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Report for 1927-28

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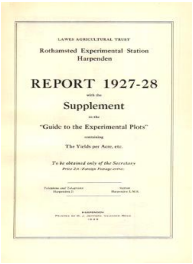
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REPORT 1927-28
Supplement
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The Yields per Acre, etc.
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Experiments at Rothamsted

Rothamsted Research

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Second Series: Replicated Experiments.

EXPERIMENTS ON CEREALS.

Barley: Comparison of Nitrogenous Fertilisers, Sulphate and Muriate of Ammonia, Urea and Cyanamide, each used in single and double dressings.

Effect of Superphosphate.

Great Harpenden, 1927.

NE

A				B			
2U P	2M P	2C	0(*b*)	0(*a*)	0(*b*) P	2S P	1S P
1M P	1C	2S	1S	1U	2C P	2U	2M
0(*a*) P	0(*d*) P	1U P	0(*c*)	1M	1C P	0(*c*) P	0(*d*)
2U	0(*a*)	0(*d*)	2(*c*) P	0(*a*) P	2C	2S	0(*d*) P
0(*b*) P	0(*c*) P	1S P	1M	1S	2U P	0(*b*)	1M P
1U	1C P	2S P	2M	2M P	1C	1U P	0(*c*)
C				D			

System of Replication.—4 randomised blocks of 12 plots each.

Area of plot $\frac{1}{40}$ acre.

O.—No Nitrogen.

U, C, S, M.—Nitrogen in form of Urea, Cyanamide, Sulphate and Muriate of Ammonia.

1, 2.—Single and double dressings at the rate of 1 and 2 cwts. per acre. S/Amm or its equivalent.

P.—Superphosphate at the rate of 3 cwts. per acre.

Manures applied March 28-29.

Barley sown April 4-6, harvested Sept. 6-7.

Actual Weights in lb.—Total Grain.

Blocks.	0(*a*)	0(*b*)	0(*c*)	0(*d*)	1U	1C	1S	1M	2U	2C	2S	2M
A	35.5	23.25	32.5	39.125	42.0	45.625	35.125	53.875	60.0	46.625	36.625	67.75
B	33.5	37.125	31.25	29.875	42.875	51.5	58.875	45.75	62.25	55.375	67.0	65.25
C	34.375	43.0	34.625	30.25	50.125	53.625	44.875	46.0	59.375	49.375	58.0	67.75
D	30.5	32.375	33.375	28.5	48.563	51.125	51.625	56.625	64.0	49.5	50.0	63.0

Actual Weights in lb.—Total Straw.

A	45.5	29.0	43.5	45.5	56.5	50.0	46.5	59.5	69.0	52.0	52.0	73.5
B	41.0	45.5	47.5	46.5	50.0	56.0	69.5	49.5	70.5	66.0	72.0	80.5
C	40.5	51.0	51.5	36.5	55.0	59.0	56.5	53.0	66.0	57.0	70.0	74.5
D	38.5	48.0	46.5	34.5	63.0	68.5	55.5	61.5	67.0	57.0	55.0	74.0

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Barley, 1927 (cont.)

(1) Summary of Average Yields, Separate Treatments.

Average Yield in cwts. per acre.		No Nitrogen.	Single Dressing.				Double Dressing.				Stand'rd Error.
			S/Amm.	M/Amm.	Cyan.	Urea.	S/Amm.	M/Amm.	Cyan.	Urea.	
Grain	without phosphate	11.1	15.5	16.4	17.3	16.6	15.5	23.8	17.2	21.7	1.21
	with phosphate	12.5	18.5	19.7	18.8	16.2	22.3	23.3	18.7	22.1	
Straw	without phosphate	14.8	18.2	18.3	21.2	18.8	19.1	27.7	19.5	24.4	1.50
	with phosphate	16.0	22.5	21.6	20.5	21.3	25.4	26.3	22.0	24.3	

NOTE.—The phosphate differences are increased in the case of the sulphate and cyanamide plots, and decreased in the case of the muriate and urea plots, by soil differences.

(2) Summary of Significant Results.

Average of all Nitrogenous Treatments.	Without Super.	With Super.	Mean.	Standard Error.
Grain, cwts. per acre ...	15.7	17.5	16.6	0.35
Grain, per cent. ...	94.7	105.3	100.0	2.10
Straw, cwts. per acre ...	18.9	20.7	19.8	0.43
Straw, per cent. ...	95.4	104.6	100.0	2.19

Average of plots with and without Super.		Grain, cwts. per acre.				Grain, per cent.			
		S/Amm.	M/Amm.	Cyan.	Urea.	S/Amm.	M/Amm.	Cyan.	Urea.
Quantity of Nitrogen	0	11.8				71.2			
	1	17.0	18.1	18.0	16.4	102.5	108.9	108.7	98.8
	2	18.9	23.5	17.9	21.9	113.9	142.0	108.1	132.2
		Straw, cwts. per acre.				Straw, per cent.			
Quantity of Nitrogen	0	15.4				77.9			
	1	20.4	20.0	20.8	20.0	103.9	98.2	103.2	102.3
	2	22.2	27.0	20.7	24.3	113.4	137.8	105.7	124.1

Standard Errors.—Grain 0.85 cwts. or 5.15 per cent.; Straw 1.06 cwts. or 5.37 per cent.

Significant response to Superphosphate in both Grain and Straw. Big response to single and double nitrogen. No differences between the equivalent nitrogenous manures appear in the single dressing, but the double dressing gives no further increase with Cyanamide and very little with sulphate.

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Barley : Comparison of Nitrogenous Fertilisers, Sulphate and Muriate of Ammonia, Urea and Cyanamide, each used in single and double dressings.

Effect of Superphosphate.

Long Hoos, 1928.

W.N.W.

A															B							
1S	0 (a)	1U	0 (c)	0 (b)	1C	2C	2U	2M	1M	2S	0 (d)	1M	2S	2M	1S	0 (c)	2C	0 (a)	0 (b)	0 (d)	1U	1C	2U
P			P		P	P				P	P	P		P		P				P	P		P

C																D							
2M	0 (c)	0 (a)	2U	2C	1U	1C	0 (b)	0 (d)	1M	1S	2S	2U	0 (a)	1M	1S	1U	0 (c)	1C	2S	0 (b)	2C	2M	0 (d)
P	P		P		P			P	P						P		P	P	P		P		P

E																F							
2M	0 (a)	0 (b)	1U	0 (c)	2C	2U	1C	1M	1S	2S	0 (d)	2M	1S	2C	0 (c)	0 (d)	0 (a)	2S	2U	1C	0 (b)	1U	1M
				P	P		P		P	P	P		P	P	P	P		P		P			

G																H							
0	1M	2C	0	2M	1U	0	2S	2U	1S	0	1C	0	1C	2U	1U	0	2M	1S	0	2C	1M	0	2S
P	P		P	P	P			P				P		P	P	P	P				P		

SYSTEM OF REPLICATION.—8 Randomised Blocks of 12 plots each. Area of plot $\frac{1}{40}$ acre. 0=No Nitrogen ; U, C, S, M= Nitrogen in form of Urea, Cyanamide, Sulphate and Muriate of Ammonia ; 1, 2=Single and double dressings at the rate of 1 and 2 cwt. per acre, S/Amm. or its equivalent ; P=Superphosphate at the rate of 3 cwt. per acre. Variety : Spratt Archer. Manures applied March 28. Barley sown March 28, harvested August 24.

Actual Weights in lb.—Total Grain.

	Without Phosphate.		With Phosphate.									
Block.	0(a)	0(b)	0(c)	0(d)	1U	1C	1S	1M	2U	2C	2S	2M
A	47.5	43.5	47.0	32.75	53.25	49.0	64.5	44.25	58.25	58.5	45.75	46.25
B	29.5	32.5	28.0	32.75	41.25	41.25	36.25	37.5	38.0	47.5	35.0	43.0
C	36.75	38.25	53.5	42.25	48.75	43.0	53.5	56.75	37.0	45.5	57.25	54.0
D	42.0	44.0	43.25	40.75	56.0	48.25	53.75	49.5	56.5	52.75	56.0	49.5
E	44.75	45.75	49.25	36.75	57.5	57.75	56.25	54.5	63.75	66.5	55.75	65.5
F	35.5	40.0	40.5	41.0	43.0	46.5	45.25	45.5	45.25	51.5	45.5	54.5
G	40.0	35.0	44.0	36.25	50.0	42.75	45.0	51.25	53.0	47.0	46.5	53.75
H	39.25	40.75	37.25	41.25	42.75	46.0	43.5	48.0	49.75	51.0	46.0	53.5

Actual Weights in lb.—Total Straw.

	Without Phosphate.		With Phosphate.									
Block.	0(a)	0(b)	0(c)	0(d)	1U	1C	1S	1M	2U	2C	2S	2M
A	76.5	65.5	71.0	64.75	85.75	81.0	106.5	90.25	111.25	107.0	100.75	112.25
B	53.5	59.0	51.0	61.75	67.25	68.25	75.75	78.0	77.5	93.0	87.5	83.0
C	58.75	58.25	90.5	64.25	78.25	69.5	80.0	86.75	61.0	76.0	94.25	92.0
D	55.5	66.0	68.75	59.25	91.5	71.25	86.25	77.0	88.5	86.75	92.5	85.0
E	79.25	70.75	74.75	74.75	89.0	97.25	96.75	89.5	97.25	99.5	104.25	112.0
F	59.5	76.0	76.0	67.5	89.5	93.0	97.25	86.5	96.25	106.5	94.0	109.5
G	81.0	70.5	84.0	67.25	107.0	80.75	90.5	105.75	106.25	99.5	107.0	106.25
H	67.75	69.75	65.75	76.25	88.25	84.5	87.0	88.0	97.5	89.5	92.5	112.0

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Barley, 1928 (cont.)

(1) Summary of Average Yields, Separate Treatments.

Average Yield in cwt. per acre.		No Nitrogen	Single Dressing.				Double Dressing.				Mean.	Standard Error.
			S/Am.	M/Am.	Cyan.	Urea.	S/Am.	M/Am.	Cyan.	Urea.		
Grain	without phosphate	14.2	15.9	17.3	15.4	18.7	16.5	19.3	17.1	20.0	16.4	0.84
	with phosphate	14.4	19.6	17.3	18.0	16.3	18.1	18.2	20.5	15.9	16.8	
Straw	without phosphate	23.8	29.8	30.6	27.1	31.8	34.0	37.4	32.0	35.1	29.4	1.32
	with phosphate	24.9	34.5	32.0	30.6	30.4	35.0	35.1	35.7	30.6	30.3	

NOTE.—The phosphate differences are increased in the case of the sulphate and cyanamide plots, and decreased in the case of the muriate and urea plots, by soil differences.

(2) Summary of Significant Results.

Average of all Nitrogenous Treatments.	Without Super.	With Super.	Mean.	Standard Error.
Grain, cwts. per acre ...	16.4	16.8	16.6	0.24
Grain, per cent. ...	98.8	101.2	100.0	1.46
Straw, cwts. per acre ...	29.4	30.3	29.9	0.38
Straw, per cent. ...	98.5	101.5	100.0	1.28

Average of plots with and without Super.		Grain, cwts. per acre.				Grain, per cent.			
		S/Amm.	M/Amm.	Cyan.	Urea.	S/Amm.	M/Amm.	Cyan.	Urea.
Quantity of Nitrogen	0	14.3				86.1			
	1	17.8	17.3	16.7	17.5	107.0	104.1	100.7	105.5
	2	17.3	18.7	18.8	17.9	104.3	112.9	113.0	107.9
Mean ...		16.6				100.0			
Standard error		0.59				3.58			
		Straw, cwts. per acre.				Straw, per cent.			
Quantity of Nitrogen	0	24.4				81.7			
	1	32.1	31.3	28.8	31.1	107.6	104.9	96.5	104.1
	2	34.5	36.2	33.8	32.8	115.5	121.4	113.3	110.0
Mean ...		29.9				100.0			
Standard error		0.94				3.14			

Significant response in both grain and straw to the single dressing, and a further response to the double dressing in the case of muriate and cyanamide. There are no differences between the equivalent nitrogenous manures in the case of grain, but with straw the cyanamide plots are significantly below the sulphate and muriate plots. The response to superphosphate is not significant, but there is evidence that it improved the yield of straw, and that the muriate plots responded better than the urea plots.

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Nitrogenous Fertilisers as Top Dressings :

Sulphate of ammonia.
Muriate of ammonia.

Each in single and double dressings (1 and 2 cwt. per acre Solidus Amm.).
Applied : (*a*) Early (April 11th) ; (*b*) Late (May 30th).

Wheat : Great Knott, 1927.

NW

P | Q

1ML	2ME	0A	2ME	0A	0B
0B	2SL	1SE	1ML	1SE	2SL
1ME	0C	2SE	1ME	1SL	0C
0D	2ML	1SL	2ML	0D	2SE
1SE	2SL	0A	0A	2SL	1ML
0B	1ML	2ME	2ME	1SE	0B
0C	2ML	1SL	1SL	2SE	2ML
1ME	2SE	0D	0C	0D	1ME

R | S

SYSTEM OF REPLICATION.—48 plots in 8 randomised blocks of 6 plots each.

Plots $\frac{1}{40}$ acre.

0.—No top dressing.

1, 2.—Dressing of 1 and 2 cwt. Sulphate of Ammonia (S) or equivalent Muriate of Ammonia (M) per acre.

E.—Early. 50 per cent. plants tillered (April 11).

L.—Late. Shoot number reached maximum (May 30).

Wheat sown Oct. 7, 1926 ; harvested Aug. 24-25, 1927.

Actual Weights in lb.—Total Grain.

Blocks.	0A	0B	0C	0D	1SE	1SL	1ME	1ML	2SE	2SL	2ME	2ML
P	71.375	63.5	47.625	42.5	61.25	56.5	57.0	71.125	59.875	68.125	70.25	58.375
Q	79.0	67.25	50.375	68.0	74.5	54.375	47.375	62.5	74.875	59.125	71.0	76.75
R	71.5	56.0	65.375	71.25	71.75	63.875	70.125	71.5	76.875	75.25	86.5	72.375
S	64.75	82.5	84.0	76.125	89.5	89.125	89.75	90.625	94.375	97.0	72.875	86.25

Actual Weights in lb.—Total Straw.

P	118.5	118.5	107.0	88.0	147.0	123.5	118.5	135.5	124.5	132.0	147.0	120.0
Q	137.0	126.5	98.0	118.0	131.0	107.0	106.5	123.0	144.5	113.0	147.5	131.5
R	133.0	126.0	129.5	154.5	132.5	152.5	160.5	147.5	174.0	139.5	169.5	155.5
S	122.5	168.5	161.5	143.0	165.0	161.5	157.0	154.0	181.5	163.0	155.5	143.0

(1) Summary of Average Yields, Separate Treatments.

Average Yield per acre.	No Top Dressing	Single S/Amm. early.	Single S/Amm. late.	Single M/Amm. early.	Single M/Amm. late.	Double S/Amm. early.	Double S/Amm. late.	Double M/Amm. early.	Double M/Amm. late.
Grain,cwt.	23.7	26.5	23.6	23.6	26.4	27.3	26.7	26.8	26.2
Straw,cwt.	45 8	51.4	48.6	48.4	50.0	55.8	48.9	55.3	49.1

ERRATUM :

On line 4 for "Solidus Amm." read "Sulphate of Ammonia."

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Wheat, 1927 (cont.)

(2) Summary of Significant Results.

Average Yield per acre.	O	Single.	Double.	Mean.	Standard Error. (a)	Early Sulphate.	Early Muriate.	Late Sulphate.	Late Muriate.	Single Early.	Double Early.	Single Late.	Double Late.	Standard Error. (b).
Grain, cwt. ...	23.7	25.0	26.8	25.2	0.73	26.9	25.2	25.2	26.3	25.1	27.1	25.0	26.5	1.03
Grain, per cent. ...	94.1	99.4	106.4	100.0	2.90	107.0	100.2	100.0	104.6	99.6	107.6	99.3	105.3	4.09
Straw, cwt. ...	45.8	49.6	52.3	49.2	1.05	53.6	51.9	48.8	49.6	49.9	55.5	49.3	49.0	1.49
Straw, per cent. ...	93.0	100.8	106.2	100.0	2.14	108.9	105.4	99.1	100.7	101.4	112.9	100.2	99.6	3.02

(a) Refers to means of 16 plots.
(b) Refers to means of 8 plots.

Significant response to double top dressing in the grain, and to both dressings in the straw. With straw the double dressing produced no further increase when applied late.

Wheat : Pastures Field, 1928.

S.E.

Yeoman II **Squareheads Master** **Swedish Iron**

A 1st								D 3rd								G 3rd							
4	2	8	5	6	1	7	3	6	7	3	8	4	1	5	2	4	5	8	2	7	3	6	1

B 2nd								E 2nd								H 1st							
7	8	2	3	4	1	6	5	6	5	1	4	8	2	3	7	1	6	2	4	8	7	3	5

C 3rd								F 1st								J 2nd							
5	6	4	3	8	7	1	2	4	3	2	8	7	6	5	1	8	7	3	1	6	2	5	4

System of Replication : 9 randomised blocks (3 to each variety) of 8 plots each.
Plots $\frac{1}{40}$ acre.
Sulphate of Ammonia at the rate of 1 cwt. per acre. Muriate of Ammonia equivalent to Sulphate.
1, 2=No Top Dressing.
3=Sulphate Early.
4=Muriate Early.
5=Sulphate Late.
6=Muriate Late.
7=Sulphate Early and Late.
8=Muriate Early and Late.
7 and 8 thus had double the amount of Nitrogen given to 3, 4, 5 and 6.
1st, 2nd, 3rd : Time of application of Top Dressing.
1st Early : Applied March 7.
2nd Early : Applied March 14.
3rd Early : Applied March 21st.
Late Dressings applied 6 weeks after Early.
Wheat sown October 21, 1927; harvested August 17, 1928.

Actual Weights in lb.—Total Grain.

Variety.	Block.	Time.	1	2	3	4	5	6	7	8	Average in cwt. per acre.	
Yeoman II.	A	1st	77.25	80.25	94.75	87.0	82.0	86.0	87.75	90.75	30.6	27.7
	B	2nd	79.0	79.5	80.0	80.0	75.5	66.0	83.25	85.25	28.1	
	C	3rd	60.75	68.5	60.75	64.75	92.0	86.75	50.75	65.75	24.6	
Squareheads Master	D	3rd	79.75	67.5	60.75	74.5	75.75	72.0	57.25	77.0	25.2	24.6
	E	2nd	61.25	67.0	73.75	66.75	62.75	69.25	77.75	79.75	24.9	
	F	1st	60.5	55.5	50.5	66.5	75.75	75.25	71.25	74.5	23.6	
Swedish Iron	G	3rd	58.25	64.0	63.25	88.75	83.75	60.25	64.0	79.75	25.1	22.9
	H	1st	48.0	49.25	55.75	50.0	68.0	69.0	62.25	61.25	20.7	
	J	2nd	55.25	58.5	59.5	76.75	68.25	64.5	66.5	66.5	23.0	
Average in cwt. per acre ...			23.2		23.8	26.0	27.1	25.8	24.6	27.0	25.1	

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Actual Weights in lb.—Total Straw.

Variety.	Block	Time.	1	2	3	4	5	6	7	8	Average in cwt. per acre.	
Yeoman II.	A	1st	96.75	97.75	125.25	114.0	108.5	114.0	114.25	116.25	39.6	35.7
	B	2nd	107.0	96.0	100.0	99.5	97.0	74.5	112.75	111.25	35.6	
	C	3rd	67.25	89.5	89.25	75.25	133.0*	117.25	60.25	84.25	32.0	
Squareheads Master	D	3rd	95.75	97.0	92.25	101.5	100.25	105.0	95.75	139.0	36.9	35.2
	E	2nd	84.75	92.0	119.25	97.25	87.75	101.75	100.75	114.25	35.6	
	F	1st	88.5	73.0	67.0*	100.5	107.25	94.75	107.75	103.0	33.1	
Swedish Iron	G	3rd	71.25	70.0	81.75	102.25	107.25	77.75	103.0	107.25	32.2	28.8
	H	1st	48.5	50.25	68.75	52.5	87.5	77.0	85.25	76.75	24.4	
	J	2nd	71.0	73.0	76.5	97.25	96.25	86.5	84.5	80.5	29.7	
Average in cwt. per acre			29.2		32.5	33.3	36.7	33.7	34.3	37.0	33.2	

* Estimated Figures.

(1) Summary of Average Yields, Separate Treatments.

	Variety.	No Top Dressing.	Sulphate of Amm'nia Early.	Muriate of Amm'nia Early.	Sulphate of Amm'nia Late.	Muriate of Amm'nia Late.	Sulphate of Amm'nia Early and Late.	Muriate of Amm'nia Early and Late.
Grain, cwt. per acre	Yeoman II ...	26.5	28.0	27.6	29.7	28.4	26.4	28.8
	Squareheads Master	23.3	22.0	24.7	25.5	25.8	24.6	27.5
	Swedish Iron ...	19.8	21.2	25.7	26.2	23.1	22.9	24.7
Straw, cwt. per acre	Yeoman II ...	33.0	37.4	34.4	40.3	36.4	34.2	37.1
	Squareheads Master	31.6	33.2	35.6	35.1	35.9	36.2	42.4
	Swedish Iron ...	22.9	27.0	30.0	34.6	28.7	32.5	31.5

(2) Summary of Significant Results, averaging varieties.

Average Yield per acre.	No Top Dressing.	Early Top Dressing.	Late Top Dressing.	Early and Late Top Dressing.	Mean.	Standard Error.
Grain, cwt. ...	23.2	24.9	26.4	25.8	25.1	0.74
Grain, per cent.	92.5	99.2	105.4	102.9	100.0	2.94
Straw, cwt. ...	29.2	32.9	35.2	35.6	33.2	1.22
Straw, per cent.	87.7	99.1	105.9	107.3	100.0	3.67

The late dressing produced a significant response in grain and straw, while the difference between the muriate and sulphate plots is not significant. There is evidence that the straw responded to some extent to the early dressing. The experiment does not permit of valid conclusions being drawn as to differences between varieties nor between the three dates of the early dressing.

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Barley : Nitrogenous Top Dressing, Sulphate and Muriate of Ammonia.

Great Harpenden, 1927.

S.S.W.

	Plot 1.	Plot 2.	Plot 3.	Plot 4.	Plot 5.	Plot 6.
Area in acres... ...	1.28	2.40	2.12	2.18	2.10	2.16
Yield of grain in lbs.	920	2292	1983	2187	1359	1631
Yield in cwt./acre ...	6.42	8.53	8.35	8.96	5.78	6.74

Barley sown April 4-6 ; harvested September 6-7.
Plots 1 and 5=No manure.
Plots 2 and 4=Sulphate of Ammonia at the rate of 1 cwt. per acre } applied June 10-11.
Plots 3 and 6=Muriate of Ammonia equivalent of above }
No straw weights taken.

Summary of Results.

Average Yield of Grain.	Control.	Muriate.	Sulphate.	Mean.
lb. per acre	682.94	845.24	979.10	835.76
cwt. per acre	6.10	7.55	8.74	7.46
Per cent.	81.7	101.1	117.2	100.0

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Barley : Nitrogenous Top Dressing, Nitrochalk.

Long Hoos, 1928.

E.S.E.

I.				II.				III.				IV.			
B	A	C	D	C	B	D	A	A	C	D	B	D	A	B	C

TREATMENTS :
A = No Top Dressing.
B = Early Top Dressing of Nitrochalk, May 22nd.
C = Middle Top Dressing of Nitrochalk, June 4th.
D = Late Top Dressing of Nitrochalk, June 19th.
Rate of application = 2 cwt. per acre.

SYSTEM OF REPLICATION :—4 randomised blocks of 4 plots each.
Area of each plot = $\frac{1}{40}$ acre.
Barley sown, March 28 ; harvested August 24, 1928.
Variety : "Standwell."

Actual Yields in lb.

Block.	Grain.				Straw.			
	A	B	C	D	A	B	C	D
I. ...	36.0	35.5	39.0	41.25	91.0	96.5	94.0	90.75
II. ...	43.5	41.75	39.25	39.0	85.5	88.25	82.75	77.5
III. ...	45.5	51.5	51.75	48.0	73.5	92.5	96.25	77.0
IV. ...	49.0	43.5	54.75	47.75	87.0	79.5	86.25	85.25

Summary of Results.

Average Yield.	No Top Dressing.	Early Top Dressing.	Middle Top Dressing.	Late Top Dressing.	Mean.	Standard Error.
Grain, cwt. per acre	15.5	15.4	16.5	15.7	15.8	0.61
Grain, per cent. ...	98.4	97.5	104.5	99.6	100.0	3.85
Straw, cwt. per acre ...	30.1	31.9	32.1	29.5	30.9	1.11
Straw, per cent. ...	97.4	103.1	103.9	95.6	100.0	3.59
Per cent. Nitrogen in dry matter of grain ...	2.075	2.118	2.110	2.160	2.116	0.0264

No significant response to treatment in grain and straw. Late top dressing gave significantly higher percentage of nitrogen in dry matter of grain than the control.

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POTATOES.

Nitrogenous Fertiliser : Sulphate of Ammonia.
Potassic Fertilisers : Sulphate of Potash.
Muriate of Potash.
30 per cent. Potash Manure Salts.
Each in single and double dressings.

Long Hoos, 1927.

W.N.W

	A		B			C			
	N4 0	N2 0	N2 P4	N2 0	N4 P2	0 0	N2 0	0 P4	N2 M2	
	0 M4	N2 S2	N4 M2	N4 P4	N4 0	N2 S4	N2 M4	N4 S4	0 0	
	N4 S4	0 0	0 P2	0 S2	N2 M2	0 M4	N4 0	N4 S2	0 P2	
	N2 P2	0 S2	N4 0	N2 P2	N4 S2	N4 0	N4 S4	N2 S2	0 M2	
D	N4 M2	N2 P4	0 S4	N2 P4	N2 0	0 M2	0 P4	N2 0	N2 M4	F
	N4 M4	N2 0	0 0	N4 M4	0 0	0 S4	0 0	N4 0	N4 P2	
	0 0	0 M2	N4 0	N2 0	N2 M4	N4 P4	0 P4	N2 S4	N4 M2	
	0 M4	N2 0	N2 S2	N4 S2	0 P2	N4 0	0 0	0 S2	N4 0	
	N4 P4	N4 P2	N2 S4	N2 M2	0 0	0 S4	N2 P2	N2 0	N4 M4	
		G			H			J		

VARIETY : Arran Comrade.

SYSTEM OF REPLICATION : 9 randomised blocks of 9 plots each.

Area of plot $\frac{1}{40}$ acre.

QUANTITIES : Sulphate of Ammonia at the rate of 2 and 4 cwt. per acre. Potash at the rate of 2 and 4 cwt. per acre as Sulphate or its equivalent as Muriate or Potash Manure Salts.

O = No artificial manure.
N = Nitrogen as Sulphate of Ammonia.
S = Sulphate of Potash.
M = Muriate of Potash.
P = Potash Manure Salts.

All plots had 10 tons F.Y.M. applied May 14-16

Artificials applied May 17-18.

Potatoes planted May 23-25 ; Lifted October 6-24.

Actual Weight in lb.

Nitrogen	Potash	A	B	C	D	E	F	G	H	J
Quantities										
0	0	356.5	382.0	348.5	395.0	366.5	349.5	337.5	411.5	351.5
0	2	365.0	401.0	354.0	357.0	360.5	361.0	345.0	395.5	344.0
0	4	308.5	364.0	335.5	362.5	395.5	319.0	302.0	401.5	333.0
2	0	379.5	379.0	380.5	394.5	409.5	402.5	377.0	446.5	389.5
2	2	421.0	420.0	389.0	404.5	408.5	411.0	467.5	474.0	400.5
2	4	382.5	424.5	409.5	323.5	403.5	369.5	463.5	455.0	405.0
4	0	333.5	413.5	399.0	412.5	428.0	400.5	440.0	411.5	369.0
4	2	430.5	381.0	408.0	440.0	438.5	358.5	388.0	473.0	390.5
4	4	403.0	396.0	436.0	436.5	465.5	412.0	356.5	405.5	436.0

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(1) Summary of Average Yields, Separate Treatments.

Average Yield in tons per acre.		No Nitrogen.			2 cwt. S/Amm.			4 cwt. S/Amm.		
Quality of Potash.		Sulphate	Muriate	P.M.S.	Sulphate	Muriate	P.M.S.	Sulphate	Muriate	P.M.S.
Quantity of Potash in cwt. per acre S/Pot.	0		6.54			7.06			7.16	
	2	6.56	6.35	6.63	7.74	7.64	7.22	7.85	7.51	6.71
	4	6.90	5.80	5.88	7.70	7.35	6.60	7.45	7.96	6.89

Standard Error 0.245 tons.

(2) Summary of Significant Results.

(a) **Effect of Potassium Salts.**

		Average Yield in tons per acre.			Average Yield, per cent.		
		Sulphate.	Muriate.	Potash Manure Salts.	Sulphate.	Muriate.	Potash Manure Salts.
Amount of Potash in cwt. per acre S/Pot. ...	0		6.92			98.9	
	2	7.38	7.16	6.86	105.5	102.3	98.0
	4	7.35	7.04	6.46	105.0	100.5	92.2

Standard Error 0.141 tons, or 2.02 per cent.

(b) **Effect of Sulphate of Ammonia.**

		Average Yield in tons per acre.			Average Yield, per cent.		
		Amount of Nitrogen.			Amount of Nitrogen.		
		0	2	4	0	2	4
Amount of Potash	0	6.54	7.06	7.16	93.5	100.9	102.2
	2	6.51	7.53	7.36	93.0	107.6	105.1
	4	6.19	7.22	7.43	88.5	103.1	106.2

Standard Error 0.141 tons or 2.02 per cent.

Average Yield.	Quantity of S/Am.			Quantity of Potash.			Mean Yield.	(a) Standard Error.	Sulphate.	Muriate.	Potash Manure Salts.	(b) Standard Error.
	0	2	4	0	2	4						
Tons per acre	6.42	7.27	7.32	6.92	7.13	6.95	7.00	0.082	7.37	7.10	6.66	0.100
Per cent. ...	91.7	103.8	104.5	98.9	101.9	99.2	100.0	1.17	105.2	101.4	95.1	1.43

(*a*) Refers to means of 27 plots. (*b*) Refers to means of 18 plots.

The Potash Manure Salts depress the yield slightly in the single dressing and significantly in the double dressing ; a similar but slighter effect appears with Muriate. In both cases the effect is least on the high Nitrogen plots. The Sulphate of Potash causes no depression, although the higher dressing gives no further increase in yield.

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POTATOES.

Nitrogenous Fertiliser : Sulphate of Ammonia.
Potassic Fertiliser : Sulphate of Potash.
Each in single and double dressings.

Superphosphate.

Great Harpenden, 1928.

N.E.

A			B			C		
3O	6P	9O	9P	6P	5O	2O	9P	4O
3P	6O	9P	9O	6O	5P	2P	9O	4P
1O	7O	2O	8O	4O	1O	7O	8P	5P
1P	7P	2P	8P	4P	1P	7P	8O	5O
4O	8P	5O	7O	2P	3O	1P	3O	6P
4P	8O	5P	7P	2O	3P	1O	3P	6O

SYSTEM OF REPLICATION : Experiment laid down as in 1927. The portion harvested consisted of 3 randomised blocks of 9 plots each divided into 2 sub-plots.

Area of whole plot : $\frac{1}{45}$ acre.

O, P=No Phosphate and Superphosphate at the rate of 3 cwt. per acre. Sulphate of Ammonia at the rate of 0, $1\frac{1}{2}$ and 3 cwt. per acre, and Potash at the rate of 0, 1 and 2 cwt. per acre Sulphate of Potash in all combinations. All plots received 10 tons F.Y.M. per acre.

VARIETY : Ally.

Artificial Manures applied April 16-17.

Potatoes planted April 17-19 ; lifted October 19.

Key to Treatments.

Treatment No.	1	2	3	4	5	6	7	8	9
S/Amm. ...	0	$1\frac{1}{2}$	3	0	$1\frac{1}{2}$	3	0	$1\frac{1}{2}$	3
Potash	0	0	0	1	1	1	2	2	2

Actual Weights in lb. Phosphate Sub-plots.

Block.	1	2	3	4	5	6	7	8	9
A	139.0	219.0	200.5	145.0	193.5	260.5	174.5	213.0	246.5
B	197.5	205.0	206.0	182.5	254.5	282.0	143.0	213.5	265.5
C	156.0	229.5	210.0	245.5	226.5	282.5	210.0	229.5	281.5

Actual Weights in lb. No Phosphate Sub-plots.

Block.	1	2	3	4	5	6	7	8	9
A	142.0	197.5	195.5	141.5	205.5	201.0	149.5	185.0	240.0
B	168.5	180.0	210.0	180.5	227.0	256.0	159.0	192.0	224.5
C	144.5	251.5	191.5	247.0	251.0	271.5	182.5	230.0	263.0

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(1) Summary of Average Yields, Separate Treatments.

Tons per acre.		Without Superphosphate.			With Superphosphate.		
		No S/Amm.	1½ cwt. S/Amm.	3 cwt. S/Amm.	No S/Amm.	1½ cwt. S/Amm.	3 cwt. S/Amm.
Quantity of Potash in cwt. per acre S/Pot. ...	0	6.09	8.42	8.00	6.60	8.75	8.26
	1	7.62	9.15	9.76	7.67	9.03	11.05
	2	6.58	8.13	9.74	7.06	8.79	10.63

(2) Summary of Significant Results.

Average Yield.	Without Super.	With Super.	Mean.	Standard Error.
Tons per acre ...	8.17	8.65	8.41	0.11
Per cent. ...	97.1	102.9	100.0	1.29

Average Yields tons per acre.					Per cent.		
		Quantity of S/Amm.			Quantity of S/Amm.		
		0	1½	3	0	1½	3
Quantity of Potash in cwt. per acre S/Pot.	0	6.34	8.59	8.13	75.5	102.2	96.7
	1	7.65	9.09	10.40	91.0	108.2	123.7
	2	6.82	8.46	10.19	81.1	100.6	121.1
		Standard error 0.32 tons			Standard error 3.84 per cent.		

Significant response to all three manures. No further response to the higher dressing of Potash, or to the higher nitrogenous dressing in the absence of Potash.

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SUGAR BEET.

Nitrogenous Fertilisers : Sulphate of Ammonia applied with seed.
Nitrate of Soda as top dressings at rates of 1, 2 and 3 cwt. per acre.
Cyanamide, applied 1 week before sowing at three rates.

Potassic Fertilisers : Muriate of Potash.
Potash Manure Salts.

Spacing of Plants.

Long Hoos, 1927

(a) **Manuring Experiment.**

N.W.

A				B				C			
S, N2 L	C4 K	S, 0 L	C3 K	S, N5 L	O, N3 L	O, 0 K	S, N1 K	C2 K	O, N1 L	S, 0 L	C4 K
S, N3 K	C1 L	O, N1 K	O, N3 L	O, N1 K	S, 0 K	C3 L	C2 L	C1 L	S, N1 K	S, N3 K	O, 0 L
O, 0 L	S, N1 K	C2 L	O, N2 K	O, N2 K	S, N2 K	C1 L	C4 L	O, N2 L	S, N2 K	C3 K	O, N3 L
S, N2 K	S, N3 L	C2 K	C3 L	S, N2 L	O, 0 L	C4 K	S, N3 K	O, N3 K	S, N1 L	S, N3 L	O, N1 K
O, N1 L	O, N2 L	O, N3 K	S, 0 K	S, N1 L	O, N2 L	O, N1 L	S, 0 L	S, N2 L	O, N2 K	O, 0 K	C3 L
O 0 K	C1 K	C4 L	S, N1 L	C2 K	O, N3 K	C1 K	C3 K	C1 K	C2 L	C4 L	S, 0 K
D				E				F			

SYSTEM OF REPLICATION :
Six randomised blocks of 12 plots each.
Area of plot = .024 acre.
O, : No basal dressing.
, O : No top dressing.
S : Basal dressing of 1 cwt. per acre Sulphate of Ammonia.
C (1, 2, 3, 4) : Basal dressings of Cyanamide equivalent to 1, 2, 3 and 4 cwts per acre Sulphate of Ammonia.
, N (1, 2, 3) : Top dressings of Nitrate of Soda equivalent to 1, 2 and 3 cwt. per acre Sulphate of Ammonia.
Each adjoining pair of plots allotted at random to receive 2 cwt. per acre Muriate of Potash (K) or equivalent Potash Manure Salts (L).
All plots had 8 tons per acre (approx.) of London Refuse.
Cyanamide applied June 1. Other Basal Manures June 8-9. Top Dressing August 10. Seed sown June 16. Pulled November 21—December 10.

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Blocks.	Roots—Actual Weights in lb.											
	0,0	C1	S,0	O,N1	O,N2	O,N3	C2	C3	C4	S,N1	S,N2	S,N3
A	153.5	207.25	199.25	193.75	197.25	204.5	216.0	204.75	227.25	208.0	228.0	200.0
B	159.5	177.75	144.5	152.75	149.75	185.5	199.25	202.5	214.5	197.0	178.25	174.5
C	157.75	173.75	159.0	200.75	167.0	183.25	198.75	132.0	200.25	177.75	163.0	164.25
D	203.5	211.25	189.0	229.0	222.75	198.5	243.25	245.25	208.5	217.25	220.25	245.25
E	180.0	147.5	121.0	153.75	197.5	196.25	197.75	165.25	203.75	215.25	211.75	177.0
F	117.5	118.5	108.5	151.25	137.25	151.75	117.0	155.75	112.5	151.75	141.25	152.0
	Tops—Actual Weights in lb.											
A	479.0	542.0	547.0	564.5	646.0	666.5	656.5	584.5	719.5	612.0	831.0	836.0
B	437.0	451.0	415.5	503.0	596.0	715.5	548.5	565.5	649.5	621.5	559.0	734.5
C	455.0	465.0	544.5	664.0	564.0	634.5	578.5	455.0	644.5	596.0	580.0	597.0
D	605.0	566.0	506.0	766.0	737.5	738.5	703.0	716.5	735.0	678.5	739.5	822.5
E	473.0	382.5	419.5	424.5	655.5	738.5	643.5	548.0	597.0	711.0	774.0	652.0
F	357.5	358.0	366.5	477.5	455.0	542.5	372.0	496.5	369.0	482.5	475.5	547.0

Summary of Results, averaging the Nitrogenous Treatments.

Average Yield.	Muriate of Potash.	Potash Manure Salts	Mean.	Standard Error.
Roots, tons per acre ...	3.30	3.45	3.38	0.05
Roots, per cent.	97.7	102.3	100.0	1.48
Tops, tons per acre ...	10.60	11.04	10.82	0.161
Tops, per cent.	98.0	102.0	100.0	1.49

Summary of Results, averaging the Potash Equivalents.

		Average Yield in tons per acre.				Average Yield per cent.			
		Top Dressing in cwt. per acre S/Amm.*				Top Dressing in cwt. per acre S/Amm.			
		0	1	2	3	0	1	2	3
Roots	No Basal	3.01	3.35	3.32	3.47	89.2	99.3	98.4	102.8
	Cyanamide	3.21	3.63	3.43	3.62	95.1	107.6	101.5	107.1
	Sulphate of Ammonia ...	2.86	3.62	3.54	3.45	84.6	107.2	104.9	102.2
Tops	No Basal	8.70	10.54	11.33	12.51	80.4	97.4	104.7	115.6
	Cyanamide	8.57	10.86	10.44	11.52	79.2	100.3	96.4	106.4
	Sulphate of Ammonia ...	8.68	11.48	12.27	12.99	80.2	106.0	113.4	120.0

Standard Error : Roots, 0.14 tons or 4.15 per cent ; Tops, 0.48 tons, or 4.45 per cent.

* Cyanamide plots received no Top Dressing, and the columns of the table refer in the case of this manure to dressings equivalent to 1, 2, 3 and 4 cwts. per acre Sulphate of Ammonia.

Potash Manure Salts show significant superiority over Muriate. There is a significant response to single top dressing, only the leaves showing any further response to the highest dressings.

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SUGAR BEET.—(*Cont.*)

Long Hoos, 1927.

(b) Spacing Experiment.

Strip Totals in lb. (left to right).

	Roots.			Tops.		
Strips	N	M	W	N	M	W
1	494.75	361.75	377.75	1780.5	1269.0	1207.0
2	487.00	439.50	395.25	1458.5	1391.0	1150.0
3	493.25	357.75	408.25	1541.5	1203.0	1200.0
4	490.50	392.75	374.75	1537.5	1230.0	1030.5
5	456.50	319.00	326.25	1645.0	1246.0	1071.0
6	411.75	350.25	337.00	1487.5	1272.0	946.0
7	454.75	299.25	290.75	1178.0	883.5	796.0
8	430.75	314.00	312.25	1435.0	877.0	978.5
9	383.75	305.25	262.00	1179.5	936.0	868.0
10	369.25	304.50	273.75	1152.5	1134.0	863.0
11	340.00	264.25	233.00	1257.0	851.5	761.5
12	394.75	292.25	269.75	1143.0	1030.5	901.0

Manuring as on previous page.

System of Replication: 216 plots, each .008 acre, in sets of 3.

N = 14 in. spacing.

M = 18 in. spacing.

W = 22 in. spacing.

Summary of Results.

Average Yield.	Narrow Spacing.	Medium Spacing.	Wide Spacing.	Mean.	Standard Error.
Roots, tons per acre...	4.04	3.10	2.99	3.38	0.062
Roots, per cent. ...	119.5	91.8	88.6	100.0	1.84
Tops, tons per acre ...	13.02	10.33	9.12	10.82	0.249
Tops, per cent. ...	120.3	95.4	84.3	100.0	2.30

The narrow spacing gives a significantly higher yield than the medium and wide spacings, while with tops the medium spacing also does significantly better than the wide.

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SUGAR BEET.

MANURING.

Nitrochalk as top dressing, applied:—(*a*) early; (*b*) early and late.
Superphosphate.
Muriate of potash and potash manure salts.

CULTIVATION.

Subsoiling. Ridging.

Great Harpenden, 1928.

N.W.

	R	F	F	R	R	F	R	F	R	F	F	R	
I	2	6	1	5	10	9	12	11	4	3	7	8	O
II	1	8	5	9	3	7	11	10	6	4	12	2	S
III	6	3	2	11	5	10	4	7	12	8	1	9	O
IV	7	5	9	12	4	8	6	3	2	1	11	10	S
V	12	4	8	3	11	6	5	1	9	10	2	7	S
VI	8	10	11	7	1	12	2	4	3	5	9	6	O
VII	4	2	3	1	9	5	10	6	7	12	8	11	O
VIII	10	7	12	8	2	11	1	9	5	6	3	4	S
IX	3	12	7	4	8	1	9	2	10	11	6	5	S
X	9	1	10	2	6	4	8	12	11	7	5	3	O
XI	5	11	6	10	7	2	3	8	1	9	4	12	O
XII	11	9	4	6	12	3	7	5	8	2	10	1	S

VARIETY: Dippe.

SYSTEM OF REPLICATION: 12×12 Latin Square.

AREA OF PLOT: .014 acre.

TREATMENTS: Muriate of Potash at the rate of 2 cwt. per acre or equivalent Potash Manure Salts (30%). Superphosphate at the rate of 2 cwt. per acre. Top dressing of Nitrochalk at the rate of 2 cwt. per acre, applied early (June 23), and both early and late (July 21). All plots had basal dressing of 10 tons compost in winter, and 2 cwt. per acre Sulphate of Ammonia with other artificials on May 4.

R, F = Pairs of strips one way allotted at random to ridged and flat seed bed.

S, O = Pairs of strips the other way allotted at random to sub-soiling and "not" sub-soiling. The 12 plots of each treatment had 3 allotted to each of the 4 cultivation treatments.

Seed sown May 5; roots lifted October 26–November 3.

Key to Treatments.

Manure.	1	2	3	4	5	6	7	8	9	10	11	12
Mur./Pot. ...	×		×		×		×		×		×	
P.M.S.		×		×		×		×		×		×
Super			×	×			×	×			×	×
Nitrochalk (early)					×	×	×	×	×	×	×	×
Nitrochalk (late)...									×	×	×	×

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SUGAR BEET, 1928 (cont.)

Actual Weights in lb.—Roots.

Row.	1	2	3	4	5	6	7	8	9	10	11	12
I	204.5	238.5	304.5	284.0	289.5	204.0	317.0	364.0	265.5	278.0	236.5	274.0
II	210.5	323.5	327.0	317.5	235.0	286.5	298.5	218.0	336.0	267.5	334.5	292.0
III	239.0	264.5	285.5	333.5	313.5	242.5	293.0	311.0	293.5	295.5	319.0	307.5
IV	303.0	288.5	270.0	264.0	238.5	339.5	253.0	291.5	280.0	336.5	290.0	287.0
V	248.5	279.5	277.0	287.0	302.5	276.5	313.0	281.5	332.0	322.0	252.0	280.0
VI	262.0	340.5	293.0	283.0	279.5	275.0	274.5	284.5	284.5	255.5	272.0	301.0
VII	222.5	207.5	252.5	215.5	290.5	243.0	307.0	292.0	317.0	345.5	291.0	312.0
VIII	302.0	266.5	325.5	361.5	269.5	332.0	180.0	281.0	239.5	232.5	282.5	233.0
IX	256.0	246.5	214.0	273.5	401.0	308.5	231.5	277.0	312.5	290.0	273.5	245.5
X	215.0	305.5	362.0	261.0	365.0	299.5	363.0	369.5	173.0	269.5	324.5	211.5
XI	328.0	290.0	315.0	347.0	270.5	244.0	299.0	281.0	332.5	297.5	244.5	405.5
XII	397.5	335.0	283.5	262.0	272.0	324.5	326.5	311.5	259.5	355.0	272.5	322.5

Actual Weights in lb.—Tops.

Row.	1	2	3	4	5	6	7	8	9	10	11	12
I	304.5	412.0	360.0	324.0	367.0	427.5	380.5	423.0	364.5	360.0	332.5	409.0
II	362.5	331.5	347.0	339.5	390.0	339.0	408.5	412.0	433.0	385.0	432.5	360.5
III	251.5	349.5	344.5	311.5	338.5	389.5	333.0	330.0	340.0	425.0	406.0	353.5
IV	325.0	275.5	306.5	305.5	327.0	355.0	286.5	358.5	430.0	362.0	354.5	367.0
V	273.5	278.0	264.5	389.0	303.5	288.0	304.0	339.0	378.5	348.5	346.5	376.0
VI	311.5	299.0	272.5	239.5	265.0	297.5	341.0	402.0	345.0	388.0	377.0	362.0
VII	298.0	247.0	302.5	330.5	321.0	315.0	330.5	332.5	361.0	385.5	306.5	396.0
VIII	305.5	332.5	358.0	356.5	352.0	359.5	317.0	364.0	333.5	414.5	344.0	397.5
IX	275.5	323.0	319.5	338.5	354.0	345.0	503.5	356.0	325.5	356.0	352.5	441.5
X	335.5	357.0	353.0	275.5	368.5	395.5	357.0	343.0	312.5	467.0	359.5	351.0
XI	358.0	310.5	303.5	300.5	358.5	461.5	396.0	364.5	382.0	473.5	517.5	394.5
XII	409.0	351.0	371.5	433.0	406.5	472.0	459.5	412.5	539.5	387.5	464.0	545.5

(1) Summary of Average Yields—Separate Treatments.

Top Dressing.	0		Early.		Early and Late.	
	Super-phosphate.	No Super-phosphate.	Super-phosphate.	No Super-phosphate.	Super-phosphate.	No Super-phosphate.
Roots, tons per acre.						
Muriate of potash ...	9.33	8.47	9.18	9.37	9.01	9.10
Potash manure salts	9.27	9.00	9.47	8.97	9.22	9.42
Tops, tons per acre.						
Muriate of potash ...	10.37	10.12	11.74	11.03	12.20	12.08
Potash manure salts	10.48	10.27	11.79	11.81	12.63	12.63
Sugar in roots, per cent.						
Muriate of potash ...	17.98	17.82	17.71	17.72	17.20	17.26
Potash manure salts	17.98	17.96	17.58	17.52	17.31	17.30

(2) Summary of Significant Results—Manuring Experiment.

Average Yield.	No Top Dressing.	Early Top Dressing.	Early and Late Top Dressing.	Mean.	Standard Error. (*a*)	Muriate of Potash.	Potash Manure Salts.	No. Super.	Super.	Standard Error. (*b*)
Roots, tons per acre	9.02	9.25	9.19	9.15	0.13	9.08	9.23	9.06	9.25	0.10
Roots, per cent. ...	98.5	101.0	100.4	100.0	1.38	99.2	100.8	99.0	101.0	1.13
Tops, tons per acre	10.31	11.59	12.39	11.43	0.16	11.26	11.60	11.32	11.54	0.13
Tops, per cent. ...	90.2	101.4	108.4	100.0	1.40	98.5	101.5	99.0	101.0	1.14
Sugar percentage	17.94	17.63	17.27	17.61	0.06	17.61	17.61	17.60	17.63	0.05

(*a*) Refers to means of 48 plots. (*b*) Refers to means of 72 plots.

The effect of the nitrogenous top dressing is the only significant result. There was a significant response with tops but not with roots. The application of top dressing depressed the sugar content significantly.

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SUGAR BEET. Great Harpenden—*contd.*

Cultivation Experiment.

Column Totals (left to right).

	R	F	F	R	R	F	R	F	R	F	F	R
Roots, lb.	2887	2840.5	3030	3487.5	3478	3392	3895.5	3092	3622	3785.5	3695	4124
Tops, lb.	4428	4686	4755	4481.5	4395.5	4104.5	4233	3963.5	4111.5	4166	4062	4231.5
Number of plants ...	2965	2936	3070	3422	3246	2897	3162	2544	2896	2770	2835	2970

Row Totals (top to bottom).

	O	S	O	S	S	O	O	S	S	O	O	S
Roots, lb.	3260	3446.5	3498	3441.5	3451.5	3405	3296	3305.5	3329.5	3519	3654.5	3722
Tops, lb.	4464.5	4541	4172.5	4053	3889	3900	3926	4234.5	4290.5	4275	4620.5	5251.5
Number of plants ...	2982	3025	2953	3081	2998	2853	2861	3016	3022	2962	2937	3023

Summary of Results—Cultivation Experiment.

Average Yield.	Ridged.	Flat.	Standard Error.	Not Sub-soiled.	Sub-soiled.	Standard Error.	Mean.
Roots, tons per acre ...	9.52	8.78	0.27	9.14	9.17	0.10	9.15
Roots, per cent. ...	104.0	96.0	2.94	99.8	100.2	1.06	100.0
Tops, tons per acre...	11.46	11.40	0.20	11.23	11.63	0.21	11.43
Tops, per cent. ...	100.3	99.7	1.72	98.3	101.7	1.85	100.0
Roots,number per acre	18513	16917	369.4	17409	18021	80.0	17715
Roots,number per cent.	104.5	95.5	2.09	98.3	101.7	0.45	100.0

Ridged beats flat significantly in the case of roots, an effect due to increased number. Sub-soiling produced a significantly larger number of roots, but this was not reflected in an increased yield.

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Swedes : Comparison of Phosphatic Fertilisers, Phosphate of Ammonia and Superphosphate ; also of Sulphate of Ammonia and Urea.

Long Hoos, 1927.

N.E.

I	3	1	5	2	4
II	5	4	2	3	1
III	4	5	3	1	2
IV	1	2	4	5	3
V	2	3	1	4	5

SYSTEM OF REPLICATION : Latin Square. Plots, $\frac{1}{25}$ acre. Supplying 75 lbs. P_2O_5 and 14.75 lbs. N. per acre.

1. Urea equivalent to 2.
2. Sulphate of Ammonia at the rate of $\frac{5}{8}$ cwt. per acre.
3. Ammonium Phosphate at the rate of 1.1 cwts. per acre.
4. Urea as 1+Superphosphate at the rate of 4 cwts. per acre.
5. Sulphate of Ammonia as 2+Superphosphate at the rate of 4 cwts. per acre.

All plots received 1 cwt. Muriate of Potash per acre.

Manures applied June 20.

Seed sown June 23 ; roots lifted November 25 and 30.

Actual Weights in lb.

Row.	Roots.					Tops.				
	1	2	3	4	5	1	2	3	4	5
I	1236	1488	1196	1428	1280	473.0	497.0	465.5	437.5	498.5
II	1448	1296	1472	1248	1252	428.0	454.0	484.0	478.5	523.0
III	1468	1408	1328	1264	1264	467.0	425.5	482.5	519.0	473.0
IV	1236	1308	1456	1324	1416	481.5	503.0	414.0	478.0	437.0
V	1252	1168	1352	1472	1504	444.5	481.5	495.5	431.0	434.0

Summary of Results.

Average Yield per acre.	No Phosphate.		Phosphate applied.			Mean.	Standard Error.
	Urea.	Sulphate.	Amm'nium Phosphate.	Urea and Super.	Sulphate and Super.		
Roots, tons ...	14.82	14.88	15.19	15.04	14.99	14.98	0.22
Roots, per cent.	98.9	99.3	101.4	100.4	100.1	100.0	1.45
Tops, tons ...	5.12	5.27	5.23	5.23	5.28	5.23	0.12
Tops, per cent.	98.0	100.9	100.0	100.1	101.0	100.0	2.32

The yields on the Phosphate plots appear to be greater than those on the no-Phosphate plots, but the difference is not significant.

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CULTIVATION EXPERIMENT.

Rotary cultivation : method of making a seed bed.
Barley, Sawyers Field, 1927.

S.W.

	S_1
1	C_1
	P_1
	C_2
2	C_2
	P_2
	C_3
3	C_3
	P_3

SYSTEM OF REPLICATION : Triplicate strips. Plots $\frac{11}{40}$ acre.

S = prepared by Simar rototiller, April 14, 1927.

C_2, C_3 = as S in 1926, but treated as C in 1927.

C = Horse cultivated and disc harrowed, May 2.

P = Ploughed, April 5 and 14 ; drag harrowed and rolled, May 6, 1927.

All plots previously ploughed in January, 1927. 3 cwt. Superphosphate, 1 cwt. Muriate of Potash and 1 cwt. Sulphate of Ammonia per acre, applied over whole area, April 19, 1927.

Barley sown, May 7. Harvested October 3–12.

Actual Weights in lb.

Grain.	S *and C*	C	P
1	409.75	282.875	284.125
2	400.5	301.125	345.75
3	383.75	344.75	308.875
Total ...	1194.0	928.75	938.75
Straw.	**S *and C***	**C**	**P**
1	602.0	473.5	439.0
2	698.5	641.5	621.5
3	702.0	601.5	627.0
Total ...	2002.5	1716.5	1687.5

Summary of Results.

	S *and C*	C	P	Mean.	Standard Error.
Grain, cwts. per acre	12.9	10.1	10.2	11.0	0.54
Grain, per cent.	117.0	91.0	92.0	100.0	4.89
Straw, cwts. per acre	21.7	18.6	18.3	19.5	0.46
Straw, per cent.	111.1	95.3	93.6	100.0	2.35

Plots cultivated with the Simar implement in 1926 show a significant superiority over others in both grain and straw in 1927. This was probably a residual effect from previous years, as only one of these plots was in 1927 treated differently from the horse cultivated plots.

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CULTIVATION EXPERIMENT.

Swedes, Great Harpenden, 1928.

S

I				II				III				IV			
*	*	*													
A	B	C	D	B	D	A	C	C	A	D	B	D	C	B	A

SYSTEM OF REPLICATION: 4 randomised blocks of 4 plots each.
Area of each plot: $\frac{1}{20}$ acre.
No Farmyard Manure, except that plots marked * were dunged in error. All plots had 2 cwt. Sulphate of Ammonia, 2 cwt. Muriate of Potash and 2 cwt. Superphosphate per acre, applied May 5.

A = Ridged Seed bed.
B = Prepared by Simar rototiller, then ridged.
C = Prepared by Simar rototiller, but left flat.
D = Prepared by Simar rototiller, left flat, and Simar implement used again between rows in July.
Special cultivations May 7-9. Seed sown, May 9. Roots lifted November 21-25.

Actual Yields.

Block.	Roots in lb.				Tops in lb.				Number of Roots.			
	A	B	C	D	A	B	C	D	A	B	C	D
I	2804	2886	2529.5	2064	124	126.5	98.5	90	1018	991	903	815
II	2392	2417	2062	1967.5	100	107	85.5	87.5	1011	1022	784	773
III	2395	2437	2039	2046.5	89	103.5	76	90.5	929	899	832	730
IV	2566	2472.5	2381.5	1996	158	131.5	122.5	91.5	954	966	805	776

Summary of Results.

Average Yield.	Ridged.	Simar and Ridged.	Simar and Flat.	Simar, flat and Simar.	Mean.	Standard Error.
Roots, tons per acre ...	22.67	22.80	20.12	18.02	20.90	0.50
Roots, per cent. ...	108.5	109.1	96.2	86.2	100.0	2.39
Tops, cwt. per acre ...	21.03	20.92	17.08	16.05	18.77	1.13
Tops, per cent. ...	112.0	111.4	91.0	85.5	100.0	6.03
Roots, number per acre	19560	19390	16620	15470	17760	338.8
Roots, number per cent.	110.1	109.2	93.6	87.1	100.0	1.91

Significant depression in both roots and tops in the case of the plots simared and left flat. A further significant depression with roots in the case of the doubly simared plots. These depressions are accounted for by the decreased numbers of plants.

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UNIFORMITY TRIAL.

Oats, Sawyers Field, 1927.

S.W.

Plot	A	B	C	D	E	F	G	H
6								
5								
4								
3								
2								
1								

Area of each plot: $\frac{1}{10}$ acre.

Area was dunged in 1926 for Swedes. No other manure.

Sown February 18-19. Harvested August 22, 23, 30.

Actual Weights in lb.

Plot.	A	B	C	D	E	F	G	H	Total.
Total Grain.									
6		274.5	265.375	289.0	282.125	290.375	271.0	261.5	1933.875
5	252.0	263.25	255.375	230.75	313.625	276.625	234.625	258.875	2085.125
4	229.25	249.875	250.375	242.0	310.500	280.625	255.25	229.125	2047.000
3	229.25	251.625	265.75	259.375	262.000	257.000	235.625	268.875	2029.500
2	207.25	244.625	238.0	231.375	215.250	262.875	237.25	225.25	1861.875
1	187.375	212.125	223.75	220.25	210.875	232.125	229.875	242.25	1758.625
Total	1105.125	1496.000	1498.625	1472.750	1594.375	1599.625	1463.625	1485.875	11716.000
Total Straw.									
6		259.5	234.0	272.0	259.0	288.0	255.0	282.5	1850.0
5	252.5	266.0	236.5	236.5	300.0	270.5	277.5	287.5	2127.0
4	241.5	256.0	237.0	237.5	256.5	284.0	250.5	259.5	2022.5
3	256.0	267.5	260.5	252.0	246.0	259.5	252.5	274.0	2068.0
2	248.5	273.0	238.0	228.0	218.0	269.5	257.0	261.0	1993.0
1	225.0	241.0	222.5	235.0	211.0	249.5	242.0	273.0	1899.0
Total	1223.5	1563.0	1428.5	1461.0	1490.5	1621.0	1534.5	1637.5	11959.5

Summary of Results.

	Grain.		Straw.	
	lb.	cwts.	lb.	cwts.
Average Yield per acre	2493	22.3	2545	22.7
Standard deviation	263.9	2.36	195.7	1.75
Standard deviation per cent. ...	10.6		7.7	