Dung	81.5	77.3	77.2	80.8	77.4	78.6	79.4
Mean	79.6	76.8	76.4	79.3	76.6	77.4	78.2
<u>1945</u>							
Shallow	96.0	95.3	95.6	95.4	95.6	96.4	95.7
Deep	97.0	96.8	96.4	96.5	96.8	97.3	96.8
No dung	96.2	95.8	95.9	95.6	96.0	96.9	96.1
Dung	96.8	96.2	96.2	96.3	96.5	96.8	96.5
Mean	96.5	96.0	96.0	96.0	96.2	96.8	96.3
<u>1946</u>							
Shallow	95.7	94.5	94.3	94.5	95.9	95.3	95.0
Deep	96.5	95.6	93.6	95.5	95.9	95.4	95.6
No dung	95.9	96.0	94.2	95.0	95.9	96.0	95.5
Dung	96.2	94.1	93.8	94.9	96.0	94.6	95.1
Mean	96.0	95.0	94.0	95.0	96.0	95.3	95.3
<u>1947</u>							
Shallow	93.8	93.2	92.5	92.4	93.9	94.6	93.3
Deep	93.4	92.6	92.7	91.7	94.0	94.6	93.0
No dung	92.5	91.8	91.4	90.2	93.3	94.4	92.1
Dung	94.6	94.0	93.8	93.9	94.6	94.8	94.3
Mean	93.6	92.9	92.6	92.1	93.9	94.6	93.2

77.4

Standard errors:	(a)	(b)	(c)
1944	0.54	0.72	0.74
1945	0.20	0.16	0.23
1946	0.58	0.94	0.88

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

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Bc/1.22

Spring Oats - Residual Effects

1945	16.8	1.12 or 6.6%, 6 d.f.	28.0	1.21 or 4.3%, 7 d.f.
1946	41.9	1.86 or 4.4%, 5 d.f.	57.3	2.72 or 4.8%, 5 d.f.
1947	28.9	1.97 or 6.8%, 4 d.f.	35.3	

Responses to treatments

	Mean	Ploughing		Dung		Phosphate		Potash	
		Shallow	Deep	Abs.	Prcs.	Abs.	Prcs.	Abs.	Prcs.
Grain: cwt. per acre									
<u>1945</u>									
Ploughing	±0.56				±0.79				
deep-shallow	-0.9	-	-	-0.3	-1.5	-1.8	0.0	-0.9	-0.9
Dung	1.6	2.2	1.0	-	-	1.4	1.8	0.8	2.4
Phosphate	±0.6	-0.3	1.5	0.4	0.8	-	-	1.2	0.0
Potash	0.3	0.3	0.3	-0.5	1.1	0.9	-0.3	-	-
<u>1946</u>									
Ploughing	±0.93				±1.32				
deep-shallow	0.6	-	-	2.0	-0.8	1.1	0.1	-0.9	2.1
Dung	2.5	3.9	1.1	-	-	3.4	1.6	4.4	0.6
Phosphate	1.8	2.3	1.3	2.7	0.9	-	-	2.6	1.0
Potash	-0.3	-1.8	1.2	1.6	-2.2	0.5	-1.1	-	-
<u>1947</u>									
Ploughing	±0.98				±1.39				
deep-shallow	-1.5	-	-	-0.6	-2.4	-1.8	-1.2	-0.8	-2.2
Dung	80.8	1.7	-0.1	-	-	2.5	-0.9	2.2	-0.6
Phosphate	1.0	0.7	1.3	2.7	-0.7	-	-	0.8	1.2
Potash	-0.6	0.1	-1.3	0.8	-2.0	-0.8	-0.4	-	-
Straw: cwt. per acre									
<u>1945</u>									
Ploughing	±0.60				±0.86				
deep-shallow	-0.1	-	-	0.8	-1.0	0.4	-0.6	-0.2	0.0
Dung	1.5	2.4	0.6	-	-	0.3	2.7	1.4	1.6
Phosphate	-1.6	-1.1	-2.1	-2.8	-0.4	-	-	-0.1	-3.1
Potash	1.2	1.1	1.3	1.1	1.3	2.7	-0.3	-	-
<u>1946</u>									
Ploughing	±1.36				±1.92				
deep-shallow	0.2	-	-	0.3	0.1	-1.5	1.9	0.8	-0.4
Dung	6.5	6.6	6.4	-	-	9.0	4.0	7.9	5.1
Phosphate	2.6	0.9	4.3	5.1	0.1	-	-	2.0	3.2
Potash	-0.3	0.3	-0.9	1.1	-1.7	-0.9	0.3	-	-
<u>1947</u>									
Ploughing									
deep-shallow	-2.4	-	-	-1.7	-3.1	-2.3	-2.5	-2.8	-2.0
Dung	1.4	2.1	0.7	-	-	2.1	0.7	2.8	0.0
Phosphate	-0.6	-0.5	-0.7	0.1	-1.3	-	-	-0.7	-0.5
Potash	0.5	0.1	0.9	1.9	-0.9	0.4	0.6	-	-