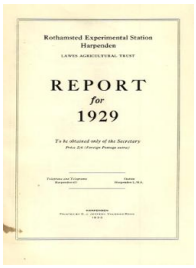
ROTHAMSTED RESEARCH

Report for 1929

Full Table of Content



Rothamsted Experimental Plots, 1929

Rothamsted Research

Rothamsted Research (1930) *Rothamsted Experimental Plots, 1929 ;* Report For 1929, pp 77 - 123 **- DOI: https://doi.org/10.23637/ERADOC-1-111**

YIELDS OF
EXPERIMENTAL PLOTS
1929

https://doi.org/10.23637/ERADOC-1-111

THE USE OF THE SUMMARY TABLES

The summaries of the significant results from the replicated experiments, whether these are stated as produce per acre or as a percentage of the average yield, are accompanied by estimates of the standard errors to which these results are liable. The agricultural precautions which have to be taken in order that these shall be certainly valid were explained in the Report for 1925-26. An explanation of their purpose is desirable here in order that a full use of the summaries may be made by those who do not wish to make for themselves a detailed examination of the yields recorded for individual plots.

An experimental yield will differ from its true value either in excess or deficit by an amount exceeding its standard error almost as frequently as once in 3 trials; it will, however, be wrong by more than twice its standard error only about once in 22 trials, and by more than three or four times its standard error once in 370 or 15,780 trials respectively. The odds against an error of any size having occurred thus increase very rapidly in a small range of multiples of the standard error. Whereas experimental differences of less than twice their standard error might always be ascribed to chance, and are, therefore, for safety, ignored as "insignificant," differences only slightly greater than these cannot reasonably be disregarded, but must be ascribed to genuine manurial or cultural effects, such as the experiment was designed to examine.

The rejection of the insignificant differences is thus a necessary preliminary, but only a preliminary, to the interpretation of the experimental results. So far as has been practicable all significant results are noted, and exhibited in the summaries of significant results. In the more successful and extensive experiments the standard error has been reduced to so low a figure, sometimes considerably less than 2 per cent., that quite small differences in yields can be detected, whereas with a standard error of 5 per cent., all but big and obvious differences in yield must be ignored. The change in precision from standard errors of 5 per cent., to standard errors of 2 per cent., or less, thus represents a very large extension in the range of agricultural effects which can be examined experimentally.

Once an effect is shown to be definitely significant it makes little difference whether the odds against its being due to chance are 100 to 1 or 1,000,000 to 1. Chance is effectively excluded in both cases, and the interest in the result is now concentrated on the actual gain in crop, either in yield per acre, or in yield per cent., which the experiment has demonstrated. The relation of this gain to any additional item of expense incurred, such as the cost of a manurial application, then determines the balance of advantage in practical procedure. Read in this way the summary tables give the direct results of critical experimentation.

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DATES OF SOWING AND HARVESTING, AND YIELD PER ACRE, 1929.

Field.	Crop.	Variety.	Principal Cultivations and Dates.	Manuring. cwt. per acre.	Sowing Dates.	Cutting Dates.	Carting Dates.	Yield per acre.
Great Harpenden	Wheat ..	Million III...	After Potatoes ploughed, Oct. 25-27. Nov. 2-3 harrowed and drilled then harrowed in ..	1½ S/Amm.	Nov. 2-3			
			After Beet ploughed, Nov. 8-12, harrowed, drilled, then harrowed	—	Nov. 14 (grass Apr.18)	Aug. 16-17	Aug. 22-23	7 qrs.
	Barley ..	Standwell ..	Mar. 8-12, ploughed and harrowed and cultivated.	1 S/Amm. 1 M/Pot. 2 Super. ..	Mar. 15 (grass Apr. 4)	Aug. 12 ..	Aug. 20 ..	see pp. 97-8
	Grass ..		Mar. 21, horse rolled	1 Nitro-Chalk ..	Aug. 24 (1928)	—	—	—
Pastures	Winter Oats patched with Spring Oats and Barley	Grey ..	Tractor sub-soiled Sept. 10. Sept. 19, Tractor harrowed and rolled.	2 S/Amm. 2½ Super.	Sept. 20 (1928) Mar. 29 (Spring oats)	Aug. 7 ..	Aug. 19-20	5½ qrs.
		Victory ..	Mar. 20-21, horse rolled. Apr. 2-4, harrowed and rolled.	1 M/Pot...	Apr. 2. .. (Barley)	Aug. 13 ..	Aug. 27-28	
		Standwell ..						
	Forage Mixture ..	1 bush. Beans, 1 bush. Tares, 3 bush. Winter Oats (rate 3 bush. per acre)	Ploughed Sept, 1929.	15-16 tons dung ..	Sept. 24-25, 1929.. ..	For sheep feed in		Spring.
Little Hoos	Wheat ..	Million III ..	Oct. 22-24, tractor ploughed and harrowed. Oct. 26, harrowed in. Mar. 20-21, horse rolled.. ..	2 Super. 1½ S/Amm. 1 M/Pot...	Oct. 25 (1928)	Aug. 16 ..	Aug. 21-22	6½ qrs.
Broadbalk Acre ..	Swedes ..	Garton's Magnificent	Tractor ploughed, horse harrowed and rolled. Bouted May 2 and 3, ridges split	15 tons "Adco" ..	May 28 (1st sowing, May 9, destroyed by fly)	—	Nov. 16-21	15 tons
Fosters ..	1 Year's Seeds ..		April 16-17, tractor rolled ..	2½ Super.				
			Ploughed up July 4-15	1½ S/Amm.				
			Cultivated July 24	1 M/Pot...	—	June 22 ..	July 1-2 ..	38 cwts.
	3½ acres Italian rye grass and trifolium killed by frost replaced by forage mixture	1 bush. beans 1 bush. peas 2 bush. spring oats (rate 4 bush. per acre)	April 6, drilled and harrowed in. Apr. 8 rolled. Ploughed up July 24	ditto ..	Sept. 10 (failed) resown Apr. 6, 1929.. ..	July 13 ..	July 23 ..	2 tons.

DATES OF SOWING AND HARVESTING AND YIELD PER ACRE, 1929.

Field.	Crop.	Variety.	Principal Cultivations and Dates.	Manuring. cwt. per acre.	Sowing Dates.	Cutting Dates.	Carting Dates.	Yield per acre.
Great Knott	Mustard ..		Mar. 14-21, tractor ploughed. Apr. 16, Mustard sown and harrowed in by tractor. June 22-29 ploughed in by tractor, twice disc scarified (June 29, Aug. 1) (Aug. 28)	25 tons St. Albans town refuse	Apr. 16	—	—	—
Long Hoos 1	Potatoes ..	Ally ..	see p. 99	—	—	—	—	see p. 99
2	Winter Oats	Grey ..	see p. 93	—	—	—	—	see p. 93
3	1 Year's Seeds	—	— —	—	—	—	—	—
4	Barley ..	Spratt Archer.. Plumage Archer	— — see p. 89	— — —	— — —	— — —	— — —	— — see p. 89
5	Sugar Beet ..	—	see p. 102	—	—	—	—	see p. 102
6	Wheat ..	—	see p. 95	—	—	—	—	see p. 95
Great Field	Grazing ..	—	May 23, tractor rolled and light harrowed	—	—	June 28-29 grass cut after grazing	July 8 ..	12-15 cwt.
Little Knott	½ pig grazing ½ hay after early grazing	—	Nov. 24, chain harrowed ..	1 acre had 2 Super., 2 M/ Pot., 1 S/Am.	—	—	July 8-9	20 cwt.
New Zealand	Grazing ..	—	Apr. 16, seeds harrowed in (tractor) and horse rolled	6 Basic Slag	Sept. 4 (1928) Apr. 16 ..	—	—	—
Stackyard..	Cut for Hay after grazing	—	Apr. 18, tractor rolled	6 Slag .. 8 tons F.Y.M.	—	—	—	12-15 cwt.
Sawyers * ..	Grazing ..	—	— —	— —	—	—	—	—
Outer Great Knott ..	Grazing ..	—	Apr. 16 tractor rolled	—	—	—	—	—
West Barnfield	—	—	Apr. 17, tractor rolled	6 Slag ..	Aug. 29 (1928)	—	—	—
Fosters Corners ..	—	—	Apr. 17, tractor rolled	6 Slag ..	—	—	—	—
Broadbalk..	Wheat ..	Square-Head's Master ..	— —	—	Oct. 9 (1928)	Aug. 9	Aug. 17	see p. 87
Hoos ..	Barley ..	Plumage Archer Spratt Archer..	— —	—	Apr. 17-18	Aug. 29-30	Sept. 4-5	see p. 88
Barnfield ..	Mangolds ..	Prize Winner .. Yellow Globe ..	— —	—	Apr. 24-27	—	Oct. 16-30	see p. 85
Agdell ..	Barley ..	Plumage Archer	— —	—	Mar. 15	Aug. 19	Aug. 26	see p. 84
Park ..	Hay ..	—	— —	—	—	July 1-6	July 10-11	see p. 86

* 4 acres sown with Barley and undersown with Grass. Yield 8 qrs.

CROP YIELDS ON THE EXPERIMENTAL PLOTS.

NOTES.—In each case the year refers to the harvest, *e.g.*, Wheat 1929 means wheat harvested in 1929. In the tables, total straw includes straw, cavings and chaff. These were weighed separately prior to 1928. Since 1928 the figure given as total straw has been arrived at as the difference : total sheaf weight—weight of grain.

CONVERSION TABLE.

1 acre	=	0.405 Hectare	0.963 Feddan.
1 bushel (Imperial)	=	0.364 Hectolitre (36.364 litres)	0.184 Ardeb.
1 lb. (pound avoirdupois)	=	0.453 Kilogramme	1.009 Rotls.
1 cwt. (hundredweight, 112 lb.)	=	50.8 Kilogrammes	113.0 Rotls. 1.366 Maunds.
1 ton (20 cwt. or 2240 lb.)	=	1016 Kilogrammes	
1 metric quintal or Doppel Zentner (dz)	=	100.0 Kilogrammes 220.46 lb.	
1 bushel per acre	=	0.9 Hectolitre per Hectare	0.191 Ardeb per Feddan
1 lb. per acre	=	1.12 Kilogramme per Hectare	1.049 Rotls per Feddan
1 cwt. per acre	=	1.256 dz. per Hectare	117.4 Rotls per Feddan
1 ton per acre	=	25.12 dz. per Hectare	
1 dz. per Hectare	=	0.796 cwt. per acre	

In America the Winchester bushel is used = 35.236 litres. 1 English bushel = 1.032 American bushels.

CONVERSION TABLE.—CWT. TO BUSHELS.

Crop.	Cwt.									
	1	2	3	4	5	10	15	20	25	30
Wheat (60 lb.) bushels	1.87	3.73	5.60	7.47	9.33	18.67	28.00	37.33	46.67	56.00
Barley (52 lb.) ,,	2.15	4.31	6.46	8.62	10.77	21.54	32.31	43.08	53.85	64.62
Oats (42 lb.) ,,	2.67	5.33	8.00	10.67	13.33	26.67	40.00	53.33	66.67	80.00

The yields of grain in the 1925-26 Report were given for the Replicated Experiments in standard bushels of 60, 52 and 42 lb. respectively.

Average Wheat Yield of Various Countries.

Country.	Mean yield per acre, 1919-27. cwt.	Country.	Mean yield per acre, 1919-27. cwt.
Great Britain	17.4	Denmark	22.5
England	17.3	Argentine	6.6
Hertfordshire	16.3	Australia	6.6
France	10.8	Canada	8.6
Germany	14.1	United States	7.5
Belgium	20.0	U.R.S.S. (Europe and Asia) *	5.7

NOTE.—Figures for Great Britain, England and Hertfordshire are taken from the Ministry of Agriculture's "Agricultural Statistics," Vol 62. Other figures from "International Year Book of Agricultural Statistics," 1922-28.
*1924-27.

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METEOROLOGICAL RECORDS, 1929.

	Rain.		Drainage through soil.				Temperature (Mean).				
	Total Fall 1/1000th Acre Gauge.	No. of Rainy Days (0.01 inch or more) 1/1000th Acre Gauge.	20 ins. deep.	40 ins. deep.	60 ins. deep.	Bright Sunshine.	Max.	Min.	1 ft. in ground.	Solar Max.	Grass Min.
1929.	Inches.	No.	Inches.	Inches.	Inches.	Hours.	°F.	°F.	°F.	°F.	°F.
Jan. ..	1.759	16	1.154	1.378	1.220	39.5	36.2	30.0	34.4	53.3	27.1
Feb. ..	0.789	8	0.708	1.006	0.931	67.2	35.5	25.9	33.8	70.3	21.0
Mar. ..	0.065	2	0.000	0.017	0.013	184.7	53.2	32.5	37.2	99.1	26.4
April...	1.613	12	0.140	0.240	0.217	155.1	50.6	35.6	43.3	102.4	30.9
May ..	3.065	13	0.852	1.101	1.017	261.0	60.4	42.7	50.8	119.9	37.7
June ..	1.023	11	0.002	0.030	0.031	226.5	63.7	48.3	57.4	124.8	43.9
July ..	1.417	10	0.001	0.006	0.006	243.7	70.8	51.9	61.5	129.4	47.1
Aug. ..	0.633	12	0.000	0.000	0.000	196.7	69.2	51.5	60.4	126.1	46.7
Sept. ..	0.246	2	0.000	0.000	0.000	206.0	72.0	52.0	61.0	119.9	46.4
Oct. ..	4.516	15	1.895	1.891	1.343	120.1	55.7	42.3	50.4	98.9	38.1
Nov. ..	6.561	20	5.931	6.093	5.790	78.0	48.8	37.5	42.9	79.8	33.1
Dec. ..	6.018	22	5.559	5.780	5.490	75.3	46.3	36.4	40.8	71.7	32.3
Total or Mean	27.705	143	16.242	17.542	16.058	1853.8	55.2	40.6	47.8	99.6	35.9

RAIN AND DRAINAGE.
MONTHLY MEAN FOR 59 HARVEST YEARS, 1870-1—1928-9.

	Rain-fall.	Drainage.			Drainage % of Rainfall.			Evaporation.		
		20-in. Gauge.	40-in. Gauge.	60-in. Gauge.	20-in. Gauge.	40-in. Gauge.	60-in. Gauge.	20-in. Gauge.	40-in. Gauge.	60-in. Gauge.
	Ins.	Ins.	Ins.	Ins.	%	%	%	Ins.	Ins.	Ins.
Sept. ..	2.398	0.818	0.792	0.729	34.1	33.0	30.4	1.580	1.606	1.669
Oct. ..	3.148	1.817	1.784	1.658	57.7	56.7	52.7	1.331	1.364	1.490
Nov. ..	2.781	2.104	2.158	2.031	75.7	77.6	73.0	0.677	0.623	0.750
Dec. ..	2.818	2.397	2.496	2.382	85.1	88.6	84.5	0.421	0.322	0.436
Jan. ..	2.408	1.970	2.168	2.068	81.8	90.0	85.9	0.438	0.240	0.340
Feb. ..	2.051	1.532	1.645	1.571	74.7	80.2	76.6	0.519	0.406	0.480
March ..	2.007	1.070	1.200	1.135	53.3	59.8	56.6	0.937	0.807	0.872
April ..	2.023	0.655	0.735	0.699	32.4	36.3	34.6	1.368	1.288	1.324
May ..	2.046	0.475	0.544	0.510	23.2	26.6	24.9	1.571	1.502	1.536
June ..	2.246	0.547	0.576	0.555	24.4	25.6	24.7	1.699	1.670	1.691
July ..	2.725	0.725	0.753	0.700	26.6	27.6	25.7	2.000	1.972	2.025
Aug. ..	2.648	0.703	0.716	0.672	26.5	27.0	25.4	1.945	1.932	1.976
Year ..	29.299	14.813	15.567	14.710	50.6	53.1	50.2	14.486	13.732	14.589

Area of each gauge 1/1000th acre.

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CHEMICAL ANALYSES OF FERTILISERS USED IN REPLICATED EXPERIMENTS.

Fertiliser.	% N	% water-sol. P_2O_5	% K_2O	% Cl.
Sulphate of Ammonia	20.7-21.2	—	—	—
Muriate of Ammonia	26.0	—	—	—
Nitrate of Soda	15.0	—	—	—
Urea	45.8	—	—	—
Cyanamide	21.0-21.3	—	—	—
Ammonium Phosphate	12.2	61.6	—	—
Superphosphate	—	16.5	—	—
Potassium Phosphate (K_2HPO_4)	—	40.8	54.0	—
Sulphate of Potash	—	—	50.8	—
Muriate of Potash	—	—	52.6	48.8
Potash Manure Salts (30%) ..	—	—	31.9	50.9
Potash Manure Salts (20%) ..	—	—	17.7	46.6
Potash Mineral	—	—	16.2	—
Agricultural Salt	—	—	—	57.2

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First Series : Classical Experiments of Lawes and Gilbert.

CROPS GROWN IN ROTATION.
AGDELL FIELD.

PRODUCE PER ACRE.

Year.	Crop.		O. Unmanured since 1848. 5. Fallow.	O. Unmanured since 1848. 6. Clover or Beans.	M. Mineral Manure‡ No Nitrogen. 3. Fallow.	M. Mineral Manure‡ No Nitrogen. 4. Clover or Beans.	C. Complete Mineral‡ and Nitrogenous Manure. 1. Fallow.	C. Complete Mineral‡ and Nitrogenous Manure. 2. Clover or Beans.
Average of First Twenty Courses, 1848-1927.								
	Roots (Swedes)	cwt.*	32.7	11.2	175.7	195.9	355.3	302.1
	Barley—							
	Dressed Grain	bush.	22.2	20.2	23.1	27.4	31.1	35.4
	Total Straw†	cwt.	13.6	13.4	13.7	15.7	18.8	21.8
	Beans—							
	Dressed Grain	bush.	—	13.1	—	18.2	—	22.3
	Total Straw	cwt.	—	9.2	—	13.2	—	15.3
	Clover Hay	cwt.	—	27.1	—	52.3	—	52.6
	Wheat—							
	Dressed Grain	bush.	24.0	22.3	28.1	30.6	28.9	30.4
	Total Straw †	cwt.	23.4	21.6	28.6	29.8	30.8	29.8
Present Course (21st), 1928 and 1929.								
1928 1929	Roots (Swedes)	cwt.	19.7	11.7	143.8	163.6	293.2	223.2
	Barley—							
	Dressed Grain	bush.	9.9	11.8	14.4	11.5	13.4	26.0
	Offal Grain	lb.	46.0	56.0	92.0	48.0	40.0	64.0
	Straw	lb.	516.0	750.0	765.0	1011.0	746.0	1619.0
	Total Straw†	cwt.	7.0	9.5	11.5	12.8	9.3	18.9
	Wt. of Dressed Grain per bush.	lb.	55.3	53.2	55.8	56.6	55.4	56.9
	Proportion of Total Grain to 100 of Total Straw		75.6	64.5	69.6	48.8	74.7	72.9

* Plots 1, 3 and 5 based upon 18 years. Plots 2, 4 and 6 based upon 17 years.

† Includes straw, cavings and chaff.

‡ Mineral Manure : 528 lb. Superphosphate (35%) ; 500 lb. Sulphate of Potash ; 100 lb. Sulphate of Soda ; 200 lb. Sulphate of Magnesia. All per acre.

Nitrogenous Manure. 206 lb. Sulphate of Ammonia and 2,000 lb. Rape dust per acre.

Manures applied once every four years, prior to sowing of swedes.

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MANGOLDS – BARNFIELD, 1929.

Roots each year since 1856. **Mangolds each year since 1876.**

PRODUCE PER ACRE.

	Strip	Strip Manures. (Amounts stated as per acre.)	1929. Cross Dressings. O	N	A	AC	C	50-Year Average, 1876-1928† Cross Dressings. O	N	A	AC	C
			None.	Nitrate of Soda (550 lb.)	Sulphate of Ammonia (412 lb.)	Sulphate of Ammonia (412 lb.) and Rape Cake.	Rape Cake (2,000 lb.)	None.	Nitrate of Soda (550 lb.)	Sulphate of Ammonia (412 lb.)	Sulphate of Ammonia (412 lb.) and Rape Cake.	Rape Cake (2,000 lb.)
ROOTS.			Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
	1	Dung only (14 tons)	10.79	18.14	13.53	12.46	14.82	17.47	26.16	21.70	23.58	23.53
	2	Dung, Superphosphate (3½ cwt.), Sulphate of Potash (500 lb.)	11.05	20.54	18.57	19.96	19.83	18.94	26.68	24.71	27.57	26.50
	4	Complete Minerals : Superphosphate and Potash as 2, Salt (200 lb.), Sulphate of Magnesia (200 lb.)	3.77	(*a*) 17.42* (*b*) 18.13	14.03	20.67	15.91	4.60	(*a*) 18.11 ** (*b*) 17.81	14.37	26.06	20.96
	5	Superphosphate only (3½ cwt.)	3.31	14.98	7.60	4.71	6.36	4.47	14.63	6.70	9.49	10.16
	6	Superphosphate (3½ cwt.), Sulphate of Potash (500 lb.) ..	3.64	15.13	13.17	16.60	12.62	4.03	15.12	13.50	22.55	18.14
	7	Superphosphate (3½ cwt.), Sulphate of Magnesia (200 lb.) and Sodium Chloride (200 lb.)	3.30	15.94	13.30	14.01	12.86	4.86	16.04	14.70	22.31	19.10
	8	No Minerals	2.97	10.85	6.32	5.53	4.46	3.34	9.61	5.32	8.52	8.89
	9	Sodium Chloride (200 lb.), Nitrate of Soda (550 lb.), Sulphate of Potash (500 lb.) and Sulphate of Magnesia (200 lb.)	16.31	—	—	—	—	—	—	—	—	—
LEAVES.												
	1	Dung only (14 tons)	1.99	3.51	2.61	2.19	3.17	3.04	4.65	4.93	5.25	4.54
	2	Dung, Superphosphate (3½ cwt.), Sulphate of Potash (500 lb.)	1.97	4.34	3.52	4.20	4.11	3.16	5.15	5.49	6.29	4.80
	4	Complete Minerals : Superphosphate and Potash as 2, Salt (200 lb.), Sulphate of Magnesia (200 lb.)	0.89	(*a*) 3.34* (*b*) 3.56	2.54	3.94	2.70	1.04	(*a*) 4.05 ** (*b*) 4.09	2.88	5.33	3.37
	5	Superphosphate only (3½ cwt.)	0.92	3.11	1.96	2.09	1.72	1.05	3.19	2.61	3.29	2.84
	6	Superphosphate (3½ cwt.), Sulphate of Potash (500 lb.)	0.98	2.76	2.00	3.11	2.12	0.93	3.04	2.81	5.20	2.87
	7	Superphosphate (3½ cwt.), Sulphate of Magnesia (200 lb.) and Sodium Chloride (200 lb.)	1.08	3.23	2.63	3.75	2.65	1.10	3.31	3.01	5.23	3.31
	8	No Minerals	0.83	3.05	1.93	1.83	1.61	0.98	3.19	2.52	3.30	2.84
	9	Sodium Chloride (200 lb.), Nitrate of Soda (550 lb.), Sulphate of Potash (500 lb.), and Sulphate of Magnesia (200 lb.)	2.79	—	—	—	—	—	—	—	—	—

* From 1904 onwards plot 4N has been divided, 4 (*a*) receiving Sulphate of Potash, Sulphate of Magnesia, Sodium Chloride and Nitrate of Soda, amounts as above, 4 (*b*) receiving Calcium Chloride (190 lb.), Potassium Nitrate (570 lb.) and Calcium Nitrate (100 lb.). Nitrogenous manures are applied as to one-third at time of sowing and two-thirds as top dressing at a later date, except with Rape Cake which all goes on with seed.

† Excluding 1885, when Nitrogenous Fertilisers were not applied, owing to poor crop, and 1908 and 1927 when the crop was swedes.

** 23 years only, 1904-1928.

HAY—THE PARK GRASS PLOTS.

Plot.	Manuring (amounts stated are per acre).		1929. Yield of Hay per acre. 1st Crop.	2nd† Crop.	Total.	Dry Matter per acre. 1st Crop.	2nd Crop.	Total.	Plot.
			cwt.	cwt.	cwt.	lb.	lb.	lb.	
1	Single dressing (206 lb.), Sulphate of Ammonia (=43 lb.N.); (with Dung also 8 years 1856-63)	not limed	2.8	0.5	3.3	243	42	285	1
		limed ..	12.1	0.6	12.7	1081	53	1134	
2	Unmanured (after Dung 8 years, 1856-63) ..	not limed	7.1	0.3	7.4	644	31	675	2
		limed ..	8.2	0.4	8.6	703	37	740	
3	Unmanured	not limed	6.3	0.3	6.6	535	27	562	3
		limed ..	6.9	0.3	7.2	591	29	620	
4-1	Superphosphate of Lime (3½ cwt.)	not limed	10.2	0.4	10.6	846	33	879	4-1
		limed ..	7.4	0.4	7.8	652	32	684	
4-2	Superphosphate of Lime (3½ cwt.) and double dressing (412 lb.) Sulphate of Ammonia (=86 lb. N.)	not limed	1.0	0.6	1.6	86	52	138	4-2
		limed ..	24.1	1.5	25.6	2363	133	2496	
5-1	(N. half) Unmanured following double dressing Ammonia Salts (=86 lb. N.) 1856-97 ..	not limed	2.3	0.8	3.1	207	72	279	5-1
5-2	(S. half) Superphosphate (3½ cwt.); Sulphate of Potash (500 lb.), following double dressing Ammonia Salts (=86 lb. N.) 1856-97 ..	not limed	8.5	0.8	9.3	783	75	858	5-2
6	Complete Mineral Manure as Plot 7; following double dressing Ammonia Salts (=86 lb. N.) 1856-68	not limed	15.3	1.8	17.1	1345	158	1503	6
7	Complete Mineral Manure: Superphosphate (3½ cwt.); Sulphate of Potash (500 lb.); Sulphate of Soda (100 lb.); Sulphate of Magnesia (100 lb.)	not limed	15.1	1.7	16.8	1351	157	1508	7
		limed ..	30.9	0.8	31.7	2910	73	2983	
8	Mineral Manure without Potash	not limed	8.3	0.9	9.2	704	79	783	8
		limed ..	7.5	0.3	7.8	632	24	656	
9	Complete Mineral Manure and double dressing (412 lb.) Sulphate of Ammonia (=86 lb. N.)	not limed	0.9	0.1	1.0	77	11	88	9
		limed ..	45.8	0.8	46.6	4117	71	4188	
10	Mineral Manure (without Potash) and double dressing Ammonia Salts (=86 lb. N.) ..	not limed	2.4	0.1	2.5	205	7	212	10
		limed ..	32.1	1.4	33.5	3158	127	3285	
11-1	Complete Mineral Manure and treble dressing (618 lb.); Sulphate of Ammonia (129 lb. N.)	not limed	1.1	1.1	2.2	90	99	189	11-1
		limed ..	48.3	1.6	49.9	4473	142	4615	
11-2	As Plot 11-1 and Silicate of Soda	not limed	7.8	5.6	13.4	641	499	1140	11-2
		limed ..	47.6	2.7	50.3	4374	244	4618	
12	Unmanured	not limed	7.7	0.7	8.4	682	62	744	12
13	Dung (14 tons) in 1905, and every fourth year since (omitted 1917), Fish Guano (6 cwt.) in 1907 and every fourth year since	not limed	24.2	3.2	27.4	2107	289	2396	13
		limed ..	22.4	1.4	23.8	1945	122	2067	
14	Complete Mineral Manure and double dressing (550 lb.) Nitrate of Soda (=86 lb. N.) ..	not limed	39.8	2.4	42.2	3519	219	3738	14
		limed(sun)	40.3	1.4	41.7	3444	124	3568	
		lmd (shade)	34.4	0.7	35.1	3051	61	3112	
15	Complete Mineral Manure as Plot 7, following double dressing Nitrate of Soda (=86 lb. N.) 1858-1875	not limed	14.5	1.4	15.9	1222	125	1347	15
		limed ..	22.4	0.5	22.9	2081	45	2126	
16	Complete Mineral Manure and single dressing (275 lb.) Nitrate of Soda (=43 lb. N.) ..	not limed	23.1	1.8	24.9	2540	158	2698	16
		limed ..	23.6	1.4	25.0	2343	123	2466	
17	Single dressing (275 lb.) Nitrate of Soda (=43 lb. N.)	not limed	12.9	0.9	13.8	1071	78	1149	17
		limed ..	16.7	0.7	17.4	1471	65	1536	
18	Mineral Manure (without Superphosphate), and double dressing Sulphate of Ammonia (=86 lb. N.), 1905 and since; following Minerals and Ammonia Salts supplying the constituents of 1 ton of Hay, 1865-1904	not limed	2.7	0.3	3.0	236	27	263	18
		limed (6788 lb.)	36.9	1.1	38.0	3295	102	3397	
		limed (3951 lb.)	28.8	1.0	29.8	2542	92	2634	
19	Farmyard Dung (14 tons) in 1905 and every fourth year since (omitted in 1917), following Nitrate of Soda (=43 lb. N.), and Minerals, 1872-1904	not limed	16.5	1.3	17.8	1554	118	1672	19
		limed 3150 lb.)	15.2	0.7	15.9	1422	64	1486	
		limed (570 lb.)	16.5	0.9	17.4	1541	84	1625	
20	Farmyard Dung (14 tons) in 1905 and every fourth year since (omitted in 1917); each intervening year Plot 20 receives Sulphate of Potash (100 lb.); Superphosphate (200 lb.) and 1½ cwt. Nitrate of Soda (=26 lb. N.); following Nitrate of Potash and Superphosphate, 1872-1904	not limed	28.1	1.3	29.4	2676	117	2793	20
		limed (2772 lb.)	25.1	1.1	26.2	2287	94	2381	
		limed .. (570 lb.)	25.1	1.2	26.3	2328	112	2440	

Ground Lime was applied to the southern portion (Limed) of the plots at the rate of 2000 lb. to the acre in the Winters of 1903-4, 1907-8, 1915-16, 1923-24, 1927-28, and at the rate of 2500 lb. to the acre in the Winter of 1920-21, except where otherwise stated.

Up to 1914 the Limed and Unlimed plot results were not separately given in the Annual Report, but the mean of the two was given. From 1915 onwards the separate figures are given.

† The second crop was carted green; the figures given are estimated hay yields, calculated from the dry matter.

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WHEAT--BROADBALK FIELD.

Plot.	Manurial Treatment. (amounts stated are per acre).	1929 (Upper or Western Part) second year after fallow.							74-year Average 1852-1925 (Prior to fallow).	
		Dressed Grain			Offal Grain per acre.	Straw per acre.	Total † Straw per acre.	Proportion of Total Grain to 100 of Total Straw.	Dressed Grain per acre.	Total Straw per acre.
		Yield per acre.	Weight per bushel.	Yield per acre.						
		bushels.	lb.	cwt.	lb.	lb.	cwt.		bushels.	cwt.
2A	Farmyard Manure (14 tons)	23.3	61.3	12.7	120	2557	28.9	47.7	26.8**	32.1**
2B	Farmyard Manure (14 tons)	30.0	63.0	16.9	95	3579	40.1	44.2	33.5	34.2
3	Unmanured since 1839	9.1	60.5	4.9	49	855	11.1	48.3	11.7	9.8
5	Complete Mineral Manure §§	9.1	60.5	4.9	40	762	9.4	56.4	13.5	11.5
6	As 5, and 206 lb. Sulphate of Ammonia	17.7	61.8	9.8	55	1730	19.0	54.4	21.7	20.3
7	As 5, and 412 lb. Sulphate of Ammonia	20.9	61.3	11.4	89	3585	39.1	33.6	30.4	32.1
8	As 5, and 618 lb. Sulphate of Ammonia	15.9	59.7	8.5	128	5288	57.6	17.3	34.5	39.8
9	As 5, and 275 lb. Nitrate of Soda	21.6	61.4	11.9	96	2905	31.5	40.4	18.8††	24.6††
10	412 lb. Sulphate of Ammonia	24.7	61.4	13.6	117	3048	33.6	43.6	18.7	17.8
11	As 10, and Superphosphate (3½ cwt.)	19.0	60.8	10.3	109	2600	29.2	39.3	21.3	21.4
12	As 10, and Super. (3½ cwt.) and Sulph. Soda (366 lb.) ..	22.9	61.1	12.5	124	3147	34.4	39.8	27.0	26.8
13	As 10, and Super (3½ cwt.) and Sulph. Potash (200 lb.) ..	25.6	61.6	14.1	103	3348	35.7	42.3	29.2	30.6
14	As 10, and Super. (3½ cwt.) and Sulph. Magnesia (280 lb.)	23.4	61.1	12.8	101	2949	32.2	42.9	26.7	26.8
15	As 5, and 412 lb. Sulphate of Ammonia all applied in Autumn	28.8	61.1	15.7	108	3262	36.6	45.5	27.8	28.2
16	As 5, and 550 lb. Nitrate of Soda	26.3	61.4	14.5	137	4079	44.8	36.3	29.9††	35.2††
17	Minerals alone as 5 or 412 lb. Sulphate of Ammonia alone	M 6.8	60.4	3.7	54	716	9.0	45.9	A27.8	27.7
18	in alternate years	A18.2	61.4	10.0	88	2236	24.5	44.5	M14.1	12.5
19	Rape Cake (1889 lb.)	26.1	61.6	14.3	97	2801	31.2	48.8	20.8‡	22.0‡
20	As 7, without Super.	29.9	61.5	16.4	84	3407	36.2	47.4	16.5§	18.6§

† Includes straw, cavings and chaff. 1929, bottom portion fallowed.

** 26 years only, 1900-1925. †† 41 years only, 1885-1925. ‡ 33 years only, 1893-1925. § 18 years only, 1906-1925 (no crop in 1912 and 1914).

§§ Complete Mineral Manure : 3½ cwt. Super, 200 lb. Sulph. Potash, 100 lb. Sulph. Soda, 100 lb. Sulph. Magnesia.

Sulphate of Ammonia is applied as to one-third in Autumn and two-thirds in Spring, except for plot 15. Nitrate of Soda is all given in Spring, there being two applications at an interval of a month on Plot 16.

In 1926 and 1927 the crop was confined to the lower (eastern) part of the field, the upper part being completely fallowed for 2 years. This was the first complete fallow on this area since the experiment began in 1843. In October, 1927, the upper or western part was sown with wheat, and again in 1928, the yields for 1929 being given above.

PERMANENT BARLEY PLOTS.
Hoos Field, 1929.

Plot.	Manuring. (Amounts stated are per acre.)	Grain, per acre.		76 Years' Average 1852-1928	Straw, per acre.		76 Years' Average 1852-1928
		Plumage Archer Cwt.	Spratt Archer Cwt.	Dressed Grain per acre bush.‖	Plumage Archer Cwt.	Spratt Archer Cwt.	Total Straw per acre cwt.†
1O	Unmanured	2.4	2.5	13.4	1.9	2.0	7.8
2O	Superphosphate only (3½cwt.)	5.0	4.8	19.0	3.8	3.7	9.8
3O	Alkali Salts only (200lb. Sulphate of Potash; 100lb. Sulphate of Soda; 100 lb. Sulphate of Magnesia).	3.9	3.8	14.3	3.2	3.4	8.7
4O	Complete Minerals; as 3O with Superphosphate (3½ cwt.)	6.2	7.3	19.0	5.4	5.9	11.2
5O	Potash (200 lb.) and Superphosphate (3½ cwt.)	3.0	2.9	15.5	3.7	4.3	9.4
1A	Ammonium Salts only (206 lb. Sulphate of Ammonia)	1.8	1.9	23.7	1.5	1.4	13.7
2A	Superphosphate and Amm. Salts	8.7	9.0	35.8	7.4	7.4	20.4
3A	Alkali Salts and Amm. Salts	3.6	2.3	25.8	3.9	2.4	16.0
4A	Complete Minerals and Amm. Salts	10.0	9.4	39.3	8.7	7.9	23.6
5A	Potash, Super. and Amm. Salts	4.4	4.4	33.8	5.5	4.5	21.7
1AA	Nitrate of Soda only (275 lb.)	3.5	2.7	24.3*	3.3	2.6	15.4*
2AA	Superphosphate and Nitrate of Soda	10.9	11.2	38.8*	8.0	10.4	23.1*
3AA	Alkali Salts and Nitrate of Soda	3.7	4.3	24.5*	3.7	4.3	16.6*
4AA	Complete Minerals and Nitrate of Soda	**10.1**	9.2	37.7*	**9.1**	8.8	23.6*
1AAS	As Plot 1AA and Silicate of Soda (400 lb.)	2.6	2.4	30.2*	2.4	2.3	18.2*
2AAS	As Plot 2AA and Silicate of Soda (400 lb.)	11.4	11.3	39.7*	8.0	8.0	23.9*
3AAS	As Plot 3AA and Silicate of Soda (400 lb.)	4.0	5.5	31.2*	4.1	4.9	19.9*
4AAS	As Plot 4AA and Silicate of Soda (400 lb.)	10.0	11.1	39.9*	10.3	9.9	25.4*
1C	Rape Cake only (1000 lb.)	3.5	4.5	35.5	2.8	4.5	20.6
2C	Superphosphate and Rape Cake	8.1	9.8	38.1	7.5	8 7	22.0
3C	Alkali Salts and Rape Cake	5.4	6.2	33.7	5.0	5.3	20.4
4C	Complete Minerals and Rape Cake	8.1	11.0	37.5	9.3	9.8	22.6
7-1	Unmanured (after dung (14 tons) for 20 years 1852-71)	6.0	5.9	22.5‡	5.5	5.1	13.5‡
7-2	Farmyard Manure (14 tons)	14.8	15.1	44.6	14.3	13.4	28.1
6-1	Unmanured since 1852	2.6	3.7	14.7	2.8	3.2	8.6
6-2	Ashes from Laboratory furnace	2.7	3.3	15.7	2.3	3.1	9.3
1N	Nitrate of Soda only (275 lb.)	1.3	2.1	28.7§	2.5	3.1	17.8§
2N	Nitrate of Soda only (275 lb.)	3.8	4.2	31.7§§	4.0	4.2	20.0§§

1 cwt. = 2.15 bushels.
‖ 1912, all plots were fallowed. †Total straw includes straw, cavings and chaff.
* 60 years, 1868-1928. ‡ 56 years, 1872-1928. § 75 years, 1853-1928. §§ 69 years, 1859-1928.

The field this year was sown across by the half-drill strip method in wide spaced drills to facilitate cleaning operations. Total sheaf weight only was taken and the Grain/Straw ratio determined in samples; Grain and Straw per acre being determined from this ratio. The sample for Plot 4AA (Plumage Archer) was lost, and the figures given in heavy type are derived from the (logarithmic) average Grain/Straw ratio for the seven remaining Plots in Series AA and AAS.

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Second Series: Replicated Experiments.

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

Effect of Superphosphate and Sulphate of Potash.

Long Hoos (Section 4), 1929.

A. Single Dressing. **W.** **B. Double Dressing.**

I.	N	C	O	M	S
II.	O	M	S	C	N
II.	S	O	C	N	M
IV.	M	S	N	O	C
V.	C	N	M	S	O

I.	N	U	M	S	C
II.	S	C	N	M	U
III.	M	S	U	C	N
IV.	C	N	S	U	M
V.	U	M	C	N	S

System of Replication: 2 Latin Squares.
Area of Each Plot: 1/40th acre.
Testing Sulphate (S) and Muriate (M) of Ammonia, Cyanamide (C), Urea (U) and Nitrate of Soda (N).
Rates: 0.2 and 0.4 cwt. of N per acre. Single Urea replaced by No Nitrogen.
Each Plot divided into 4 sub-plots each 1/160th acre, for the treatments—(1) No Potash or Phosphate, (2) Sulphate of Potash (.6 cwt. K_2O per acre), (3) Superphosphate (.4 cwt P_2O_5 per acre), (4) Sulphate of Potash and Superphosphate. Yields of sub-plots estimated by sampling method only.
Barley sown: March 12. Harvested: August 10.
Variety: "Plumage Archer" (3-4 bushels per acre). Manures applied: March 14-16.
Previous Crop: Barley.

Actual Weights in lb. Per Whole Plot.

	Grain.									
	Single Dressing.					Double Dressing.				
Row.	O	S	M	N	C	U	S	M	N	C
I.	51.50	64.50	62.25	75.50	56.75	64.25	59.50	66.00	79.25	63.00
II.	59.00	59.75	57.50	71.25	66.50	69.75	77.00	69.50	77.00	71.75
III.	55.75	66.25	75.25	64.50	69.75	75.50	71.50	82.75	72.75	75.50
IV.	63.00	61.75	66.50	76.50	75.00	66.00	77.50	69.50	80.50	79.25
V.	51.50	71.25	68.75	71.25	63.00	80.25	67.75	78.75	80.25	78.50
	Straw.									
I.	47.25	66.75	60.00	81.50	58.75	57.75	58.50	61.50	74.00	62.50
II.	62.00	57.50	57.25	79.75	65.50	70.25	70.75	71.50	81.75	71.75
III.	51.00	81.50	72.75	65.00	66.25	69.50	68.50	83.00	75.25	76.50
IV.	64.50	57.75	65.25	78.00	75.75	63.00	73.25	68.25	79.75	80.50
V.	59.75	70.75	68.25	70.00	62.75	76.00	77.75	72.75	73.00	67.75

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Barley: Long Hoos, 1929 (contd.)

Summary of Results by the usual Threshing Method.—Nitrogenous Comparisons.

A. Single Dressing.

	No Nitrogen.	Sulphate of Amm.	Muriate of Amm.	Nitrate of Soda.	Cyana-mide.	Mean.	Standard Error.
Grain, cwt. per acre	20.1	23.1	23.6	25.6	23.6	23.2	0.88
Grain, per cent. ..	86.4	99.6	101.6	110.5	101.9	100.0	3.79
Straw, cwt. per acre	20.3	23.9	23.1	26.7	23.5	23.5	1.06
Straw, per cent. ..	86.4	101.6	98.3	113.7	100.0	100.0	4.49

Significant response to all nitrogenous manures with both grain and straw. The yield on the Nitrate of Soda plots was significantly better than the mean yield of the plots receiving the other three dressings.

B. Double Dressing.

	Urea.	Sulphate of Amm.	Muriate of Amm.	Nitrate of Soda.	Cyana-mide.	Mean.	Standard Error.
Grain, cwt. per acre	25.4	25.2	26.2	27.8	26.3	26.2	0.44
Grain, per cent. ..	97.0	96.3	100.0	106.3	100.4	100.0	1.68
Straw, cwt. per acre	24.0	24.9	25.5	27.4	25.6	25.5	0.71
Straw, per cent. ..	94.3	97.7	100.0	107.5	100.6	100.0	2.80

Plots treated with Nitrate of Soda gave significantly higher yield than all the others.

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Summary of Results by Sampling Method.
Table of Separate Yields.

Grain, cwt. per acre.	A. Single Dressing.					
	No Nitrogen.	Sulphate of Ammonia.	Muriate of Ammonia.	Nitrate of Soda.	Cyana-mide.	Standard Errors.
Without Phosphate and Potash	19.5	25.4	24.2	23.5	22.9	1.40
With Superphosphate	21.5	24.3	23.9	26.0	19.1	
With Sulphate of Potash ..	21.5	20.5	22.6	25.2	23.8	
With Potash and Phosphate ..	20.1	24.3	23.4	24.1	22.5	
Mean	20.7	23.6	23.5	24.7	22.1	0.57
Straw, cwt. per acre.						
Without Phosphate and Potash	19.1	25.7	25.7	23.6	23.7	1.57
With Superphosphate	21.6	24.3	23.3	26.4	19.6	
With Sulphate of Potash ..	21.6	20.5	22.6	27.2	24.0	
With Potash and Phosphate ..	20.4	24.3	24.7	25.7	23.1	
Mean	20.7	23.7	24.1	25.7	22.6	1.42

Grain, cwt. per acre.	B. Double Dressing.					
	Urea.	Sulphate of Ammonia.	Muriate of Ammonia.	Nitrate of Soda.	Cyana-mide.	Standard Errors.
Without Phosphate and Potash	25.8	26.0	26.8	28.3	29.6	1.26
With Superphosphate	25.0	29.1	25.5	29.6	27.6	
With Sulphate of Potash ..	23.7	24.2	27.6	26.6	26.5	
With Potash and Phosphate ..	25.1	24.8	25.8	27.2	26.3	
Mean	24.9	26.0	26.4	27.9	27.5	0.83
Straw, cwt. per acre.						
Without Phosphate and Potash	25.5	25.4	25.9	28.9	32.1	1.41
With Superphosphate	25.1	29.3	24.4	29.6	30.9	
With Sulphate of Potash ..	24.0	23.2	27.1	28.3	27.9	
With Potash and Phosphate ..	26.3	24.3	24.3	27.6	27.4	
Mean	25.3	25.6	25.4	28.6	29.6	0.91

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Barley : Long Hoos, 1929 (contd.)

Potassic and Phosphatic Comparisons.—(Yields Estimated by Sampling).

A. Single Dressing (including No Nitrogen).

GRAIN.	Average Yield in cwt. per acre.		Average Yield per cent.	
	Without Phosphate.	With Phosphate.	Without Phosphate.	With Phosphate.
Without Sulphate of Potash	23.1	23.0	100.8	100.2
With Sulphate of Potash	22.7	22.9	99.1	99.9

Mean—22.9.
Standard Error—0.63 or 2.74%

STRAW.	Average Yield in cwt. per acre.		Average Yield per cent.	
	Without Phosphate.	With Phosphate.	Without Phosphate.	With Phosphate.
Without Sulphate of Potash	23.6	23.0	100.8	98.6
With Sulphate of Potash	23.2	23.7	99.2	101.3

Mean—23.4. Standard Error—0.70 or 3.00%.

No significant effects of Phosphate or Potash with grain or straw.

B. Double Dressing.

GRAIN.	Average Yield in cwt. per acre.		Average Yield per cent.	
	Without Phosphate.	With Phosphate.	Without Phosphate.	With Phosphate.
Without Sulphate of Potash	27.3	27.4	102.8	103.0
With Sulphate of Potash	25.7	25.8	96.8	97.3

Mean—26.6. Standard Error—0.57 or 2.13%.

STRAW	Average Yield in cwt. per acre.		Average Yield per cent.	
	Without Phosphate.	With Phosphate.	Without Phosphate.	With Phosphate.
Without Sulphate of Potash	27.6	27.9	102.5	103.6
With Sulphate of Potash	26.1	26.0	97.1	96.8

Mean—26.9. Standard Error—0.63 or 2.34%.

With both grain and straw Potash has depressed the yield significantly, while Phosphate has been ineffective.

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Winter Oats : Comparison of Nitrogenous Fertilisers, Sulphate of Ammonia and Cyanamide, in all combinations of Autumn and Spring dressings.

Long Hoos (Section 2), 1929.

W

A								B								C							
4	2	13	16	3	11	9	1	2	3	4	5	9	1	11	7	5	8	7	13	3	12	10	9
10	7	5	6	14	12	15	8	12	6	10	15	14	13	16	8	2	14	16	6	4	11	15	1

System of Replication :—3 randomised blocks of 16 plots each.

Area of Each Plot : 1/40th acre.

Unit dressing at a rate equivalent to ¾ cwt. Cyanamide per acre.

System of Manuring : All combinations of Sulphate of Ammonia and equivalent Cyanamide, applied in Autumn and Spring, as shown in key to treatments.

Sulphate of Ammonia applied : September 24, March 19.

Cyanamide applied : September 14, March 18.

Variety : Grey Winter.

Sown : September 24.

Harvested : August 7.

Previous Crop : Barley.

Key to Treatments.

Spring Dressings.

Autumn Dressings	None.	Sulphate.	Cyanamide.	Both.
None ..	1	4	5	10
Sulphate	2	6	7	12
Cyanamide	3	9	11	15
Both ..	8	13	14	16

Actual Weight in lb.—Total Grain.

Blocks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	37.75	34.75	34.75	32.50	35.75	37.25	34.50	31.50	43.00	25.00	41.50	26.00	37.00	34.00	32.50	40.50
B	42.50	40.75	39.50	36.75	40.25	30.75	44.50	45.00	38.50	32.50	51.25	31.00	37.25	29.75	41.50	40.50
C	39.25	42.75	34.75	38.25	40.50	30.75	37.50	37.75	31.00	27.00	40.50	31.25	38.00	44.00	32.50	37.25

Actual Weight in lb.—Total Straw.

Blocks.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	63.75	68.75	57.75	53.50	66.25	71.00	74.25	71.00	78.50	62.50	76.75	69.75	86.50	69.75	73.25	83.75
B	66.75	61.50	66.25	68.75	75.00	68.00	87.50	73.25	86.75	73.50	81.25	78.25	79.75	79.25	77.50	81.25
C	58.50	69.75	53.75	71.50	77.50	78.25	68.00	64.75	72.00	62.75	65.75	63.25	73.00	74.25	72.25	76.25

Summary of Results.

		Grain—cwt. per acre.					Grain—per cent.				
	Average Yield.	Spring Dressings.				Mean.	Spring Dressings.				Mean.
		None.	Sulphate.	Cyanamide.	Both.		None.	Sulphate.	Cyanamide.	Both.	
Autumn Dressings.	None ..	14.2	12.8	13.9	10.1	12.7	108.4	97.5	105.7	76.7	97.1
	Sulphate ..	14.1	11.8	13.9	10.5	12.5	107.3	89.6	105.7	80.1	95.7
	Cyanamide ..	13.0	13.4	15.9	12.7	13.7	98.9	102.1	120.9	96.6	104.6
	Both ..	13.6	13.4	12.8	14.1	13.5	103.7	101.8	97.8	107.3	102.6
	Mean ..	13.7	12.8	14.1	11.8	13.1	104.6	97.8	107.5	90.2	100.0

Standard Error—0.84 cwt. or 6.39 per cent.

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Winter Oats : Long Hoos, 1929 (contd.)

Average Yield.		Straw—cwt. per acre.					Straw—per cent.				
		Spring Dressings.				Mean.	Spring Dressings.				Mean.
		None.	Sulphate.	Cyanamide.	Both.		None.	Sulphate.	Cyanamide.	Both.	
Autumn Dressings.	None ..	22.5	23.1	26.0	23.7	23.8	88.1	90.3	102.0	92.6	93.2
	Sulphate ..	23.8	25.9	27.3	25.1	25.5	93.2	101.3	107.1	98.5	100.0
	Cyanamide	21.2	28.2	26.6	26.5	25.6	82.8	110.6	104.3	103.9	100.4
	Both ..	24.9	28.5	26.6	28.7	27.2	97.4	111.5	104.0	112.4	106.4
	Mean ..	23.1	26.4	26.6	26.0	25.5	90.4	103.4	104.3	101.9	100.0

Standard Error—1.16 cwt. or 4.56 per cent.

With grain there was a significant depression where Sulphate of Ammonia was applied in Spring, which was materially less on the plots that had had Autumn Cyanamide. The yield was depressed by the application of Spring Cyanamide to those plots which did not receive Cyanamide in the Autumn; those which had Autumn Cyanamide responded moderately to the Spring Cyanamide.

With straw there were significant responses to all four single dressings, but no further response to the double dressing. The interaction of Autumn Cyanamide and Spring Sulphate was significant, in that the response to Autumn Cyanamide only appeared on the plots that were dressed with Sulphate in the Spring, while on the other hand, the response to Spring Sulphate was only evident on the plots that had been previously dressed with Autumn Cyanamide.

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WHEAT.

VARIETY TRIAL.

Nitrogenous Fertilisers as Top Dressing: Sulphate of Ammonia. Muriate of Ammonia.

Each in single and double dressings.

Long Hoos (Section 6), 1929.

W

	Ml, Sq, Y, Sw	Sw, Y, Sq, Ml	Sq, Y, Ml, Sw	Sq, Sw, Ml, Y	Ml, Sq, Y, Sw	Sw, Ml, Sq, Y	Y, Ml, Sw, Sq	Ml, Y, Sw, Sq
C	S, E & L	O1	O2	M, L	M, E & L	M, E	S, L	S, E
B	M, L	S, E	S, L	S, E & L	M, E	O1	O2	M, E & L
A	S, E	M, E & L	S, L	S, E & L	M, L	M, E	O1	O2

SYSTEM OF REPLICATION: 3 randomised blocks of 32 plots each.
AREA OF EACH PLOT: 6/325th acre.
S=Sulphate of Ammonia } at the rate of 0.2 cwt.
M=Muriate of Ammonia } Nitrogen per acre.
O1, O2=No Top Dressing.
E=Early Application (March 18).
L=Late Application (May 13).
E & L=Early and Late Application, thus giving double dressing.

Strips running across the blocks were allotted to 4 varieties as indicated in plan.
Ml=Million III.
Y=Yeoman II.
Sq=Square-Head's Master.
Sw=Swedish Iron.
Wheat Sown: October 3, 1928.
Harvested: August 26, 1929.
Previous Crop: Barley.

Actual Weights in lb.—Total Grain.

Variety.	Blocks.	O1.	O2.	S.E.	S.L.	M.E.	M.L.	S. E. & L.	M. E & L.
Million III. ..	A	31.25	28.75	51.00	32.75	36.00	34.00	29.25	47.25
	B	29.50	25.75	43.50	35.75	35.75	52.00	32.25	29.00
	C	39.25	31.75	27.00	30.75	35.25	31.00	59.25	30.25
Average in cwt. per acre		15.0		19.6	16.0	17.2	18.9	19.5	17.2
Yeoman II ..	A	29.50	28.00	53.50	40.25	35.25	33.25	31.00	44.25
	B	26.50	25.00	42.50	40.75	33.50	49.75	32.50	33.75
	C	40.50	37.25	28.00	27.00	25.50	30.75	57.00	31.25
Average in cwt. per acre		15.1		20.0	17.4	15.2	18.3	19.4	17.6
Square-Head's Master ..	A	29.75	29.50	44.50	40.25	36.25	32.50	38.25	41.25
	B	25.25	28.00	41.50	39.00	36.25	46.75	37.00	36.75
	C	35.00	37.75	35.75	27.25	22.50	35.50	49.00	32.25
Average in cwt. per acre		14.9		19.6	17.2	15.3	18.5	20.0	17.8
Swedish Iron ..	A	34.00	34.00	54.50	40.00	35.25	31.50	37.50	56.75
	B	32.25	31.50	47.00	43.75	31.25	51.25	36.75	35.25
	C	41.00	35.25	34.00	35.00	32.00	36.75	55.50	25.75
Average in cwt. per acre		16.8		21.8	19.1	15.9	19.3	20.9	19.0

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Wheat : Long Hoos, 1929 (contd.).

Actual Weights in lb.—Total Straw.

Variety.	Blocks.	O1	O2.	S.E.	S.L.	M.E.	M.L.	S. E & L.	M. E & L.
Million III ..	A	43.25	37.25	65.75	48.00	52.50	49.00	52.75	66.50
	B	43.25	36.50	62.25	50.00	54.00	66.75	55.75	48.75
	C	60.75	47.75	43.75	51.50	58.50	51.75	86.25	59.25
Average in cwt. per acre		21.7		27.7	24.1	26.6	27.0	31.4	28.1
Yeoman II ..	A	34.50	37.50	69.00	54.00	51.50	46.00	52.00	46.75
	B	34.50	36.25	56.50	57.50	51.25	62.50	54.50	57.50
	C	55.00	53.00	44.75	43.00	45.00	50.75	84.50	64.75
Average in cwt. per acre		20.2		27.4	24.9	23.8	25.7	30.8	27.2
Square-Head's Master ..	A	41.75	45.25	63.00	56.50	55.75	57.25	63.50	63.00
	B	35.25	40.50	64.75	63.25	54.75	62.75	64.00	57.75
	C	55.25	60.75	62.75	43.75	58.75	61.75	80.00	62.25
Average in cwt. per acre		22.5		30.7	26.4	27.3	29.3	33.4	29.5
Swedish Iron ..	A	45.75	47.25	81.00	55.25	50.00	40.75	61.25	79.75
	B	43.00	41.25	66.50	60.00	48.00	69.50	63.75	58.00
	C	57.25	52.25	54.25	57.25	56.50	59.50	86.50	56.50
Average in cwt. per acre		23.1		32.5	27.8	24.9	27.4	34.1	31.3

Summary of Results.—(a) Effect of Top Dressing.

Grain.	No Nitrogen	Sulphate Early	Sulphate Late.	Muriate Early.	Muriate Late.	Sulphate Early and Late.	Muriate Early and Late.	Mean.	Standard Error.
Cwt. per acre	15.4	20.3	17.4	15.9	18.7	20.0	17.9	17.6	2.29
Per cent. ..	87.6	114.9	98.9	90.2	106.3	113.2	101.4	100.0	12.98
Straw.									
Cwt. per acre	21.9	29.6	25.8	25.6	27.3	32.4	29.0	26.7	2.33
Per cent. ..	81.9	110.8	96.6	96.1	102.4	121.5	108.8	100.0	8.74

Summary of Results.—(b) Varietal Response.

Grain.	Million III.	Yeoman II.	Square-Head's Master.	Swedish Iron.	Mean.	Standard Error.
Cwt. per acre ..	17.3	17.3	17.3	18.7	17.6	0.35
Per cent. ..	98.1	97.9	98.0	106.0	100.0	1.98
Straw.						
Cwt. per acre ..	26.0	25.0	27.7	28.0	26.7	0.54
Per cent. ..	97.5	93.8	103.7	105.0	100.0	2.04

Yield of Swedish Iron significantly greater than that of other varieties in grain, while Square-Head's Master and Swedish Iron are superior in straw. Significant responses to both early and late top dressings in the case of straw, but with grain, while numerically large, the responses are insignificant on account of the high Standard Error. Sulphate appears to do better than Muriate, but the difference is not significant.

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CULTIVATION EXPERIMENT.

Barley, Great Harpenden, 1929.

OLD SET.

E

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

TREATMENTS :—
A = Ridged Seed bed.
B = Simar rototiller, then ridged.
C = Simar rototiller, but left flat.
D = Simar rototiller, left flat, and Simar implement used again between rows in July.

SYSTEM OF REPLICATION : 4 randomised blocks of 4 plots each.
Area harvested of each Plot : 1/40th acre.
Barley sown : March 14.
Harvested : August 7-8.
VARIETY : " Standwell," 3-4 bushels per acre.

These were treatments in 1928—no further treatments in 1929. Whole ploughed March 12-13. All plots had dressing of 1 cwt. Sulphate of Ammonia, 2 cwt. Superphosphate and 1 cwt. Muriate of Potash per acre, applied March 27.
Previous Crop : Swedes.

Actual Weights in lb.

Blocks.	Grain.				Straw.			
	A	B	C	D	A	B	C	D
I. ..	74.50	69.75	76.25	79.00	97.50	85.25	102.75	125.00
II. ..	70.75	74.75	59.25	82.50	95.25	109.25	90.75	115.50
III. ..	75.00	75.50	69.25	83.25	97.50	111.50	85.75	114.25
IV. ..	84.50	85.25	73.50	73.25	101.50	111.25	96.50	106.75
Total ..	304.75	305.25	278.25	318.00	391.75	417.25	350.75	461.50

Summary of Results.

Average Yield.	1928 Treatment.				Mean.	Standard Error.
	Ridged.	Simar and Ridged.	Simar and Flat.	Simar flat and Simar.		
Grain, cwt. per acre ..	27.2	27.2	24.8	28.4	26.9	1.11
Grain, per cent. ..	101.1	101.2	92.3	105.5	100.0	4.13
Straw, cwt. per acre ..	35.0	37.2	33.5	41.2	36.7	1.71
Straw, per cent. ..	95.2	101.4	91.3	112.1	100.0	4.67

The plots doubly Simared in 1928 have given a significantly higher yield of straw than the others, but the advantage in grain is not significant.

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CULTIVATION EXPERIMENT.

Barley, Great Harpenden, 1929.

NEW SET.

I.				II.				III.				IV.			
E	F	G	H	F	H	E	G	G	E	H	F	H	G	F	E

TREATMENTS :—
E and G = Ordinary Spring Cultivation, March 11.
F and H = Simar Spring Cultivation, March 11.
All plots had dressing of 1 cwt. Sulphate of Ammonia, 2 cwt. Superphosphate and 1 cwt. Muriate of Potash per acre applied March 27.
Previous Crop : Swedes.

SYSTEM OF REPLICATION :—4 randomised blocks of 4 plots each.
Area harvested of each plot : 1/40th acre.
Barley sown : March 14.
Harvested : August 7-8.
VARIETY : "Standwell," (3-4 bushels per acre).

Actual Weights in lb.

Blocks.	Grain.				Straw.			
	E	G	F	H	E	G	F	H
I. ..	91.75	83.25	80.50	77.75	128.25	134.75	109.00	137.75
II. ..	80.50	90.75	83.00	83.75	143.50	120.25	126.00	127.25
III. ..	84.50	76.50	84.25	85.25	122.00	109.50	111.25	122.75
IV. ..	89.75	86.50	90.75	85.25	124.25	124.00	129.25	116.25
Total ..	346.50	337.00	338.50	332.00	518.00	488.50	475.50	504.50
	683.5		670.5		1006.5		980.0	

Summary of Results.

Average Yield.	Ordinary Spring Cultivation.	Simar Spring Cultivation	Mean.	Standard Error.
Grain, cwt. per acre ..	30.5	29.9	30.2	0.57
Grain, per cent.	101.0	99.0	100.0	1.90
Straw, cwt. per acre ..	44.9	43.7	44.3	1.19
Straw, per cent.	101.3	98.7	100.0	2.69

The difference in yield is not significant.

https://doi.org/10.23637/ERADOC-1-111 *pp 23*

POTATOES.

Nitrogenous Fertiliser: Sulphate of Ammonia.

Potassic Fertilisers: Sulphate and Muriate of Potash and Potash Manure Salts (30%).

Each in single and double dressings.

Superphosphate.

Long Hoos (Section 1), 1929.

	W								
	G			D			A		
	— / 5M	9P / —	— / 8S	— / 6M	— / 8P	— / 5P	9S / —	4M / —	— / 7P
	3 / —	— / 2	4P / —	— / 3	9M / —	7S / —	3 / —	— / 1	2 / —
	7M / —	6S / —	— / 1	1 / —	— / 2	4S / —	— / 8M	6P / —	5S / —
	— / 4M	5S / —	— / 6P	— / 6S	9P / —	— / 2	8P / —	— / 4S	3 / —
H	3 / —	— / 9S	8M / —	— / 8S	— / 4P	— / 5M	— / 5P	1 / —	— / 6M	B
	— / 2	7P / —	1 / —	— / 3	1 / —	7M / —	2 / —	— / 7S	9M / —	
	4S / —	— / 1	8P / —	— / 8M	— / 3	— / 6P	— / 5M	8S / —	2 / —	
	5P / —	9M / —	6M / —	— / 1	— / 9S	— / 2	1 / —	— / 9P	— / 4P	
	— / 7S	— / 2	3 / —	— / 4M	7P / —	5S / —	— / 7M	3 / —	6S / —	
	I			F			C		

Key to Treatments.

Treatment No.	1	2	3	4	5	6	7	8	9
S/Ammonia	0	1	2	0	1	2	0	1	2
Potash ..	0	0	0	1	1	1	2	2	2

SYSTEM OF REPLICATION: 9 randomised blocks of 9 plots each. Each plot divided into 2 sub-plots.

AREA OF EACH SUB-PLOT: 1/90th acre.

TREATMENTS: Sulphate of Ammonia at the rate of 0, 0.3 and 0.6 cwt. Nitrogen per acre, and Potash at the rate of 0, 0.5 and 1.0 cwt. K_2O per acre in all combinations as shown in Key to Treatments.

S = Sulphate of Potash.

M = Muriate of Potash.

P = Potash Manure Salts (30%).

Superphosphate at the rate of 0.4 cwt. P_2O_5 per acre is applied to one out of each pair of sub-plots, indicated by the treatment symbol occurring on that half.

All plots received Farmyard Manure at the rate of 14 tons per acre, approximately, ploughed in January 5-9.

Artificials applied: April 12-15.

Potatoes planted: April 16-24. Lifted: September 23-25.

VARIETY: Ally.

Previous Crop: Barley.

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Potatoes : Long Hoos, 1929 (contd.)

Actual Weights in lb.—Sub-Plots with Phosphate.

S/Amm.	Potash.	A	B	C	D	E	F	G	H	I
Quantities										
0	0	111.00	121.00	127.00	123.75	106.00	124.75	121.25	105.50	133.25
0	1	105.75	110.75	117.50	140.25	123.00	118.50	128.00	140.50	138.75
0	2	89.25	126.25	109.25	119.25	112.00	153.50	133.50	112.25	141.00
1	0	121.25	138.25	118.00	137.75	155.50	118.75	148.50	154.50	144.00
1	1	140.00	145.50	153.00	121.75	152.50	140.00	170.00	145.50	154.00
1	2	153.25	164.00	145.50	131.25	141.25	152.25	125.75	144.00	136.25
2	0	131.50	150.25	156.00	149.75	125.00	148.75	164.25	155.50	150.00
2	1	159.75	162.00	136.75	131.00	140.50	181.50	164.25	168.25	161.75
2	2	153.75	157.75	162.50	160.50	170.75	158.75	146.25	169.00	178.00

Actual Weights in lb.—Sub-Plots without Phosphate.

S/Amm.	Potash.	A	B	C	D	E	F	G	H	I
Quantities										
0	0	111.50	119.25	115.25	121.75	96.00	111.00	121.50	97.75	117.50
0	1	107.00	118.50	98.75	119.75	126.75	133.25	123.75	125.00	136.75
0	2	84.25	117.00	111.00	123.25	109.50	119.75	116.50	114.25	138.75
1	0	101.00	129.25	113.25	142.25	136.25	113.50	133.75	132.25	141.25
1	1	142.00	141.25	126.50	105.50	131.75	120.25	140.75	125.75	145.00
1	2	142.50	139.25	134.75	126.25	132.75	110.75	121.50	135.00	145.25
2	0	128.00	148.00	119.00	133.75	125.00	128.25	152.50	138.25	132.75
2	1	146.50	135.25	108.00	138.50	122.75	137.50	146.75	137.00	138.50
2	2	131.00	128.25	139.75	134.75	152.50	142.00	136.50	153.25	135.00

Summary of Average Yields.—Separate Treatments.

Tons per acre.		Without Superphosphate.			With Superphosphate.		
		No S/Amm.	Single S/Amm.	Double S/Amm.	No S/Amm.	Single S/Amm.	Double S/Amm.
No Potash		4.52	5.10	5.38	4.79	5.52	5.94
Single Potash	Sulphate	5.02	5.20	5.06	5.22	5.70	5.91
	Muriate	4.89	5.34	5.52	4.89	6.37	6.09
	Potash Salts	4.68	5.25	5.64	4.94	5.64	6.82
Double Potash	Sulphate	5.08	5.21	5.71	5.18	5.52	6.45
	Muriate	4.51	5.20	5.33	4.75	6.02	6.65
	Potash Salts	4.26	5.50	5.74	4.75	5.78	6.42

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Summary of Significant Results.

	Average Yield, tons per acre.						
	Without Superphosphate.			With Superphosphate.			Standard Error.
	No Sulph. Amm.	Single Sulph. Amm.	Double Sulph. Amm.	No Sulph. Amm.	Single Sulph. Amm.	Double Sulph. Amm.	
No Potash	4.52	5.10	5.38	4.79	5.52	5.94	0.105
Single Potash	4.86	5.26	5.41	5.01	5.90	6.28	
Double Potash ..	4.62	5.30	5.59	4.89	5.77	6.51	

	Average Yield per cent.						
	Without Superphosphate.			With Superphosphate.			Standard Error.
	No Sulph. Amm.	Single Sulph. Amm.	Double Sulph. Amm.	No Sulph. Amm.	Single Sulph. Amm.	Double Sulph. Amm.	
No Potash	84.1	95.0	100.2	89.2	102.8	110.6	1.96
Single Potash	90.6	98.0	100.6	93.4	109.9	116.9	
Double Potash ..	86.0	98.8	104.2	91.1	107.5	121.1	

Average Yield.	Without Super.	With Super.	Mean.	Standard Error.
Tons per acre ..	5.12	5.62	5.37	0.035
Per cent. ..	95.3	104.7	100.0	0.65

Significant responses to single and double dressings of Sulphate of Ammonia, and to single dressing of Potash. The double dressing of Potash produced no further increase in yield. Significant response to Superphosphate, the benefit being moderate on the plots without Nitrogen and Potash, but large on those plots receiving the highest dressings. No qualitative differences in the kind of Potash supplied.

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SUGAR BEET.

MANURING.

Nitrogenous Fertilisers: Sulphate of Ammonia, Nitrate of Soda.
Chloride Dressings: Muriate of Potash, Salt.
Superphosphate.

VARIETAL TEST.

Klein Wanzleben—Kuhn (Johnson's Perfection).

Long Hoos (Section 5), 1929.

	J	K	J	K	K	N J	K	J	J	K	J	K	
I.	9	10	11	6	8	3	2	7	5	1	12	4	P
II.	3	5	1	12	11	7	9	6	2	4	8	10	O
III.	1	9	7	2	6	10	4	12	3	8	5	11	O
IV.	8	2	12	3	4	6	10	1	7	5	11	9	P
V.	4	3	10	9	1	5	7	8	12	11	2	6	O
VI.	6	4	3	7	5	9	12	2	11	10	1	8	P
VII.	12	8	5	10	2	11	1	9	4	7	6	3	O
VIII.	2	1	4	8	9	12	11	10	6	3	7	5	P
IX.	10	11	8	1	7	4	6	5	9	2	3	12	P
X.	11	7	6	4	10	2	5	3	8	12	9	1	O
XI.	7	12	9	5	3	1	8	11	10	6	4	2	O
XII.	5	6	2	11	12	8	3	4	1	9	10	7	P

SYSTEM OF REPLICATION: Latin Square.

AREA OF EACH PLOT: 1/90th acre.

TREATMENTS: Sulphate of Ammonia and Nitrate of Soda with seed at the rate of 0.4 cwt. N per acre. Muriate of Potash at the rate of 0.8 cwt. Cl, and Salt in equivalent amount, alone and in combination.

J, K = Pairs of strips one way allotted at random to varieties Kuhn (Johnson's Perfection) and Klein Wanzleben respectively.

O, P = Pairs of strips the other way allotted at random to No Superphosphate and Superphosphate at the rate of 0.6 cwt. P_2O_5 per acre.

The 12 plots of each Nitrogenous and Potassic treatment had 6 allotted to each variety, of which half had no Superphosphate and half had Superphosphate.

All plots had Basal dressing of St. Albans refuse (14 tons per acre) applied March 11-13.

Manures applied: May 2-3.

Seed sown: May 4 (13-16 lb. per acre).

Roots lifted: Oct. 29—Nov. 6.

Previous Crop: Barley.

Key to Treatments.

Manure.	1	2	3	4	5	6	7	8	9	10	11	12
S/Amm.		×			×			×			×	
N/Soda			×			×			×			×
M/Potash . .				×	×	×				×	×	×
Salt							×	×	×	×	×	×

Actual Weights in lb.—Roots.

Row.	1	2	3	4	5	6	7	8	9	10	11	12
I.	174.25	193.25	239.75	116.75	214.75	223.75	203.00	229.00	210.50	190.25	240.25	212.75
II.	187.25	200.00	179.25	153.75	197.50	207.00	183.25	200.75	207.00	117.25	220.50	198.75
III.	160.25	214.75	209.50	169.75	184.75	220.50	196.75	180.75	193.50	165.75	123.00	217.00
IV.	203.00	159.25	216.50	178.25	176.00	199.25	208.00	182.75	123.00	166.50	204.25	222.50
V.	169.25	163.00	161.25	142.75	196.25	114.25	184.25	208.25	207.25	190.75	164.25	211.25
VI.	190.00	229.75	229.50	154.50	195.25	181.25	198.00	130.50	211.50	155.25	242.50	218.00
VII.	169.25	183.25	131.25	179.50	194.50	213.00	164.25	167.00	189.50	194.25	184.25	172.00
VIII.	137.50	170.00	171.75	192.00	150.00	200.50	200.50	205.75	180.50	168.00	192.50	194.00
IX.	172.75	188.00	194.25	170.25	175.50	183.00	179.00	195.00	196.50	160.75	167.00	164.25
X.	135.25	198.75	179.25	197.25	164.50	186.75	137.50	195.00	206.00	187.00	185.25	187.50
XI.	149.75	143.25	172.25	194.00	204.00	197.50	191.00	176.50	196.00	172.00	175.25	177.50
XII.	174.25	200.50	169.50	159.50	243.00	183.50	150.00	194.25	179.75	201.00	210.00	188.00

https://doi.org/10.23637/ERADOC-1-111

Actual Weights in lb.—Tops.

Row.	1	2	3	4	5	6	7	8	9	10	11	12
I.	103.75	128.50	172.50	85.75	151.25	158.25	124.50	183.25	156.75	122.00	185.00	172.25
II.	124.75	132.50	136.75	97.75	136.75	140.75	121.75	159.25	125.75	86.75	173.75	165.00
III.	114.00	146.75	156.50	102.00	149.25	170.50	133.75	127.25	170.50	111.50	107.50	148.75
IV.	111.00	114.75	158.75	113.25	113.25	145.50	132.75	142.75	108.50	97.00	149.25	185.00
V.	104.25	122.50	120.25	95.50	143.00	110.00	101.50	134.75	163.50	132.75	117.00	164.25
VI.	121.25	135.50	176.00	99.75	136.75	137.25	132.25	108.75	162.75	93.75	169.50	139.50
VII.	99.25	126.50	115.50	114.50	146.50	159.00	96.75	140.75	133.75	128.50	141.25	138.25
VIII.	97.75	121.25	116.50	130.50	118.25	142.50	124.50	152.00	146.75	97.25	123.50	154.00
IX.	114.75	125.00	145.75	119.00	108.75	148.00	118.50	138.75	146.25	125.25	118.00	143.25
X.	104.25	140.25	134.75	136.75	139.00	154.00	94.25	143.25	160.25	133.00	162.00	157.00
XI.	114.50	110.25	141.00	131.50	148.25	152.75	157.50	150.25	161.00	111.50	133.00	152.25
XII.	103.75	153.75	150.50	98.75	211.75	147.50	112.00	167.00	144.50	127.25	180.50	167.25

Summary of Results.—(a) Separate Treatments.

Klein Wanzleben.—Roots, tons per acre.

		No Nitrogen.		Sulphate of Amm.		Nitrate of Soda.	
		Without Mur./Pot.	With Mur./Pot.	Without Mur./Pot.	With Mur./Pot.	Without Mur./Pot.	With Mur./Pot.
Without Phosphate	Without Salt ..	6.34	6.97	7.25	7.58	6.22	7.13
	With Salt ..	6.51	6.68	7.02	6.80	8.14	7.55
With Phosphate	Without Salt ..	6.49	6.02	7.24	6.98	7.47	7.91
	With Salt ..	7.06	6.86	7.57	7.63	6.47	7.64
		Standard Error=0.271 tons or 3.65 per cent.*					
		Tops, tons per acre.					
Without Phosphate	Without Salt ..	4.12	4.51	5.14	5.68	5.05	5.80
	With Salt ..	3.92	4.66	5.60	5.33	6.16	6.35
With Phosphate	Without Salt ..	4.24	4.00	4.93	4.93	5.70	6.08
	With Salt ..	4.86	4.19	5.95	5.65	5.35	6.03
		Standard Error=0.162 tons or 2.99 per cent.*					

*For comparisons other than Phosphate *versus* No Phosphate.

Kuhn (Johnson's Perfection).—Roots, tons per acre.

		No Nitrogen.		Sulphate of Amm.		Nitrate of Soda.	
		Without Mur./Pot.	With Mur./Pot.	Without Mur./Pot.	With Mur./Pot.	Without Mur./Pot.	With Mur./Pot.
Without Phosphate	Without Salt ..	6.66	6.91	7.52	7.71	7.61	8.13
	With Salt ..	7.65	7.08	8.09	7.30	7.92	8.04
With Phosphate	Without Salt ..	7.60	6.99	8.04	8.48	8.89	7.78
	With Salt ..	8.19	7.09	7.66	9.20	8.28	8.43
		Standard Error=0.271 tons or 3.65 per cent.*					
		Tops, tons per acre.					
Without Phosphate	Without Salt ..	4.73	4.57	5.29	5.88	5.73	6.08
	With Salt ..	5.53	4.76	5.86	5.84	6.09	6.04
With Phosphate	Without Salt ..	4.50	4.66	5.50	6.32	6.62	5.70
	With Salt ..	5.11	4.68	6.00	6.75	6.24	6.85
		Standard Error=0.162 tons or 2.99 per cent.*					

*For comparisons other than Phosphate *versus* No Phosphate.

https://doi.org/10.23637/ERADOC-1-111

Sugar Beet : Long Hoos, 1929 (contd.)

Klein Wanzleben.—Sugar Percentage.

		No Nitrogen.		Sulphate of Amm.		Nitrate of Soda.	
		Without Mur./Pot.	With Mur./Pot.	Without Mur./Pot.	With Mur./Pot.	Without Mur./Pot.	With Mur./Pot.
Without Phosphate	Without Salt ..	18.32	18.54	18.20	18.56	18.05	17.81
	With Salt ..	18.82	18.51	18.42	18.09	18.43	18.35
With Phosphate	Without Salt ..	18.64	18.57	18.20	18.04	18.03	18.29
	With Salt ..	18.77	18.95	18.10	18.38	17.91	18.24
		Standard Error=0.103.*					

Kuhn.—Sugar Percentage.

Without Phosphate	Without Salt ..	18.45	18.55	17.92	18.32	18.35	18.28
	With Salt ..	18.63	18.71	17.97	18.53	18.16	18.51
With Phosphate	Without Salt ..	18.42	18.58	18.62	18.54	18.34	18.33
	With Salt ..	18.52	18.62	18.40	18.17	18.42	18.00
		Standard Error=0.103.*					

*For comparisons other than Phosphate *versus* No Phosphate.

(b) Effect of Nitrogenous Dressing, averaging for variety, Phosphate and Chloride.

Average Yield.	No Nitrogen.	Sulphate of Ammonia.	Nitrate of Soda.	Mean.	Standard Error.
Roots, tons per acre ..	6.94	7.63	7.72	7.43	0.068
Roots, per cent. ..	93.4	102.6	103.9	100.0	0.91
Tops, tons per acre ..	4.57	5.67	5.99	5.41	0.040
Tops, per cent. ..	84.4	104.8	110.8	100.0	0.75
Sugar percentage in Roots	18.60	18.28	18.22	18.36	0.026

Significant response to both Nitrogenous dressings in the case of roots and tops. The plots treated with Nitrate of Soda gave a significantly higher yield of tops. The application of a Nitrogenous dressing depressed the sugar percentage in the roots significantly, but this was more than offset by the increased yield. The net increases in sugar per acre were 7.6 per cent. for Sulphate of Ammonia plots and 8.5 per cent. for Nitrate of Soda plots.

(c) Effect of Chloride and Phosphatic Dressings, averaging for Variety and Nitrogen.

Average Yield.—Roots, tons per acre.

	Without Phosphate.		With Phosphate.		Standard Error.
	Without Mur./Pot.	With Mur./Pot.	Without Mur./Pot.	With Mur./Pot.	
Without Salt	6.93	7.41	7.62	7.36	0.111
With Salt	7.55	7.24	7.54	7.81	

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Average Yield.—Tops, tons per acre.

	Without Phosphate.		With Phosphate.		Standard Error.
	Without Mur./Pot.	With Mur./Pot.	Without Mur./Pot.	With Mur./Pot.	
Without Salt	5.01	5.42	5.25	5.28	0.066
With Salt	5.53	5.50	5.59	5.69	

The increases due to Muriate of Potash and Salt applied separately were 6.4 per cent. and 8.3 per cent. respectively in roots, with a standard error of 2.11; for tops 7.6 per cent. and 9.6 respectively, with a standard error of 1.73. For superphosphate alone the increase was 9.3 per cent. in roots, with a standard error of 3.76, this last being based on only 5 degrees of freedom. This increase should not be regarded as significant. There was no significant response to superphosphate in tops. No further increase was obtained when the Salts were applied in pairs, but the best yield of all resulted from an application of all three together.

(d) **Effect of Phosphatic Dressing in Relation to Variety; averaging for Nitrogen and Chloride.**

Average Yield.—Roots.

	Tons per acre.		Standard Error.	Per cent.		Standard Error.
	Kuhn.	Klein Wanzleben		Kuhn.	Klein Wanzleben	
Without Phosphate ..	7.55	7.02	0.078	101.6	94.4	1.05
With Phosphate ..	8.05	7.11		108.3	95.7	
Mean	7.80	7.06	0.283	105.0	95.0	3.81

Average Yield.—Tops.

	Tons per acre.		Standard Error.	Per cent.		Standard Error.
	Kuhn.	Klein Wanzleben		Kuhn.	Klein Wanzleben	
Without Phosphate ..	5.53	5.19	0.047	99.8	93.6	0.84
With Phosphate ..	5.74	5.16		103.6	93.0	
Mean	5.64	5.18	0.162	104.3	95.7	2.99

Of the varieties, only the Kuhn responded significantly to the dressing of Superphosphate, Klein Wanzleben showing on the average no significant response.

In addition to the simpler results already described, certain other significant results appeared. A significant depression followed an application of Muriate of Potash in the absence of a nitrogenous dressing, but only on the plots of Kuhn treated with Superphosphate. The crop, however, responded significantly to Muriate of Potash in the presence of the nitrogenous dressings and Superphosphate (*a*) on the plots of Kuhn treated with Sulphate of Ammonia, and (*b*) on the plots of Klein Wanzleben treated with Nitrate of Soda. Again, on the plots without a Nitrogenous dressing the beneficial effect of Salt appeared on Kuhn without Superphosphate, and on Klein Wanzleben with Superphosphate. No response to Salt occurred on the plots receiving Sulphate of Ammonia, but on those receiving Nitrate of Soda the yield of Klein Wanzleben was improved significantly by Salt in the absence of Superphosphate but depressed in presence of Superphosphate.

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REPLICATED EXPERIMENTS AT WOBURN:
MALTING BARLEY.

Nitrogenous Fertilisers: Sulphate and Muriate of Ammonia.
Potassic Fertiliser: Sulphate of Potash.
Superphosphate.

Butt Furlong, 1929.

S

B				D			
M K	M K P	K	S K P	M K P	K P	K	M K
P	M	S	S K	S K	S	S P	S K P
O	S P	K P	M P	M	O	M P	P
S K P	S	M	M K P	M K P	K P	K	S
S P	K P	K	O	M K	S K	O	M
P	M P	M K	S K	M P	S P	S K P	P

A C

SYSTEM OF REPLICATION : 4 randomised blocks of 12 plots each.

AREA OF EACH PLOT : 1/60th acre.

O = No Manure.

Sulphate (S) or Muriate (M) of Ammonia at the rate of 0.2 cwt. of Nitrogen per acre ; Sulphate of Potash (K) at the rate of 0.6 cwt. K_2O per acre, and Superphosphate (P) at the rate of 0.4 cwt. Phosphoric acid per acre, in all combinations.

Manures applied : March 22.

Barley sown : March 21. Harvested : Aug. 1-3.

VARIETY : Plumage Archer (3 bushels per acre).

Previous Crop : Sugar Beet.

Actual Weights in lb.—Total Grain.

Blocks.	O	P	K	K+P	S	S+P	S+K	S+K +P	M	M+P	M+K	M+K +P
A	47.75	52.75	53.00	55.50	60.50	54.50	56.50	52.00	60.75	64.50	64.75	54.50
B	52.50	51.00	68.00	66.75	63.25	54.25	60.00	60.50	59.50	59.50	63.50	67.25
C	35.75	40.00	43.00	41.75	34.50	43.75	47.25	44.50	37.25	50.00	47.25	51.00
D	52.50	35.75	62.00	62.75	59.50	59.00	62.50	43.00	54.25	53.25	58.75	62.00

Actual Weights in lb.—Total Straw.

Blocks.	O	P	K	K+P	S	S+P	S+K	S+K +P	M	M+P	M+K	M+K +P
A	59.50	67.00	65.75	75.25	81.00	82.00	72.25	81.50	79.75	82.25	85.00	68.25
B	80.00	71.75	89.00	89.75	89.50	91.75	84.25	84.50	86.00	74.25	87.00	86.75
C	51.25	50.25	54.50	53.75	47.25	60.75	67.00	62.75	54.75	70.25	63.75	64.25
D	68.50	45.75	93.50	72.50	78.50	74.25	81.00	56.50	71.25	71.00	76.25	103.25

https://doi.org/10.23637/ERADOC-1-111

(a) **Summary of Results.—Separate Treatments.**

Average Yield per acre.	No P or K	P	K	P+K	Sulph. Amm.	S+P	S+K	S+ P+K	Mur. Amm.	M+P	M+K	M+ P+K
Grain (cwt.) ..	25.2	24.0	30.3	30.4	29.2	28.3	30.3	26.8	28.4	30.4	31.4	31.4
Straw (cwt.) ..	34.7	31.4	40.5	39.0	39.7	41.4	40.8	38.2	39.1	39.9	41.8	43.2

(b) **Summary of Significant Results.—Averaging for Phosphate.**

	Grain—cwt. per acre.			Grain—per cent.		
	No Nitrogen.	S/Amm.	M/Amm.	No Nitrogen.	S/Amm.	M/Amm.
No Potash ..	24.6	28.7	29.4	85.4	99.7	101.9
Sulphate of Potash	30.3	28.5	31.4	105.1	99.0	108.9

Mean—28.8 cwt. Standard Error—0.98 cwt. or 3.39 per cent.

	Straw—cwt. per acre.			Straw—per cent.		
	No Nitrogen.	S/Amm.	M/Amm.	No Nitrogen.	S/Amm.	M/Amm.
No Potash	33.1	40.5	39.5	84.5	103.5	100.9
Sulphate of Potash ..	39.8	39.5	42.5	101.6	100.9	108.6

Mean—39.1 cwt. Standard Error—1.70 cwt. or 4.33 per cent.

Significant responses to Nitrogenous and Potassic fertilisers, but no response to Phosphate. The interaction of Nitrogen and Potash was significant in the case of grain and suggestive with straw—in the absence of one fertiliser the other increased the yield significantly, but in the presence of one, no further effect was produced by adding the other. The grain appears to respond better to Muriate than to Sulphate, but the difference falls short of significance.

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POTATOES.

Nitrogenous Fertiliser : Sulphate of Ammonia.
Potassic Fertilisers : Sulphate and Muriate of Potash and Potash Manure Salts (30%.)

Each in single and double dressings.

Superphosphate.

Butt Close, 1929.

	G			N D			A		
	3 —	— 9P	— 4S	7S —	— 5S	— 1	— 3	— 1	4M —
	— 1	— 2	8S —	2 —	3 —	8P —	— 7P	5P —	— 2
	— 6P	5M —	— 7M	9M —	— 6M	4P —	— 9S	6S —	8M —
	4P —	— 8P	5S —	8M —	— 3	— 7P	3 —	8S —	— 4S
H	6M —	— 7S	3 —	1 —	5P —	— 2	9P —	— 5M	2 — B
	1 —	— 9M	— 2	— 9S	— 6S	4M —	— 6P	7M —	1 —
	8M —	— 5P	9S —	— 1	9P —	— 8S	4P —	— 9M	— 3
	4M —	— 2	1 —	— 4S	— 7M	— 2	— 7S	— 5S	— 8P
	6S —	— 7P	— 3	5M —	— 6P	3 —	— 6M	— 1	— 2
	I			F			C		

SYSTEM OF REPLICATION : 9 randomised blocks of 9 plots each. Each plot divided into 2 sub-plots.

AREA OF EACH SUB-PLOT : 1/80th acre.

TREATMENTS : Sulphate of Ammonia at the rate of 0, 0.3 and .6 cwt. Nitrogen per acre, and Potash at the rate of 0, 0.5 and 1.0 cwt. K_2O per acre, in all combinations as shown in Key to Treatments.

S = Sulphate of Potash.

M = Muriate of Potash.

P = Potash Manure Salts (30%).

Superphosphate at the rate of .4 cwt. P_2O_5 per acre is applied to one out of each pair of sub-plots, indicated by the treatment symbol occurring on that half. All plots received 2 tons Lime per acre, applied in January, and 12 tons Bedford Corporation Manure per acre applied April 20-21. Artificials applied : April 29-30.

Potatoes planted May 1-6. Lifted : September 14-18.

VARIETY : Ally. Blocks C, F, I, once grown.

Previous Crop : Barley.

Key to Treatments.

Treatment No.	1	2	3	4	5	6	7	8	9
S/Ammonia	0	1	2	0	1	2	0	1	2
Potash ..	0	0	0	1	1	1	2	2	2

Actual Weights in lb.—Sub-Plots with Phosphate.

S/Amm.	Potash	A	B	C	D	E	F	G	H	I
Quantities										
0	0	165.25	120.75	67.00	154.50	132.50	115.50	164.50	156.50	120.50
0	1	176.75	130.50	94.50	148.00	141.00	118.50	211.75	130.50	122.25
0	2	182.00	161.50	85.75	181.75	162.50	99.00	162.75	184.25	111.00
1	0	198.00	146.50	90.50	187.00	130.00	96.75	176.00	152.00	79.00
1	1	223.50	165.00	96.00	182.00	132.00	103.00	164.00	157.50	117.50
1	2	157.50	130.50	89.00	163.75	161.00	89.00	164.25	162.50	97.75
2	0	201.25	133.00	99.50	190.50	134.50	75.50	149.75	159.00	104.75
2	1	183.00	150.00	79.00	147.00	127.50	85.00	166.00	146.00	115.00
2	2	160.50	174.75	120.00	198.00	160.25	93.50	205.00	98.00	141.25

https://doi.org/10.23637/ERADOC-1-111

Actual Weights in lb.—Sub-Plots without Phosphate.

S/Amm.	Potash	A	B	C	D	E	F	G	H	I
Quantities										
0	0	160.75	121.00	53.00	148.00	136.50	129.50	141.75	107.00	96.00
0	1	136.00	119.00	98.50	123.00	118.00	123.00	186.25	155.50	118.00
0	2	198.50	154.50	99.00	171.75	114.00	114.25	160.00	154.50	90.00
1	0	162.25	152.00	74.00	191.25	128.50	91.50	185.50	179.25	104.50
1	1	206.75	158.50	114.00	167.50	162.50	97.50	184.00	159.50	114.75
1	2	155.00	148.00	94.00	192.00	145.00	68.00	207.00	169.00	103.00
2	0	163.50	150.50	80.00	200.00	122.50	99.00	131.25	195.25	106.00
2	1	154.00	169.00	88.00	182.00	127.50	91.00	170.25	156.50	118.50
2	2	208.00	174.75	130.00	183.50	206.00	95.00	197.50	172.00	142.00

Summary of Average Yields, Separate Treatments.

Tons per acre.		Without Superphosphate.			With Superphosphate.		
		No S/Amm.	Single S/Amm.	Double S/Amm.	No S/Amm.	Single S/Amm.	Double S/Amm.
No Potash		4.34	5.03	4.95	4.75	4.98	4.95
Single Potash	Sulphate	5.10	5.25	4.76	5.49	5.18	5.07
	Muriate	4.43	5.24	5.08	5.24	5.14	4.43
	Potash Salts	4.49	5.76	5.12	4.44	5.63	4.77
Double Potash	Sulphate	5.06	5.04	6.62	5.38	4.57	5.50
	Muriate	5.10	4.80	5.78	5.04	4.96	4.95
	Potash Salts	4.79	5.42	5.56	5.42	4.94	5.63

Summary of Significant Results.

	Average Yield in tons per acre.						Standard Error.
	Without Superphosphate.			With Superphosphate.			
	No Sulph. Amm.	Single Sulph. Amm.	Double Sulph. Amm.	No Sulph. Amm.	Single Sulph. Amm.	Double Sulph. Amm.	
No Potash	4.34	5.03	4.95	4.75	4.98	4.95	
Single Potash	4.67	5.42	4.99	5.05	5.32	4.76	0.181
Double Potash.. ..	4.99	5.08	5.99	5.28	4.82	5.36	

https://doi.org/10.23637/ERADOC-1-111

Potatoes : Butt Close, 1929 (contd.)

	Average Yield per cent.						
	Without Superphosphate.			With Superphosphate.			Standard Error.
	No Sulph. Amm.	Single Sulph. Amm.	Double Sulph. Amm	No Sulph. Amm.	Single Sulph. Amm.	Double Sulph. Amm.	
No Potash	86.1	99.9	98.2	94.2	98.9	98.2	
Single Potash	92.7	107.5	98.9	100.3	105.5	94.3	3.60
Double Potash ..	98.9	100.8	118.8	104.7	95.7	106.4	

General Mean—5.04 tons.

Significant response on the average of all Nitrogenous and Superphosphate comparisons to both dressings of Potash. Evidence of response to Sulphate of Ammonia, which, however, was masked by lower plant numbers. No qualitative differences in the kind of Potash supplied. No response to Superphosphate, an apparent benefit in the case of the plots without Nitrogen being offset by a depression on those plots receiving high dressings of Sulphate of Ammonia and of Potash.

POTATOES : Effect of Potash.

Butt Close, 1929.

S

K	S	O
O	K	S
S	O	K

SYSTEM OF REPLICATION : Latin Square.
AREA OF EACH PLOT : 1/40th acre.
TREATMENTS : Testing Potash Mineral (K) and an equivalent dressing of Sulphate of Potash (S) at the rate of 0.5 cwt. of K_2O per acre. Basal Dressing, 12 tons of Bedford Corporation Manure per acre, applied April 19-21.
Artificials applied : April 29-30.
VARIETY : Majestic.
Potatoes planted : May 1-5. Lifted : September 14-18.
Previous Crop : Barley.

Actual Yield in lb.

Row.	O	S	K
I.	276.50	239.00	236.00
II.	223.50	235.00	203.75
III.	188.75	174.00	216.25

Summary of Results.

	No Potash.	Sulphate of Potash.	Potash Mineral.	Mean.	Standard Error.
Tons per acre ..	4.10	3.86	3.90	3.95	0.076
Per cent.	103.7	97.6	98.8	100.0	1.93

No response to either dressing of Potash on very low yield.

https://doi.org/10.23637/ERADOC-1-111

SUGAR BEET.

Effect of Nitrogenous Fertilisers:

Sulphate of Ammonia, with seed.
Nitrate of Soda (*a*) with seed.
(*b*) as top dressing.

Lansome, 1929.

N.W.

A				B				C			
Ns+Nt	S+Ns +Nt	O	S+Nt	O	S+Ns +Nt	Ns+Nt	Nt	Ns	Ns+Nt	S	S+Ns
S	Nt	Ns	S+Ns	S+Ns	S+Nt	Ns	S	S+Nt	O	Nt	S+Ns +Nt
S+Ns +Nt	Ns	S+Nt	Ns+Nt	Nt	S	S+Ns +Nt	Ns	S	Ns+Nt	O	Ns
Nt	S+Ns	S	O	S+Nt	Ns+Nt	S+Ns	O	S+Nt	S+Ns	Nt	S+Ns +Nt
D				E				F			

System of Replication : 48 plots in 6 randomised blocks.
Area of Each Plot : 1/40th acre.
Treatments :
S=Sulphate of Ammonia with seed
Ns=Nitrate of Soda with seed
Nt=Nitrate of Soda as top dressing
} in all combinations.
Rate : 0.4 cwt. Nitrogen per acre in all cases.
Basal Manure : Bedford Corporation Manure (10 tons per acre).
Applied : February 3—March 10. Artificials Applied : Basal, May 21-22. Top Dressing : July 10.
Variety : " Klein Wanzleben."
Beet sown : May 23 (16 lb. per acre). Lifted : October. 24-26.
Previous Crop : Clover and Grasses.

Actual Yield in lb.—Roots.

Block.	O	S	Ns	Nt	S+Ns	S+Nt	Ns+Nt	S+Ns +Nt
A	359.0	140.0	377.0	251.0	492.5	477.5	176.5	340.0
B	433.0	448.0	461.0	301.5	530.0	469.5	410.5	460.5
C	470.0	456.5	322.5	522.5	343.0	530.0	354.0	448.5
D	560.5	512.0	444.5	364.5	527.5	513.5	516.5	241.0
E	501.0	565.0	562.0	535.5	620.0	554.0	550.5	602.0
F	491.5	468.0	413.5	517.5	570.5	503.5	510.5	478.5

Actual Yield in lb.—Tops.

Block.	O	S	Ns	Nt	S+Ns	S+Nt	Ns+Nt	S+Ns +Nt
A	389	220	218	345	530	460	237	502
B	405	463	451	190	562	557	410	502
C	307	416	318	398	231	572	483	406
D	455	504	392	341	480	485	507	255
E	535	504	555	511	513	481	542	548
F	476	419	448	524	465	540	578	526

https://doi.org/10.23637/ERADOC-1-111

Sugar Beet : Lansome, 1929 (contd.)

Summary of Results.

ROOTS.	Average Yield—tons per acre.				Average Yield—per cent.			
	Without S/Amm.		With S/Amm.		Without S/Amm.		With S/Amm.	
	Without N/Soda with seed.	With N/Soda with seed.	Without N/Soda with seed.	With N/Soda with seed.	Without N/Soda with seed.	With N/Soda with seed.	Without N/Soda with seed.	With N/Soda with seed.
Without Top Dressing ..	8.38	7.68	7.71	9.18	103.8	95.1	95.5	113.7
With Top Dressing ..	7.42	7.50	9.07	7.65	91.9	92.9	112.4	94.8

Mean—8.07 tons. Standard Error—0.592 tons or 7.34 per cent.

TOPS.	Average Yield —tons per acre.				Average Yield—per cent.			
	Without S/Amm.		With S/Amm.		Without S/Amm.		With S/Amm.	
	Without N/Soda with seed.	With N/Soda with seed.	Without N/Soda with seed.	With N/Soda with seed.	Without N/Soda with seed.	With N/Soda with seed.	Without N/Soda with seed.	With N/Soda with seed.
Without Top Dressing ..	7.64	7.09	7.52	8.28	97.1	90.1	95.5	105.2
With Top Dressing ..	6.87	8.21	9.21	8.15	87.3	104.3	117.0	103.6

Mean=7.87 tons. Standard Error=0.676 tons or 8.58 per cent.

Sugar Percentage.

	Average Sugar Percentage.			
	Without Sulphate of Ammonia.		With Sulphate of Ammonia.	
	Without N/Soda with seed.	With N/Soda with seed.	Without N/Soda with seed.	With N/Soda with seed.
Without Top Dressing	16.91	16.42	16.68	16.63
With Top Dressing ..	15.98	16.30	16.33	16.00

Mean—16.41. Standard Error—0.261 or 1.59 per cent.

There is evidence of a response to Sulphate of Ammonia on those plots which were also treated with Nitrate of Soda, either with the seed or as a top dressing, but on the plots which had all three dressings there was no response. Application of top dressing of Nitrate of Soda has depressed the sugar percentage significantly, while the Nitrogenous dressings applied at time of sowing had no effect.

https://doi.org/10.23637/ERADOC-1-111

SUGAR BEET.

Potassic Fertilisers : Muriate of Potash, Potash Manure Salts, Potash Mineral.

Phosphatic Fertilisers : Slag, Superphosphate.

Lansome, 1929.

A				B				C			
Sl K	S M	S O	O O	Sl O	S O	O P	Sl P	S M	O O	O M	S P
Sl P	S P	O M	Sl M	O O	S M	S K	S P	O K	Sl O	Sl P	Sl K
Sl O	O K	S K	O P	Sl M	Sl K	O M	O K	S K	S O	O P	Sl M

Upper letters refer to dressings of Phosphate.
Lower letters refer to dressings of Potash.

SYSTEM OF REPLICATION : 36 plots in 3 randomised blocks.
AREA OF EACH PLOT : 1/40th acre.
TREATMENTS : (*a*) No Potash (O) and Potash in the form of Muriate of Potash (M), Potash Manure Salts (P), and Potash Mineral (K). (Rate 0.8 cwt. K_2O per acre). (*b*) No Phosphate (O), and Phosphate in the form of Slag (Sl), and Superphosphate (S). (Rate 0.6 cwt. P_2O_5 per acre.) (*a*) and (*b*) in all combinations.
Basal Manure : Bedford Corporation Manure, 10 tons per acre, February 3–March 10.
Artificials applied : May 21-22.
Beet sown : May 23 (16 lb. per acre).
Singled : June 20-24.
Lifted : October 23-24.
Previous Crop : Clover and Grasses.

Actual yield in lb.—Roots.

Blocks.	No Potash.			Muriate of Potash.			Potash Manure Salts.			Potash Mineral.		
	No Phosphate.	Slag.	Super.	No Phosphate.	Slag.	Super.	No Phosphate.	Slag.	Super.	No Phosphate.	Slag.	Super.
A	490.5	422.5	490.0	469.5	467.5	455.5	527.0	453.5	506.5	439.0	474.5	497.0
B	432.0	476.5	432.5	482.0	523.0	402.5	480.0	495.0	428.5	506.0	460.0	418.5
C	462.5	438.5	519.0	492.0	473.5	414.5	517.5	409.5	458.5	371.5	343.5	468.5

Actual yield in lb.—Tops.

Blocks.	No Potash.			Muriate of Potash.			Potash Manure Salts.			Potash Mineral.		
	No Phosphate.	Slag.	Super.	No Phosphate.	Slag.	Super.	No Phosphate.	Slag.	Super.	No Phosphate.	Slag.	Super.
A	450	483	409	462	496	452	493	524	500	403	436	495
B	418	356	455	412	441	390	529	441	693	391	342	428
C	458	431	452	420	178	175	378	539	175	376	233	420

Summary of Results.—Roots.

	Average Yield in tons per acre.				Average Yield per cent.			
	No Potash.	Muriate of Potash.	Potash Manure Salts.	Potash Mineral.	No Potash.	Muriate of Potash.	Potash Manure Salts.	Potash Mineral.
No Phosphate ..	8.24	8.59	9.07	7.84	100.1	104.4	110.2	95.2
Slag	7.96	8.71	8.08	7.61	96.7	105.8	98.2	92.4
Superphosphate	8.58	7.57	8.29	8.24	104.2	92.0	100.7	100.1

Mean—8.23 tons. Standard Error—0.422 tons or 5.13 per cent.

https://doi.org/10.23637/ERADOC-1-111

Sugar Beet: Lansome, 1929 (contd.)

Tops.

	Average Yield in tons per acre.				Average Yield per cent.			
	No Potash.	Muriate of Potash.	Potash Manure Salts.	Potash Mineral.	No Potash.	Muriate of Potash.	Potash Manure Salts.	Potash Mineral.
No Phosphate ..	7.89	7.70	8.33	6.96	105.1	102.6	111.0	92.8
Slag	7.56	6.64	8.95	6.02	100.7	88.4	119.3	80.2
Superphosphate	7.83	6.05	8.14	7.99	104.3	80.6	108.5	106.5

Mean—7.51 tons. Standard Error—0.996 tons or 13.27 per cent.

Sugar Percentage.

	No Potash.	Muriate of Potash.	Potash Manure Salts	Potash Mineral.	Mean.
No Phosphate ..	17.88	17.72	17.66	17.74	17.75
Slag	17.50	17.53	17.84	17.42	17.57
Superphosphate ..	17.89	18.28	17.92	17.57	17.91

Mean—17.74 Standard Error—0.251 or 1.41 per cent.

There has been no response whatever to the Phosphatic dressing, while the effect of Potash was insignificant, there being only a slight indication of a depression due to Potash Mineral in the case of roots and tops, and also a depression due to Muriate of Potash with tops only. The plots treated with Superphosphate have given a significantly higher sugar percentage than those treated with Slag. No significant differences in sugar percentage due to the Potassic treatments.

https://doi.org/10.23637/ERADOC-1-111

REPLICATED EXPERIMENTS AT OUTSIDE CENTRES.

Grassland. New Hay. Effect of Basic Slag.

(Basic Slag Committee.)

Mr. B. W. H. Pratt, Brooke, Norfolk, 1929.

S

I.	L	H	C	M
II.	H	C	M	L
III.	C	M	L	H
IV.	M	L	H	C

Seed sown : 1925.
SYSTEM OF REPLICATION : Latin Square.
AREA OF EACH PLOT : ¼ acre.
Soil : Calcareous boulder clay.
TREATMENTS :
C = Control.
L = Low soluble slag (37.3%).
M = Medium soluble slag (60.9%).
H = High soluble slag (86.8%).
Slags applied at the rate of 100 lb. P_2O_5 per acre in March, 1926.
All plots received 1 cwt. Sulphate of Ammonia and 2 cwt. 20% Potash Manure Salts.

Actual Weights in lb.

Row.	C	L	M	H
I.	273	355	464	386
II.	283	387	348	392
III.	318	344	333	395
IV.	344	330	378	385

Summary of Results.

Average Yield.	Control.	Low Soluble.	Medium Soluble.	High Soluble.	Mean.	Standard Error.
Cwt. per acre.. ..	10.9	12.6	13.6	13.9	12.8	0.45
Per cent.	85.2	99.1	106.6	109.0	100.0	3.52

Significant response to all grades of Slag. The average yield of the plots treated with medium and high soluble Slags is significantly greater than the average of the low soluble plots.

https://doi.org/10.23637/ERADOC-1-111

Grassland. Old Hay. Effect of Basic Slag.

(Basic Slag Committee).

Mr. E. Habberfield, Home Farm, Enmore, Somerset, 1929.

I.	L	C	H	M
II.	H	M	L	C
III.	M	H	C	L
IV.	C	L	M	H

System of Replication : Latin Square.
Area of Each Plot : ¼ acre.
Soil : Red clay loam on sandstone.
Treatments :
C = Control.
L = Low soluble slag (37.3%).
M = Medium soluble slag (60.9%).
H = High soluble slag (86.8%).
All plots received 1 cwt. Sulphate of Ammonia and 2 cwt. 20% Potash Manure Salts.
Slags applied at the rate of 100 lb. P_2O_5 per acre in March, 1926.

Actual Weights in lb.

Row.	C	L	M	H
I.	602	537	817	787
II.	618	707	629	395
III.	622	610	520	661
IV.	394	670	662	631

Summary of Results.

Average Yield.	Control.	Low Soluble.	Medium Soluble.	High Soluble.	Mean.	Standard Error.
Cwt. per acre.. ..	20.0	22.5	23.5	22.1	22.0	0.99
Per cent.	90.7	102.4	106.6	100.3	100.0	4.51

The response to the treatment is not significant, but there is evidence that the yield of hay was better on the plots treated with Slag in 1926 than on the plots not so treated. All the Slags seem to give equivalent results.

https://doi.org/10.23637/ERADOC-1-111

Potatoes. Effect of Superphosphate

G. Major, Esq., Newton Farm, Lincs., 1929

	A	B	B	A	B	A	A	B
I.	5	5	0	0	2½	2½	10	10
II.	10	10	2½	2½	0	0	5	5
III.	2½	2½	10	10	5	5	0	0
IV.	0	0	5	5	10	10	2½	2½

VARIETIES : British Queen (A) and King Edward (B) in random strips.

SYSTEM OF REPLICATION : Latin Square.

AREA OF EACH SUB-PLOT : 1/50th acre.

TREATMENT : Superphosphate at the rate of 0, 2½, 5 and 10 cwt. per acre. Basal Manuring : 4 cwt. Sulphate of Ammonia and 4 cwt. Sulphate of Potash per acre.

Potatoes set : April 11.

Lifted : October 15-16.

Actual Weights in lb.

Row.	British Queen.				King Edward.			
	0	2½	5	10	0	2½	5	10
I.	509	512	498	563	560	613	614	623
II.	457	524	564	503	582	584	663	640
III.	497	503	538	592	568	569	577	601
IV.	461	553	541	553	548	614	599	624

Summary of Results.

(a) **Separate Varieties.**

Average Yield in tons per acre.	No Superphosphate.	2½ cwt. Superphosphate.	5 cwt. Superphosphate.	10 cwt. Superphosphate.
British Queen ..	10.74	11.67	11.95	12.34
King Edward ..	12.60	13.28	13.69	13.88

(b) **Varietal Difference.**

Average Yield.	British Queen.	King Edward.	Mean.	Standard Error.
Tons per acre ..	11.67	13.36	12.52	0.189
Per cent.	93.3	106.7	100.0	1.51

(c) **Effect of Superphosphate.**

Average Yield.	No Super.	2½ cwt. Super.	5 cwt. Super.	10 cwt. Super.	Mean.	Standard Error.
Tons per acre ..	11.67	12.48	12.82	13.11	12.52	0.147
Per cent.	93.2	99.7	102.4	104.7	100.0	1.17

King Edwards yielded significantly better than British Queen in both yield and size (as observation in field showed). Significant response to Superphosphate with both varieties, but no differential response.

https://doi.org/10.23637/ERADOC-1-111

Sugar Beet: Effect of Nitrogenous Fertilisers.

Col. F. Wilson, Stanway Hall Farm, Colchester, 1929.

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

Soil : Light sandy loam.
VARIETY : Kuhn P.
SYSTEM OF REPLICATION : Latin Square.
AREA OF EACH PLOT : 1/50th acre.
TREATMENT : 0.4 cwt. of N per acre in the forms Sulphate of Ammonia, Nitrate of Soda with seed and as a top dressing.
Basal Dressing : Dung, Superphosphate at the rate of 0.4 cwt. P_2O_5 per acre and Muriate of Potash at the rate of 0.8 cwt. K_2O per acre.
Artificials applied : Basal, March 10. Top Dressing, June 13.
Beet sown : April 22. Lifted : December 9.

Actual Yields in lb.

Row.	Roots.				Tops.			
	A O	B S/Amm.	C N/Soda (seed).	D N/Soda (T.D.)	A O	B S/Amm.	C N/Soda (seed).	D N/Soda (T.D.)
I.	296.0	312.5	361.0	326.5	229	207	284	313
II.	317.0	369.0	389.0	390.5	229	306	304	313
III.	298.5	370.5	384.5	385.0	242	280	299	333
IV.	346.5	377.0	362.5	382.0	224	277	333	327

Summary of Results.

Average Yield.	No Nitrogen.	Sulphate of Ammonia.	Nitrate of Soda (seed).	Nitrate of Soda (T.D.)	Mean.	Standard Error.
Roots, tons per acre.. ..	7.02	7.97	8.35	8.28	7.91	0.213
Roots, per cent.	88.8	100.8	105.6	104.7	100.0	2.69
Roots, sugar percentage ..	18.03	17.86	17.78	17.81	17.87	0.078
Tops, tons per acre	5.16	5.97	6.81	7.18	6.28	0.167
Tops, per cent.	82.1	95.1	108.4	114.3	100.0	2.66

Significant response to all forms of Nitrogenous dressing. Nitrate of Soda significantly better than Sulphate of Ammonia in the case of tops—with roots the difference, while moderately large, is not significant. The difference between the application of Nitrate of Soda with seed, and as a top dressing, is not significant. The Nitrogenous dressings appear to have depressed slightly the percentage of sugar in the roots.

https://doi.org/10.23637/ERADOC-1-111

Sugar Beet: Effect of Chloride Dressings

Col. F. Wilson, Stanway Hall Farm, Colchester, 1929

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

Soil: Light sandy loam.

VARIETY: Kuhn P.

SYSTEM OF REPLICATION: Latin Square.

AREA OF EACH PLOT: 1/50th acre.

TREATMENTS: Muriate of Potash at the rate of 0.8 cwt. K_2O per acre, Potash Manure Salts (20%) equivalent in Potash to KCl, and Salt equivalent in Chloride to Potash Manure Salts.

Basal Dressing: Superphosphate at the rate of 0.4 cwt. P_2O_5 per acre and Sulphate of Ammonia at the rate of 0.4 cwt. N pe acre.

Artificials applied: March 10.

Beet sown: April 22. Lifted: December 6.

Actual Yields in lb.

Row.	A O	B M/Pot.	C P.M.S.	D Salt.
I.	288.0	285.5	337.0	279.5
II.	233.0	302.0	326.0	311.0
III.	294.0	305.5	364.0	347.5
IV.	246.0	270.5	338.5	293.5

Summary of Results.

Average Yield.	No Potash or Salt	Muriate of Potash.	Potash Manure Salts.	Salt.	Mean.	Standard Error.
Roots, tons per acre..	5.92	6.49	7.62	6.87	6.73	0.256
Roots, per cent.	88.0	96.5	113.3	102.2	100.0	3.80
Roots, sugar percentage	17.64	17.63	18.00	17.84	17.78	0.161
Ratio from 4 plots—100 × roots/tops	83	92	124	87	—	—

Significant response to all manurial treatments. The dressing of Potash Salts gave significantly higher yield than either Muriate or Salt. There was some evidence to show that Potash Salts raised the percentage of sugar in the roots, but the difference was not significant.

https://doi.org/10.23637/ERADOC-1-111

Barley: Effect of Sulphate of Ammonia, Sulphate of Potash and Superphosphate.

(Yields determined by sampling method.)

H. G. Nevile, Esq., Wellingore, 1929.

A	NK	NPK	O	NP	N	PK	P	K
B	O	K	NPK	N	NP	P	NK	PK

VARIETY : Plumage Archer.
Soil : Light loam on Lincoln Heath.
SYSTEM OF REPLICATION : 2 randomised blocks of 8 plots each.
AREA OF EACH PLOT : 1/60th acre.
TREATMENTS : Sulphate of Ammonia (N) at the rate of 1 cwt. per acre, Superphosphate (P) at the rate of 3 cwt. per acre, and Sulphate of Potash (K) at the rate of 1½ cwt. per acre, in all combinations.
Manures applied : March 14.
Barley sown : March 12. Harvested : August 22-23.
The plots were harvested by the sampling method, 20 separate metres of drill being selected at random from each plot.

Actual Weights in grams per Sample.

Block.		O	K	N	P	KN	KP	NP	NKP
Grain	A ..	729	807	736	749	822	661	859	911
	B ..	796	873	848	716	852	723	966	1128
Straw	A ..	674	734	674	674	764	580	826	991
	B ..	655	740	785	659	841	620	862	972

Summary of Results.

Grain.	Cwt. per acre.				Per cent.			
	Without S/Pot.		With S/Pot.		Without S/Pot.		With S/Pot.	
	Without S/Amm.	With S/Amm.	Without S/Amm.	With S/Amm.	Without S/Amm.	With S/Amm.	Without S/Amm.	With S/Amm.
Without Super.	18.8	19.5	20.7	20.6	92.7	96.2	102.0	101.6
With Super. ..	18.0	22.4	17.0	25.1	88.9	110.8	84.0	123.8

Mean—20.2 cwt. Standard Error—0.89 cwt. or 4.38 per cent.

Significant response to the Nitrogenous dressing, which, however, only shows up on the plots having Superphosphate. Superphosphate depressed the yield on the plots without Nitrogenous fertiliser, but increased the yield significantly on the plots having a Nitrogenous dressing in addition. There was evidence of a small response in the aggregate to Potash, but the difference was not significant.

https://doi.org/10.23637/ERADOC-1-111

Straw.	Cwt. per acre.				Per cent.			
	Without S/Pot.		With S/Pot.		Without S/Pot.		With S/Pot.	
	Without S/Amm.	With S/Amm.	Without S/Amm.	With S/Amm.	Without S/Amm.	With S/Amm.	Without S/Amm.	With S/Amm.
Without Super.	16.3	17.9	18.1	19.7	88.2	96.9	97.8	106.5
With Super. ..	16.4	20.7	14.7	24.1	88.5	112.0	79.6	130.3

Mean—18.5 cwt. Standard Error—0.59 cwt. or 3.20 per cent.

Significant responses to the Nitrogenous and Potassic fertilisers, the response to the latter only appearing on the plots dressed with Nitrogen. The interaction between the Nitrogenous and Phosphatic fertilisers was significant, alone and in the presence of Potash : without Potash the response to Phosphate occurred only on the plots treated with a Nitrogenous dressing, those without Nitrogen being unaffected : in the presence of Potash there was a significant depression due to the adding of Superphosphate to plots not treated with Nitrogenous fertiliser, but a significant response to Phosphate on the plots also receiving the Nitrogenous dressing.

Experiments at other centres, carried out by the local workers on the lines of those described on the preceding pages.

Potatoes. Mr. E. J. Roberts, College Farm, Aber, Caernarvonshire, 1929

Latin Square : Plots 1/40th acre. Potatoes set March 27, lifted October 10, 14, 15.
Basal Manuring : 12 tons Farmyard Manure (ploughed in), 2 cwt. Sulphate of Ammonia and 3 cwt. 30% Potash Salt in drills.
Variety : Kerr's Pink. Soil : Light gravelly loam.

Average Yield.	No Superphosphate.	2 cwt. Super.	4 cwt. Super.	8 cwt. Super.	Mean.	Standard Error.
Tons per acre	14.66	14.25	14.53	14.66	14.52	0.177
Per cent. ..	100.9	98.1	100.1	100.9	100.0	1.22

No response to Superphosphate.

Potatoes. Mr. E. Arden, Owmby Cliff, Lincolnshire, 1929.

Latin Square : Plots 1/80th acre. Soil : Cliff Land (Oölitic Limestone).
Basal Manuring : 4 cwt. Sulphate of Ammonia and 3 cwt. Sulphate of Potash per acre.
Variety : King Edward. Potatoes set March 26, lifted September 18.

Average Yield.	No Superphosphate.	2 cwt. Super.	4 cwt. Super.	8 cwt. Super.	Mean.	Standard Error.
Tons per acre ..	7.42	7.44	7.34	7.30	7.37	0.153
Per cent. ..	100.6	100.8	99.5	99.0	100.0	2.07

No response to Superphosphate.

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Experiments at other Centres (cont.)

Potatoes. Mr. W. W. Ballardie, Midland Agricultural College, Loughborough, 1929.

Latin Square : Plots 1/48th acre. Soil : Light gravelly nature (Old Valley Gravel).
Basal Manuring : 2 cwt. Sulphate of Ammonia and 2 cwt. Sulphate of Potash per acre.
Variety : King Edward. Potatoes set April 28, lifted September 6-11.

Average Yield.	No Super-phosphate.	2 cwt. Super.	4 cwt. Super.	8 cwt. Super.	Mean.	Standard Error.
Tons per acre	8.00	7.82	7.63	7.97	7.85	0.22
Per cent. ..	101.9	99.6	97.1	101.4	100.0	2.81

No response to Superphosphate on total yield.

Sugar Beet. County School, Welshpool, Montgomeryshire, 1929.

Randomised Blocks : Plots 1/160th acre. Soil : School garden.
Treatment : Nitrogen in the form of Sulphate and Muriate of Ammonia and Cyanamide, at the rate of 0.6 cwt. N per acre.
Basal Manuring : Potash at the rate of 1 cwt. K_2O per acre, and Superphosphate at the rate of 0.8 cwt. P_2O_5 per acre.
Variety : Garton's Warrington. Beet sown May 21, lifted November 5.

Average Yield.	No Nitrogen.	Cyana-mide.	Sulphate of Ammonia.	Muriate of Ammonia.	Mean.	Standard Error.
Roots, tons per acre	11.6	13.8	13.5	12.8	12.9	0.26
Roots, per cent. ..	89.7	106.9	104.2	99.1	100.0	1.98
Tops, tons per acre	16.5	19.2	21.1	20.3	19.3	0.93
Tops, per cent. ..	85.6	99.7	109.2	105.4	100.0	4.81
Sugar percentage in Roots	17.90	18.06	17.21	17.66	17.71	0.298

Significant response to all forms of Nitrogenous dressings in both roots and tops. With roots the response to Cyanamide and Sulphate is better than that to Muriate. No significant differences in sugar percentage.

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Sugar Beet. South-Eastern Agricultural College, Wye, Kent, 1929.

Latin Square : Plots 1/80th acre. (2 discarded). Soil : Loam on chalk.
Basic Dressing : 4 cwt. Superphosphate, 1 cwt. Steamed Bone Flour and 1 cwt. Muriate of Potash. Nitrogenous Manures—1 cwt. per acre Sulphate of Ammonia, and equivalent dressings of Muriate of Ammonia and Nitrate of Soda.
Variety : Kleinwanzleben E. Beet sown May 3rd, lifted October 16-19.

Average Yield.	No Nitrogen.	Sulphate of Ammonia.	Muriate of Ammonia.	Nitrate of Soda.	Mean.	Standard Error.
Roots, tons per acre (unwashed) ..	9.77	8.73	9.85	9.93	9.57	0.583
Roots, per cent. ..	102.1	91.2	102.9	103.8	100.0	6.09

No response to treatment.

Barley. Mr. J. M. Templeton, Farm Institute, Sparsholt, Winchester, 1929.

Latin Square : Plots 1/20th acre. Soil : Thin flinty loam on chalk.
Treatment : Salt at the rate of 100 lb. and 300 lb. per acre and Muriate of Potash at the rate of 1 cwt. per acre.
Variety : Plumage Archer. Barley sown April 5, harvested August 13.

Average Yield.	No Manure.	Salt 100 lb.	Salt 300 lb.	Muriate of Potash.	Mean.	Standard Error.
Grain, cwt. per acre ..	23.9	24.1	24.4	23.5	24.0	0.74
Grain, per cent. ..	99.7	100.4	101.9	98.0	100.0	3.08

No significant differences due to treatments.

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