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The Classical Experiments

Rothamsted Research

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CROP YIELDS ON THE EXPERIMENTAL PLOTS

Notes.—In each case the year refers to the harvest, *e.g.*, Wheat 1932 means wheat harvested in 1932. 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 in the replicated experiments 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 2,240 lb.)	1016 Kilogrammes.	
1 metric quintal or Doppel Zentner (Dz.) ..	{ 100.0 Kilogrammes. 220.46 lb.	
1 metric ton (tonne)	1000 Kilogrammes.	
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.	
1 kg. per Hectare ..	0.892 lb. per acre.	

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

CONVERSION TABLE—CWT. TO BUSHEL.

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, 1922-31. cwt.	Country.	Mean yield per acre, 1922-31. cwt.
Great Britain	17.4	Denmark	22.1
England and Wales ..	17.3	Argentina	6.7
Hertfordshire	16.3	Australia	6.3
France	11.1	Canada	9.2
Germany	15.1	United States.. ..	7.8
Belgium	20.2	U.S.S.R. (Europe and Asia)	5.8*

Note.—Figures for Great Britain, England and Hertfordshire are taken from the Ministry of Agriculture's "Agricultural Statistics," Vol. 66. Other figures from "International Year Book of Agricultural Statistics," 1927-31.

* 1924-28

METEOROLOGICAL RECORDS, 1932

	Rain.		Drainage through soil.			Bright Sun- shine.	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.		Max.	Min.	1 ft. in ground	Solar Max.	Grass Min.
1932—	Inches.	No.	Inches.	Inches.	Inches.	Hours.	°F.	°F.	°F.	°F.	°F.
Jan. ..	2.200	13	2.040	2.252	2.178	50.5	47.0	35.7	41.2	68.7	31.5
Feb. ..	0.209	5	0.000	0.018	0.017	67.6	40.7	31.5	37.3	80.3	27.6
Mar. ..	2.002	11	0.852	0.809	0.840	144.2	47.0	31.9	38.1	98.8	25.4
April ..	2.336	19	0.697	0.757	0.745	131.3	50.1	37.5	43.7	108.7	34.2
May ..	4.274	21	2.425	2.493	2.460	128.4	57.2	43.6	50.6	85.3	40.4
June ..	0.850	4	0.006	0.046	0.034	215.5	65.2	48.0	57.6	105.7	43.2
July ..	2.619	17	0.642	0.576	0.574	136.3	68.2	53.7	61.5	98.0	50.2
Aug. ..	2.102	8	0.621	0.658	0.638	191.5	71.8	55.2	63.2	103.9	50.5
Sept. ..	1.985	18	0.270	0.208	0.175	113.2	62.3	48.7	57.1	84.7	44.0
Oct. ..	4.842	23	2.840	3.418	3.290	104.1	53.5	41.9	49.1	74.6	37.5
Nov. ..	1.783	16	1.069	1.154	1.114	47.4	47.4	38.7	43.9	71.9	35.3
Dec. ..	0.733	12	0.453	0.564	0.559	56.2	44.7	36.1	40.1	65.7	31.9
Total or Mean	25.935	167	11.915	12.953	12.624	1386.2	54.6	41.9	48.6	87.2	37.6

RAIN AND DRAINAGE.
MONTHLY MEAN FOR 62 HARVEST YEARS, 1870-1—1931-2.

	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. ..	2.377	0.819	0.796	0.735	34.4	33.5	30.9	1.558	1.581	1.642
Oct. ..	3.099	1.762	1.732	1.603	56.8	55.9	51.7	1.337	1.367	1.496
Nov. ..	2.886	2.207	2.263	2.134	76.5	78.4	73.9	0.679	0.623	0.752
Dec. ..	2.842	2.422	2.522	2.408	85.2	88.7	84.7	0.420	0.320	0.434
Jan. ..	2.406	1.976	2.171	2.071	82.1	90.2	86.1	0.430	0.235	0.335
Feb. ..	1.999	1.487	1.599	1.527	74.4	80.0	76.4	0.512	0.400	0.472
March ..	1.967	1.045	1.170	1.107	53.1	59.5	56.3	0.922	0.797	0.860
April ..	2.056	0.674	0.754	0.719	32.8	36.7	35.0	1.382	1.302	1.337
May ..	2.104	0.514	0.583	0.550	24.4	27.7	26.1	1.590	1.521	1.554
June ..	2.191	0.523	0.552	0.531	23.9	25.2	24.2	1.668	1.639	1.660
July ..	2.737	0.727	0.755	0.706	26.6	27.6	25.8	2.010	1.982	2.031
Aug. ..	2.654	0.715	0.730	0.687	26.9	27.5	25.9	1.939	1.924	1.967
Year ..	29.318	14.871	15.627	14.778	50.7	53.3	50.4	14.447	13.691	14.540

CHEMICAL ANALYSES OF MANURES USED IN REPLICATED EXPERIMENTS, 1932

Manures	% N	Manures	% P ₂ O ₅		
			Total	Soluble in water	Soluble in Cit. Acid
Sulphate of Amm. . .	20.6	Superphosphate (9) ..	16.1	15.1	—
Nitrate of Soda (1)	15.3	Superphosphate (10) ..	16.2	15.5	—
Nitrate of Soda (2)	16.0	Superphosphate (11) ..	16.1	—	—
Cyanamide ..	20.0	Mineral Phosphate ..	25.9	—	—
Dicyanodiamide ..	66.6	(90% through 120 mesh)			
Humic Acid (3) ..	4.36	Basic Slag High Sol. ..	14.9	—	14.4
Humic Acid (4) ..	4.29	Basic Slag Low Sol. ..	15.1	—	3.5
	Total N. Amm. N.		Sulphate of Potash : 49.6% K ₂ O		
Amm. Humate (5)	7.95 2.88		Potash Manure Salt (30%) : 30.6% K ₂ O		
Amm. Humate (6)	8.30 3.16		Dung : 0.392% N, 0.226% P ₂ O ₅ , 0.736% K ₂ O		
Amm. Humate (7)	8.00 2.87				
Amm. Humate (8)	8.16 3.02				

- | | |
|---|---|
| (1) Used in R.S. 1-64, W.S. 1-64. | (7) Used in P.S. 26-57, Z.S. 1-25, Z.M. 1-25. |
| (2) Used in R.S. 1-64, W.S. 1-64. | (8) Used at Welshpool, Tonbridge, Burford, Godalming, Hull. |
| (3) Used in R.K. 1-25, W.K. 65-89. | (9) Used in R.B. 1-96. |
| (4) Used at Welshpool, Tonbridge, Burford, Godalming, Hull. | (10) Used in R.P. 1-162, R.S. 1-64, W.S. 1-64. |
| (5) Used in R.K. 1-25, W.K. 65-89. | (11) Used in G.H. 1-50, D.H. 1-50, Bakewell. |
| (6) Used in V.B. 1-64, S.B. 1-64, Z.B. 1-64. | |

FOUR COURSE ROTATION, 1932

Manures	% Organic Matter	% N	% P ₂ O ₅	% K ₂ O
Chaff	80.4	0.398	0.291	1.42
Dung	19.2	0.559	0.264	1.08
Adco	10.8	0.294	0.248	0.308
Superphosphate ..	—	—	16.4	—
Mineral Phosphate ..	—	—	26.1	—
(90% through 120 mesh)				
Muriate of Potash ..	—	—	—	50.6
Sulphate of Ammonia ..	—	20.6	—	—

SIX COURSE ROTATION, 1932

	% N	% P ₂ O ₅			% K ₂ O	
Sulphate of Ammonia	20.6	—			—	
Muriate of Potash ..	—	—			50.6 (1)	51.8 (2)
Superphosphate ..	—	15.7 (3)	16.4 (4)	16.2 (5)	—	

- (1) Used in B.C., B.W., B.F., C.W., C.F., C.C.
 (2) Used in B.S., B.B., B.P., C.S., C.P., C.B.
 (3) Used in B.W., B.F., C.W.
 (4) Used in B.C., C.F., C.C.
 (5) Used in B.P., B.B., B.S., C.S., C.P., C.B.

CROPS GROWN IN ROTATION, AGDELL FIELD
PRODUCE PER ACRE.

Year.	Crop.	O. Unmanured since 1848.		M. Mineral Manure. † No Nitrogen.		C. Complete Mineral and Nitrogenous Manure.	
		5. Fallow.	6. Clover or Beans.	3. Fallow.	4. Clover or Beans.	1. Fallow.	2. Clover or Beans.
Average of first twenty-one courses, 1848-1931.							
	Roots (Swedes) .. cwt.*	32.0	16.1	174.0	206.5	352.0	310.0
	Barley—						
	Dressed Grain .. bush.	21.6	19.8	22.7	26.6	30.3	35.0
	Total Straw .. cwt. †	13.3	13.2	13.6	15.6	18.4	21.7
	Beans—						
	Dressed Grain .. bush. ††	—	13.1	—	18.2	—	22.3
	Total Straw .. cwt. ††	—	9.2	—	13.2	—	15.3
	Clover Hay .. cwt. §	—	25.6	—	52.1	—	52.0
	Wheat—						
	Dressed Grain .. bush.	23.1	21.6	26.9	29.4	27.5	29.0
	Total Straw .. cwt. †	22.9	21.2	28.2	29.8	29.4	29.3
Present Course (22nd), 1932.							
1932	Roots (Turnips) .. cwt.	20.2	5.4	86.0	118.0	120.0	98.6

* Plots 1, 3 and 5 based upon 19 courses. Plots 2, 4 and 6 based upon 18 courses.

† 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.

†† Based on 8 courses.

§ Based on 13 courses.

WHEAT AFTER FALLOW—HOOS FIELD

Without Manure, 1851 and since.

SCHEME FOR COMPARING A THREE YEAR FALLOW WITH A ONE YEAR FALLOW.

Each of the two strips on Hoos Wheat after Fallow is to be divided into four parts separated by headlands. In the year when a strip is in crop, one quarter is to continue to be fallowed, so that this quarter has a three year fallow. Different quarters are to be selected for fallow in successive years in the rotation given in the following table:—

Cropping of strips A and B.

C=Crop. F=Fallow.

	A	N	B		Year.	A1.	A2.	A3.	A4.	B1.	B2.	B3.	B4.
1			1		1932	F	C	C	C	F	F	F	F
2			2		1933	F	F	F	F	C	C	F	C
					1934	C	F	C	C	F	F	F	F
					1935	F	F	F	F	C	C	C	F
3			3		1936	C	C	F	C	F	F	F	F
					1937	F	F	F	F	F	C	C	C
					1938	C	C	C	F	F	F	F	F
					1939	F	F	F	F	C	F	C	C
4			4		1940	F	C	C	C	F	F	F	F

A comparison of the effect of a three year fallow with the effect of a one year fallow will be possible in every year.

Half the experiment will continue to be wheat after one year fallow, and continuity with previous results will thus be maintained.

PRODUCE PER ACRE.

	A2	A3	A4	Mean.	Average 76 years, 1856-1931.
Dressed Grain—bushels	16.4	18.6	15.6	16.9	14.2
Total grain—cwt.	11.0	12.0	9.3	10.8	8.0
Weight per bushel—lb.	63.8	63.3	63.3	63.5	58.7
Straw—lb.	2182	2118	2182	2161	—
Total straw—cwt.	25.4	24.4	22.3	24.1	12.5

MANGOLDS—BARNFIELD, 1932

Mangolds each year since 1876.

Roots each year since 1856.

PRODUCE PER ACRE.

Strip.	Normal spacing * Strip Manures. (Amounts stated are per acre.)	1932.					50 Year Average, 1876-1928. †						
		Cross Dressings.					Cross Dressings.						
		O	N	A	AC	C	O	N	A	AC	C		
		None.	Nitrate of Soda (550 lb.)	Sulphate of Ammonia (412 lb.)	Sulphate of Ammonia (412 lb.) & Rape Cake.	Rape Cake (2,000 lb.)	None.	Nitrate of Soda (550 lb.)	Sulphate of Ammonia (412 lb.)	Sulphate of Ammonia (412 lb.) & Rape Cake.	Rape Cake (2,000 lb.)		
		Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
ROOTS	1	Dung only (14 tons)	40.89	34.03	33.09	34.15	17.47	26.16	21.70	23.58	23.53		
	2	Dung, Superphosphate (3½ cwt.), Sulphate of Potash (500 lb.)	43.74	39.76	40.50	40.39	18.94	26.68	24.71	27.57	26.50		
	4	Complete Minerals: Super. and Potash as 2, Salt (200 lb.)	8.91	25.79	37.67	32.52	4.60	(a) 17.35 (b) 17.81§	14.37	26.06	20.96		
	5	Sulphate of Magnesia (200 lb.)	7.66	15.44	13.40	17.02	4.47	14.63	6.70	9.49	10.16		
	6	Superphosphate only (3½ cwt.)	6.89	24.20	32.92	27.24	4.03	15.12	13.50	22.55	18.14		
	7	Super. (3½ cwt.) Sulphate of Potash (500 lb.) and Super. (3½ cwt.) Sulphate of Magnesia (200 lb.) and Sodium Chloride (200 lb.)	6.87	26.47	27.99	29.90	4.86	16.04	14.70	22.31	19.10		
	8	No Mineral	5.02	12.80	11.79	15.78	3.34	9.61	5.32	8.52	8.89		
	9	Sodium Chloride (200 lb.), Nit. Soda (550 lb.), Sulph. Potash (500 lb.) and Sulph. Mag. (200 lb.)	23.98	—	—	—	—	—	—	—	—		
LEAVES	1	Dung only (14 tons)	3.48	4.83	5.54	4.77	3.04	4.65	4.93	5.25	4.54		
	2	Dung, Superphosphate (3½ cwt.), Sulphate of Potash (500 lb.)	3.32	5.45	5.77	4.99	3.16	5.15	5.49	6.29	4.80		
	4	Complete Minerals: Super. and Potash as 2, Salt (200 lb.)	1.27	3.01	4.68	3.95	1.04	(a) 3.87 (b) 4.09§	2.88	5.33	3.37		
	5	Sulph. of Magnesia (200 lb.)	1.36	2.31	2.18	2.88	1.05	3.19	2.61	3.29	2.84		
	6	Super. (3½ cwt.) Sulphate of Potash (500 lb.)	1.19	2.90	4.59	3.34	0.93	3.04	2.81	5.20	2.87		
	7	Super. (3½ cwt.) Sulphate of Magnesia (200 lb.) and Sodium Chloride (200 lb.)	1.16	3.90	4.05	4.10	1.10	3.31	3.01	5.23	3.31		
	8	No Minerals	1.03	3.12	3.22	4.32	0.98	3.19	2.52	3.30	2.84		
	9	Sodium Chloride (200 lb.), Nit. Soda (550 lb.), Sulph. Potash (500 lb.) and Sulph. Mag. (200 lb.)	3.15	—	—	—	—	—	—	—	—		

* In 1932 the normal spacing of 26 ins. was resumed over the whole field.
 ** From 1904 onwards plot 4N has been divided, 4(a) receiving Superphosphate, Sulphate of Potash, Sulphate of Magnesia, Sodium Chloride and Nitrate of Soda, amounts as above; (4b) receiving Superphosphate, 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 the seed.
 † Excluding 1886 when nitrogenous fertilisers were not applied, owing to poor crop and 1908 and 1927 when the crop was swedes.
 § 23 years only, 1904-1928. For this period the average yield of plot 4(a) was 18.11 for roots and 4.05 for leaves.

HAY—THE PARK GRASS PLOTS, 1932

Plot.	Manuring (amounts stated are per acre.)	Yield of Hay per acre.			Dry Matter per acre.			
		1st Crop.	2nd * Crop.	Total	1st Crop.	2nd Crop.	Total.	
1	Single dressing (206 lb.) Sulphate of Ammonia (=43 lb. N.), (with Dung also 8 years, 1856-63) ...	not limed ..	cwt. 21.8	cwt. 8.6	cwt. 30.4	lb. 2044	lb. 766	lb. 2810
2	Unmanured (after Dung 8 years, 1856-63) ..	limed ..	27.1	10.4	37.5	2463	931	3394
3	Unmanured ..	not limed ..	19.0	11.5	30.5	1670	1030	2700
4-1	Superphosphate of lime (3½ cwt.) ..	limed ..	23.1	10.3	33.4	2032	919	2951
4-2	Superphosphate of lime (3½ cwt.), and double dressing (412 lb.) Sulphate of Ammonia (=86 lb. N.) ..	not limed ..	17.4	10.3	27.7	1497	921	2418
5-1	(N. half) Unmanured following double dressing Ammonia salts (=86 lb. N.) 1856-97 ..	limed ..	21.3	8.8	30.1	1794	788	2582
5-2	(S. half) Superphosphate (3½ cwt.) Sulphate of Potash (500 lb.) following double dressing Amm. salts (=86 lb. N.) 1856-97 ..	not limed ..	26.6	12.0	38.6	2241	1073	3314
6	Complete Mineral Manure as Plot 7; following double dressing Amm. salts (=86 lb. N.) 1856-68 ..	limed ..	25.7	7.5	33.2	2201	675	2876
7	Complete Mineral Manure: Super. (3½ cwt.); Sulphate of Potash (500 lb.); Sulphate of Soda (100 lb.); Sulphate of Magnesia (100 lb.) ..	not limed ..	35.6	13.7	49.3	2918	1225	4143
8	Mineral Manure without Potash ..	limed ..	42.2	14.1	56.3	3562	1266	4828
9	Complete Mineral Manure and double dressing (412 lb.) Sulphate of Ammonia (=86 lb. N.) ..	not limed ..	18.2	8.1	26.3	1562	729	2291
10	Mineral Manure (without Potash) and double dressing Amm. salts (=86 lb. N.) ..	limed ..	31.8	12.2	44.0	2602	1097	3699
11-1	Complete Mineral Manure and treble dressing (618 lb.) Sulphate of Amm. (129 lb. N.) ..	not limed ..	32.7	11.3	44.0	2817	1009	3826
11-2	As Plot 11-1 and Silicate of Soda ..	limed ..	34.4	11.4	45.8	3040	1022	4062
12	Unmanured ..	not limed ..	29.3	11.7	41.0	2505	1052	3557
13	Dung (14 tons) in 1905, and every fourth year since (omitted 1917), Fish Guano (6 cwt.) in 1907 and every fourth year since ..	limed ..	26.2	14.4	40.6	2148	1289	3437
14	Complete Mineral Manure and double dressing (550 lb.) Nitrate of Soda (=86 lb. N.) ..	not limed ..	21.4	14.6	36.0	1808	1305	3113
15	Complete Mineral Manure as Plot 7; following double dressing Nitrate of Soda (=86 lb. N., 1858-75) ..	limed ..	92.5	9.6	102.1	6251	858	7109
16	Complete Mineral Manure and single dressing (275 lb.) Nitrate of Soda (=43 lb. N.) ..	not limed ..	64.4	15.0	79.4	5502	1349	6851
17	Single dressing (275 lb.) Nitrate of Soda (43 lb. N.) ..	limed ..	41.2	11.2	52.4	3725	1006	4731
18	Mineral Manure (without Super.), and double dressing Sulphate of Amm. (=86 lb. N.), 1905 and since; following Minerals and Amm. salts supplying the constituents of 1 ton of hay, 1865-1904 ..	not limed ..	43.0	14.8	57.8	4094	1326	5420
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 ..	limed ..	86.1	31.2	117.3	5606	2794	8400
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 ..	63.5	22.0	85.5	5374	1971	7345
		limed ..	82.6	32.2	114.8	5770	2886	8656
		not limed ..	72.2	27.6	99.8	6017	2477	8494
		limed ..	18.0	9.3	27.3	1612	830	2442
		not limed ..	52.3	11.2	63.5	4794	1003	5797
		limed ..	41.9	7.8	49.7	3856	699	4555
		not limed ..	60.0	17.4	77.4	4463	1562	6025
		limed Sun. ..	66.0	14.2	80.2	5529	1276	6805
		Shade ..	39.5	14.0	53.5	3233	1259	4492
		not limed ..	30.1	13.8	43.9	2710	1232	3942
		limed ..	30.1	9.8	39.9	2672	875	3547
		not limed ..	41.2	16.0	57.2	3610	1429	5039
		limed ..	37.6	12.8	50.4	3328	1146	4474
		not limed ..	19.5	11.6	31.1	1643	1037	2680
		limed ..	28.3	9.6	37.9	2620	865	3485
		not limed ..	37.6	12.0	49.6	3553	1078	4631
		limed ..	50.6	11.2	61.8	3827	1002	4829
		(6788 lb.) ..	39.3	8.6	47.9	3535	774	4309
		(3951 lb.) ..	27.2	12.6	39.8	2436	1126	3562
		not limed ..	25.0	9.5	34.5	2184	847	3031
		limed ..	33.0	11.7	44.7	2834	1050	3884
		(570 lb.) ..	45.7	13.5	59.2	4008	1206	5214
		not limed ..	47.8	12.0	59.8	3928	1070	4998
		limed ..	46.2	12.0	58.2	4025	1070	5095
		(570 lb.) ..						

Ground Lime was applied to the southern portion (limed) of the plots at the rate of 2,000 lb. to the acre in the Winters of 1903-4, 1907-8, 1915-16, 1923-24, 1927-28, 1931-32, and at the rate of 2,500 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 on the basis of hay containing 20 per cent. moisture.

PARK GRASS PLOTS
BOTANICAL COMPOSITION PER CENT.
1928 (1st Crop)

Plot	Manuring	Liming	Grami- neae	Legumi- nosae	Other Orders	" Other Orders " consist largely of
3	Unmanured.	Limed	64.4	7.1	28.5	<i>Plantago lanceolata</i>
		Unlimed	54.3	6.0	39.7	<i>Plantago lanceolata</i>
7	Complete Mineral Manure.	Limed	57.4	34.1	8.5	<i>Heracleum sphondylium</i>
		Unlimed	20.0	20.7	59.3	<i>Achillea millefolium</i>
9	Complete Mineral Manure and double Amm. Salts.	Limed	98.5	—	1.5	—
		Unlimed	99.9	—	0.1	—
14	Complete Mineral Manure and double Nitrate of Soda.	Limed (sun)	92.7	3.9	3.4	<i>Taraxacum vulgare</i>
		Limed (Shade)	96.0	3.5	0.5	<i>Anthriscus sylvestris</i>
		Unlimed	99.2	0.4	0.4	<i>Anthriscus sylvestris</i> <i>Rumex acetosa</i>
15	As plot 7 following double Nitrate of Soda, 1858-75.	Limed	}	not	analysed	—
Unlimed		—				
17	Single Nitrate of Soda.	Limed	}	not	analysed	—
		Unlimed				—
18	Mineral Manure (without Super) and double Sulphate Amm. 1905 and since.	L. 6,788 lb.	94.5	0.2	5.3	<i>Heracleum sphondylium</i>
		L. 3,951 lb.	96.7	—	3.3	<i>Rumex acetosa</i>
19	Farmyard Dung in 1905 and every fourth year since (omitted 1917).	Unlimed	96.3	—	3.7	<i>Rumex acetosa</i>
		L. 3,150 lb.	89.8	4.4	5.8	<i>Ranunculus spp.</i>
		L. 570 lb.	88.6	2.0	9.4	<i>Rumex acetosa</i> <i>Ranunculus spp.</i>
20	Farmyard Dung in 1905 and every fourth year since (omitted in 1917) each intervening year Sulphate of potash, Super., and Nitrate of Soda.	Unlimed	89.8	1.9	8.3	<i>Rumex acetosa</i> <i>Ranunculus spp.</i>
		L. 2,772 lb.	87.2	5.4	7.4	<i>Taraxacum vulgare</i> <i>Ranunculus spp.</i>
		L. 570 lb.	89.6	3.2	7.2	<i>Rumex acetosa</i> <i>Ranunculus spp.</i>
		Unlimed	93.0	2.8	4.2	<i>Taraxacum vulgare</i> <i>Rumex acetosa</i> <i>Ranunculus spp.</i> <i>Canopodium denudatum</i>

PARK GRASS PLOTS

BOTANICAL COMPOSITION PER CENT. 1929 (1st Crop)

Plot	Manuring	Liming	Grami- neae	Legumi- nosae	Other Orders	" Other orders " consist largely of
3	Unmanured.	Limed	43.1	19.1	37.8	<i>Plantago lanceolata</i>
		Unlimed	33.8	7.3	58.9	<i>Plantago lanceolata</i>
7	Complete Mineral Manure.	Limed	33.0	57.0	10.0	<i>Heracleum sphondylium</i>
		Unlimed	40.3	34.8	24.9	<i>Achillea millefolium</i>
9	Complete Mineral Manure and double Amm. Salts.	Limed	99.5	—	0.5	—
		Unlimed *	—	—	—	—
14	Complete Mineral Manure and Double Nitrate of Soda.	Limed (sun)	91.4	4.8	3.8	<i>Taraxacum vulgare</i>
		Limed (shade)	97.1	2.2	0.7	—
		Unlimed	97.5	1.0	1.5	<i>Taraxacum vulgare</i>
		Unlimed	97.5	1.0	1.5	<i>Taraxacum vulgare</i>
15	As plot 7 following double Nitrate of Soda, 1858-75.	Limed	41.8	49.3	8.9	<i>Achillea millefolium</i>
		Unlimed	52.4	22.0	25.6	<i>Achillea millefolium</i>
17	Single Nitrate of Soda.	Limed	70.8	1.7	27.5	<i>Plantago lanceolata</i>
		Unlimed	60.9	0.2	38.9	<i>Plantago lanceolata</i>
18	Mineral Manure (without Super.) and double Sulphate Amm. 1905 and since.	L. 6,788 lb.	96.6	0.1	3.3	—
		L. 3,951 lb.	96.3	—	3.7	<i>Achillea millefolium</i>
		Unlimed *	—	—	—	—
19	Farmyard Dung in 1905 and every fourth year since (omitted 1917).	L. 3,150 lb.	77.4	16.4	6.2	—
		L. 570 lb.	84.3	7.6	8.1	—
20	Farmyard Dung in 1905 and every fourth year since (omitted in 1917) each intervening year Sulphate of Potash, Super., and Nitrate of Soda.	Unlimed	83.9	9.3	6.8	—
		L. 2,772 lb.	72.2	18.4	9.4	—
		L. 570 lb.	83.3	8.9	7.8	—
		Unlimed	81.1	12.4	6.5	—

* No sample taken. Herbage killed by frost and drought.

WHEAT—BROADBALK FIELD, 1932

Plot.	Manurial Treatment (amounts stated are per acre).	Dressed Grain, bushels per acre (in some cases estimated from half or quarter-bushel).					Total Grain, cwt. per acre.					74-year Average 1852-1925 (prior to fallow). Total Grain, cwt.
		I					I					
		III	IV	V	III	IV	V	III	IV	V		
2A	Farmyard Manure (14 tons)	10.7	18.0	15.1	10.1	8.3	11.9	9.9	7.6	16.3 **		
2B	Farmyard Manure (14 tons)	14.0	23.3	10.0	9.3	10.4	14.3	7.4	7.2	19.4		
3	Unmanured since 1839	17.6	8.5	10.8	9.4	11.5	5.7	6.1	6.2	6.7		
5	Complete Mineral Manure §§	19.1	10.2	11.5	10.5	12.9	6.7	7.7	7.1	7.8		
6	As 5, and 206 lb. Sulphate of Ammonia	16.1	15.6	11.0	9.3	11.0	10.0	7.4	6.3	12.5		
7	As 5, and 412 lb. Sulphate of Ammonia	18.4	22.0	19.5	14.9	11.3	14.2	12.9	10.0	17.6		
8	As 5, and 618 lb. Sulphate of Ammonia	16.2	23.0	18.9	18.0	13.4	15.6	13.7	12.4	20.1		
9	As 5, and 275 lb. Nitrate of Soda	16.8	18.5	16.1	11.8	11.5	11.8	10.4	7.0	13.9 ††		
10	412 lb. Sulphate of Ammonia	23.4	19.5	14.9	15.2	15.2	12.8	9.9	10.4	10.9		
11	As 10, and Superphosphate (3½ cwt.)	18.4	20.6	16.4	16.5	12.2	13.1	10.8	11.3	12.3		
12	As 10, and Super (3½ cwt.) and Sulph. Soda (366 lb.)	15.5	21.8	19.9	15.1	10.7	14.3	13.2	10.4	15.7		
13	As 10 and Super (3½ cwt.) and Sulph. Potash (200 lb.)	16.8	19.7	16.2	11.0	11.5	12.8	11.0	8.1	17.0		
14	As 10, and Super. (3½ cwt.) and Sulph. Magnesia (280 lb.)	16.0	20.4	19.2	15.7	10.4	13.3	12.6	10.6	15.5		
15	As 5, and 412 lb. Sulphate Amm. all applied in Autumn	14.1	16.6	14.6	13.8	9.4	10.8	9.6	8.9	16.1		
16	As 5, and 550 lb. Nitrate of Soda	21.6	25.8	21.8	17.3	14.8	16.3	14.1	11.4	17.8 ††		
17	Minerals alone as 5 or 412 lb. Sulphate of Ammonia	A20.2	21.8	21.5	15.2	13.6	14.0	13.4	10.2	A16.1 *		
18	alone in alternate years	M16.3	3.6	6.5	8.9	10.9	2.8	4.6	6.2	M 8.1		
19	Rape Cake (1,889 lb.)	18.2	16.8	16.3	11.9	11.9	11.2	10.9	8.1	12.6 †		
20	As 7, without Super.	23.8	—	—	—	15.6	—	—	—	10.3 §		

Season.	Season.					Season.
	I.	II.	III.	IV.	V.	
1925-26	F	F	F	C	C	1930-31
1926-27	F	F	F	C	C	1931-32
1927-28	C	C	F	F	F	1932-33
1928-29	C	C	F	F	F	1933-34
1929-30	C	C	C	C	C	1934-35

Fallowing Rotation. After the fallows of 1925-6 to 1928-9 a regular cycle of fallowing was started in the season 1930-31. This cycle and the preceding fallows are shown in the accompanying diagram (C=crop, F=fallow). The sections (I. to V.) are numbered in order from the upper or western end of the field. Preparatory to the first fallow the field was harvested in five separate sections (1924-5).

For notes, see next page.

WHEAT—BROADBALK FIELD, 1932

Plot.	Manurial Treatment (amounts stated are per acre).	Bushel Weight in lb. (in some cases estimated from half or quarter-bushel).					Total Straw†, cwt. per acre.					74-year Average 1852-1925 (prior to fallow.) Total Straw, cwt.
		V					V					
		I	III	IV	IV	V	I	III	IV	IV	V	
2A	Farmyard Manure (14 tons)	61.1	62.6	61.4	61.4	62.8	59.0	39.5	41.0	42.6	42.6	32.1 **
2B	Farmyard Manure (14 tons)	61.6	62.0	61.1	61.1	62.1	62.4	45.3	51.5	59.8	59.8	34.2
3	Unmanured since 1839	63.2	62.0	60.5	60.5	62.5	27.8	9.9	13.0	12.3	12.3	9.8
5	Complete Mineral Manure §§	62.9	61.9	63.4	63.4	63.6	34.2	12.0	14.4	14.2	14.2	11.5
6	As 5, and 206 lb. Sulphate of Ammonia	62.3	62.8	63.8	63.8	63.4	44.3	21.5	16.2	15.4	15.4	20.3
7	As 5, and 412 lb. Sulphate of Ammonia	61.8	62.9	63.4	63.4	63.5	58.8	39.8	42.4	42.2	42.2	32.1
8	As 5, and 618 lb. Sulphate of Ammonia	61.5	62.9	62.9	62.9	62.0	59.5	56.4	56.2	58.1	58.1	39.8
9	As 5, and 275 lb. Nitrate of Soda	61.9	62.7	62.9	62.9	63.4	52.7	27.0	27.4	25.9	25.9	24.6††
10	412 lb. Sulphate of Ammonia	62.5	63.2	62.1	62.1	63.2	43.1	30.2	29.4	31.2	31.2	17.8
11	As 10, and Superphosphate (3½ cwt.)	62.2	62.5	62.4	62.4	62.9	45.6	32.9	34.3	34.8	34.8	21.4
12	As 10, and Super (3½ cwt.) and Sulph. Soda (366 lb.)	61.8	62.9	62.9	62.9	62.9	54.4	36.5	31.1	36.2	36.2	26.8
13	As 10, and Super (3½ cwt.) and Sulph. Potash (200 lb.)	61.6	63.4	63.2	63.2	63.1	47.6	38.6	37.7	46.3	46.3	30.6
14	As 10, and Super. (3½ cwt.) and Sulph. Magnesia (280 lb.)	60.6	63.6	63.2	63.2	62.9	52.5	37.5	39.9	39.6	39.6	26.8
15	As 5, and 412 lb. Sulphate Amm. all applied in Autumn	62.2	62.8	62.9	62.9	60.8	48.6	25.3	25.0	37.7	37.7	28.2
16	As 5, and 550 lb. Nitrate of Soda	62.1	62.2	63.4	63.4	61.5	54.0	40.2	40.9	47.5	47.5	35.2††
17	Minerals alone as 5 or 412 lb. Sulphate of Ammonia	A63.8	62.7	61.9	61.9	61.9	47.9	36.7	39.3	47.0	47.0	A28.1 *
18	alone in alternate years	M63.0	61.8	61.6	61.6	62.1	30.3	6.4	9.8	13.9	13.9	M12.3
19	Rape Cake (1,889 lb.)	61.8	61.1	61.5	61.5	60.5	42.1	36.6	37.8	43.0	43.0	22.0‡
20	As 7, without Super.	62.9	—	—	—	—	39.4	—	—	—	—	18.6§

† Includes straw, cavings, and chaff. * A = Ammonia series. M = Mineral series. ‡ Thirty-three years only, 1893-1925. § Eighteen years only, 1906-1925 (no crop in 1912 and 1914). †† Forty-one years only, 1885-1925. ‡‡ Thirty-three years only, 1893-1925. § Eighteen 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 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.

BARLEY—HOOS FIELD, 1932

Plot.	Manuring (Amounts stated are per acre).	Dressed Grain, bushels per acre (in some cases estimated from half or quarter bushel).		Total Grain, cwt. per acre.		76 Years' Average, 1852-1928 Dressed Grain per acre bush.		Bushel weight in lb. (in some cases estimated from half or quarter bushel).		Total Straw, cwt. per acre.		76 Years' Average, 1852-1928 Total straw per acre cwt. †
		Plumage-Archer.	Spratt-Archer.	Plumage-Archer.	Spratt-Archer.	Plumage-Archer.	Spratt-Archer.	Plumage-Archer.	Spratt-Archer.	Plumage-Archer.	Spratt-Archer.	
10	Unmanured	8.2	6.1	5.0	4.8	13.4	52.9	7.7	7.2	7.8		
20	Superphosphate only (3½ cwt.)	20.5	19.4	11.4	11.6	19.0	53.9	11.3	11.7	9.8		
30	Alkali Salts only (200 lb. Sulphate of Potash; 100 lb. Sulphate of Soda; 100 lb. Sulphate of Magnesia)	6.9	5.7	4.3	4.4	14.3	52.9	8.6	7.7	8.7		
40	Complete Minerals; as 30 with Superphosphate (3½ cwt.)	10.9	14.0	6.5	8.8	19.0	53.2	10.5	10.7	11.2		
50	Potash (200 lb.) and Superphosphate (3½ cwt.)	16.9	14.8	9.6	9.7	15.5	52.5	12.3	13.6	9.4		
1A	Ammonium Salts only (206 lb. Sulphate of Ammonia)	14.1	6.8	8.8	5.9	23.7	53.3	10.9	9.6	13.7		
2A	Superphosphate and Amm. Salts	34.3	23.6	20.8	15.4	35.8	54.5	19.2	17.0	20.4		
3A	Alkali Salts and Amm. Salts	4.8	7.2	4.0	6.0	25.8	53.5	12.8	11.4	16.0		
4A	Complete Minerals and Amm. Salts	34.2	39.0	18.8	22.3	39.3	53.5	18.2	23.1	23.6		
5A	Potash Super and Amm. Salts	27.3	33.0	16.1	20.0	33.8	54.2	23.3	27.5	21.7		
1AA	Nitrate of Soda only (275 lb.)	13.4	8.8	8.8	8.2	24.3*	54.1	14.7	13.1	15.4*		
2AA	Superphosphate and Nitrate of Soda	34.7	26.7	20.2	17.7	38.8*	55.1	20.2	17.2	23.1*		
3AA	Alkali Salts and Nitrate of Soda	12.1	6.3	7.7	5.8	24.5*	52.4	13.8	12.6	16.6*		
4AA	Complete Minerals and Nitrate of Soda	29.2	34.1	17.0	20.1	37.7*	54.8	18.6	23.6	23.6*		
1AAS	As Plot 1AA and Silicate of Soda (400 lb.)	23.5	12.4	13.8	9.6	30.2*	53.4	16.2	14.7	18.2*		
2AAS	As Plot 2AA and Silicate of Soda (400 lb.)	34.0	22.3	19.3	15.6	39.7*	55.0	17.3	19.8	23.9*		
3AAS	As Plot 3AA and Silicate of Soda (400 lb.)	13.4	9.4	8.4	7.9	31.2*	53.2	14.9	13.8	19.9*		
4AAS	As Plot 4AA and Silicate of Soda (400 lb.)	30.6	32.0	17.5	19.5	39.9*	54.4	19.4	22.6	25.4*		
1C	Rape Cake only (1,000 lb.)	27.6	21.9	15.8	13.7	35.5	53.8	19.5	17.5	20.6		
2C	Superphosphate and Rape Cake	39.9	35.5	21.1	22.6	38.1	53.0	21.3	23.4	22.0		
3C	Alkali Salts and Rape Cake	22.6	18.8	13.0	11.6	33.7	54.0	17.3	19.0	20.4		
4C	Complete Minerals and Rape Cake	30.5	39.0	17.0	21.6	37.5	54.3	20.9	25.6	22.6		
7-1	Unmanured after dung (14 tons) for 20 years (1852-71)	15.5	20.0	8.7	12.3	25.5†	52.9	11.6	14.8	13.5†		
7-2	Farmyard manure (14 tons)	34.0	41.6	19.6	25.2	44.6	54.0	24.7	38.1	28.1		
6-1	Unmanured since 1852	4.0	5.5	2.9	4.5	14.7	54.8	6.4	8.4	8.6		
6-2	Ashes from Laboratory furnace	5.6	9.0	3.7	6.5	15.7	53.8	7.6	9.1	9.3		
1N	Nitrate of Soda only (275 lb.)	12.2	3.9	7.8	3.8	28.7§	51.8	13.6	9.4	17.8§		
2N	Nitrate of Soda only (275 lb.)	22.2	13.0	12.5	9.8	31.7§§	52.0	16.6	15.1	20.0§§		

In 1912 all plots were fallowed. || 1 cwt. 2.15 bushels. † Total straw includes straw, cavings and chaff. * Sixty years 1868-1928. ‡ 56 years, 1872-1928. § 75 years, 1853-1928.

In 1932 the same procedure of sowing in widely spaced drills (18 ins. apart) was adopted as in 1930 and 1931. The strips sown with Plumage-Archer in 1931 were sown with Spratt-Archer in 1932 and vice versa. The two varieties were again sown by the half-drill strip method, the whole of the area of each variety being included in the weighed produce.