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Woburn Experimental Farm, 1927, 1928

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Dr J. A. Voelcker (1928) *Woburn Experimental Farm, 1927, 1928* ; Report For 1927-28, pp 102 - 115
- DOI: <https://doi.org/10.23637/ERADOC-1-85>

WOBURN EXPERIMENTAL FARM

REPORTS FOR 1926-7 AND 1927-8,

By DR. J. A. VOELCKER, C.I.E., M.A.

SEASON 1926-7.

This season was the third unfavourable one in succession. A wet November delayed the early growth of wheat, and all crops were affected by the absence of sunshine and warmth after May, and by the wet August and September; ripening of cereal crops was unsatisfactory and harvest was badly delayed. The first cut of hay was poor, while the second cut was ruined by the wet. Sowing of the root crops was ruined by weather, and the yields were below average.

SEASON 1927-8.

This season was distinctly better. Autumn operations were concluded without difficulty, and wheat came up well. After Christmas, cold and dull weather persisted until May, and sowing of spring crops was delayed. However, the warmer weather of the next two months was a great help to all crops, except potatoes which suffered through drought, and grass that had suffered from the earlier dull weather. Harvesting was carried through without difficulty.

RAINFALL.

	1926-7. Inches.	No. of days on which rain fell.	1927-8. Inches.	No. of days on which rain fell.
October	2.22	9	1.20	17
November	3.39	20	2.17	18
December	0.40	3	2.52	14
January	2.15	13	3.69	24
February	2.87	13	1.45	12
March	2.09	19	1.56	18
April	1.35	10	1.11	16
May	0.70	9	1.43	14
June	3.27	18	2.39	17
July	1.79	11	2.58	10
August	3.19	20	2.77	20
September	4.37	17	0.70	10
	27.79	162	23.57	190

FIELD EXPERIMENTS.

1.—CONTINUOUS GROWING OF WHEAT AND BARLEY (STACKYARD FIELD).

As stated in the Report for 1925-26, it was decided to fallow these plots, which had become infested with weeds. Intensive cleaning operations have been in progress in the past two seasons, including hand-digging to remove twitch and bind weed. The dominant weeds—coltsfoot and mayweed on the wheat plots, and spurrey on the barley plots—were attacked by repeated ploughing and harrowing, but the wet season of 1926-27 enabled many of them to root afresh after the operations. Better progress was made in 1927-28, especially on the wheat plots, and at the end of the season all the plots were clean. Wheat and barley will therefore be sown for the 1928-29 season, but no manures will be given, so that the effect of two years fallowing, coupled with the withholding of manures for three years, may be ascertained.

The average yields for the fifty years during which the experiments ran before the fallowing operations, are given in Tables I and II.

2.—ROTATION EXPERIMENTS.

The Unexhausted Value of Cake and Corn (Stackyard Field)

(a) Series C.

1927.—BARLEY.

The details of the preparation of the land for barley by folding the previous root-crop with sheep were as follows :—

Corn-fed Plot.

Swedes, 13 t. 18 cwt. per acre, plus oats equivalent to 14.27 lb. nitrogen per acre.

Cake-fed Plot.

Swedes, 13 t. per acre, plus linseed and cotton cake equivalent to 37.7 lb. nitrogen per acre.

Barley was sown three weeks after feeding was finished. The yields were :—

Barley after Swedes, Produce per Acre.

Plot.					Head Corn.		Tail Corn Weight.	Straw, Chaff, etc.
			Bushels.	Weight per Bushel.	lb.	cwt.		
1	Corn-fed	...	...	16.8	42.5	39.5	11.2
2	Cake-fed	...	...	18.1	44.0	49.0	12.6

In spite of the increased amounts of nitrogen given, the extra yield on the cake-fed plot (1.3 bush. corn and 1.4 cwt. straw) is no greater than on the corresponding area of Series D in 1926, when no cake or corn was given (Report 1925-26, p. 103).

TABLE I.
CONTINUOUS GROWING OF WHEAT. Stackyard Field, 1877-1926

Plot.	Manures Applied Annually per acre.	Average Produce of Dressed Corn per acre.				Average Weight per bushel.				Average Produce of Straw, Chaff, etc., per acre.			
		20 years, 1877-96, cwt.	10 years, 1897-1906, cwt.	10 years, 1907-16, cwt.	10 years, 1917-26, cwt.	20 years, 1877-96, lb.	10 years, 1897-1906, lb.	10 years, 1907-16, lb.	10 years, 1917-26, lb.	20 years, 1877-96, cwt.	10 years, 1897-1906, cwt.	10 years, 1907-16, cwt.	10 years, 1917-26, cwt.
1	Unmanured	7.62	4.85	5.27	3.64	57.6	60.3	60.1	58.4	15.01	8.96	8.60	6.80
2a	¹ Sulphate of Ammonia (= 50 lb. Ammonia till 1906, 25 lb. since)	12.29	5.01	0.28	0.30	57.3	59.87	60.0 ⁹	58.71 ⁰	22.40	7.62	1.54	1.56
2aa	As 2a, with 5 cwt. lime, Jan. 1905; repeated 1909, 1910 and 1911	—	—	6.06	3.75	—	—	60.3 ¹¹	58.91 ²	—	—	9.86	8.02
2b	As 2a, with 2 tons lime, Dec. 1897... ..	—	—	8.89	4.27	—	59.6 ⁵	60.2	59.0	—	14.06 ⁵	12.34	7.95
2bb	As 2b, with further 2 tons lime, Jan. 1905	—	—	7.50	4.77	—	—	59.3	59.0	—	—	12.94	8.53
3a	Nitrate of Soda (= 50 lb. Ammonia)	11.75	9.47	9.93	8.09	55.2	57.2	57.1	57.3	23.72	18.33	18.65	14.57
3b	Nitrate of Soda (= 25 lb. Ammonia) since 1907 only	—	—	8.50	7.08	—	—	57.7	58.1	—	—	15.02	12.77
4	² Mineral Manures	7.82	4.68	4.84	4.42	57.8	60.6	60.0	58.1	15.60	8.72	8.48	8.63
5a	Mineral Manures and Sulphate of Ammonia as 2a	15.86	13.89	8.86	5.06	58.7	61.9	59.8	58.5 ¹²	29.03	19.79	13.56	9.98
5b	As 5a with 1 ton lime, Jan. 1905... ..	—	—	12.03	7.37	—	—	60.5	59.0	—	—	17.11	13.02
6	Mineral Manures and Nitrate of Soda (= 50 lb. Ammonia till 1906; 25 lb. since)	16.15	13.29	9.73	8.58	57.8	59.7	58.6	58.0	31.38	22.61	17.19	14.78
7	Unmanured	8.14	6.17	5.79	4.05	57.0	61.1	59.9	58.7	15.42	9.88	8.85	6.86
8a	Mineral Manures: Sulphate of Ammonia (= 100 lb. Ammonia till 1906; 50 lb. since) in alternate years, beginning with 1883	15.87 ⁶	10.17	2.74	2.10	59.1 ⁶	60.8 ⁸	59.0 ¹³	60.1 ¹⁴	28.62 ⁶	15.88	5.41	4.39
8aa	As 8a, with 10 cwt. lime, Jan. 1905, repeated Jan. 1918	—	—	9.94	5.30	—	—	59.5	59.6	—	—	15.73	10.62
8b	Mineral Manures: Sulphate of Ammonia as 8a, yearly till 1882, omitted in 1883 and alternate years since	15.81 ⁶	12.09	4.96	1.71	59.2 ⁶	61.7	60.0 ¹⁵	59.7 ¹⁸	27.66 ⁶	18.04	4.55	3.35

TABLE 1. YIELD OF WHEAT, 1882-1906, WITH AND WITHOUT FERTILISERS

Years when		20-02 ⁶	13-33	2-74	2-10	59-3 ⁶	61-7	59-0 ¹³	60-1 ¹⁴	35-53 ⁶	19-62	5-41	4-39
8a	Sulph. Ammonia (8a and b applied)	—	—	9-94	5-30	—	—	59-5	59-6	—	—	15-73	10-62
8aa	Sulph. Ammonia (8a and b omitted)	12-25 ⁶	8-94	2-45	1-71	59-1 ⁶	60-8 ⁸	60-0 ¹⁵	59-7 ¹⁶	20-76 ⁶	14-29	4-55	3-35
8b		—	—	7-60	4-61	—	—	60-4	58-8 ¹²	—	—	11-69	7-75
8bb		—	—	—	—	—	—	—	—	—	—	—	—
9a	Nitrate of Soda applied	17-32 ⁶	16-49	10-17	8-22	56-9 ⁶	59-8	58-8	59-0	36-85 ⁶	29-45	19-28	16-09
9b	Nitrate of Soda omitted	8-59 ⁶	6-73	5-82	4-62	58-6 ⁶	60-9	60-0	58-8	15-31 ⁶	11-53	9-80	8-29
WHEAT													
10a	Unmanured 1882-1906 ⁸ (except rape cake in 1889 as 10b) Superphosphate 3 cwt., Nitrate of Soda (= 25 lb. Ammonia) 1907-1926 ...	9-07 ⁶	7-18	9-72	8-28	58-1 ⁶	61-1	58-9	58-2	16-17 ⁶	11-10	16-05	13-96
10b	Farmyard Manure (= 100 lb. Ammonia) 1877-87, unmanured 1888, rape cake 1889-1906 (= 50 lb. Ammonia in 1889, 100 lb. there-after) rape dust (= 25 lb. Ammonia) 1907-26 ...	—	15-01	10-64	6-79	—	61-0	60-8	59-3	—	25-56	16-48	11-69
11a	Unmanured 1882-1906. ⁴ Sulphate of Potash 1 cwt., Nitrate of Soda (= 25 lb. Ammonia) 1907-26 ...	9-71 ⁶	8-01	8-65	7-15	58-4 ⁶	61-2	59-1	58-5	17-00 ⁶	12-34	15-33	13-97
11b	Farmyard Manure (= 200 lb. Ammonia till 1906, 100 lb. since) ...	14-27	13-46	11-03	9-54	58-7	60-7	59-7	58-6	26-55	24-50	21-31	19-01

⁸ Omitting 1904 when there was no crop.

⁹ 1907 and 1911 only.

¹⁰ 1917, 1920 and 1922 only.

¹¹ Omitting 1909.

¹² Omitting 1925.

¹³ Omitting 1914, 1915, 1916.

¹⁴ Omitting 1924 and 1926.

¹⁵ Omitting 1913, 1914, 1916.

¹⁶ Omitting 1924, 1925, 1926.

¹ Till 1907 Ammonia Salts (equal weights of Sulphate and Muriate of Ammonia) were applied; since 1907 Sulphate of Ammonia only has been used.

² Minerals for first 30 years were:—3½ cwt. Superphosphate, 200 lb. Sulphate of Potash, 100 lb. Sulphate of Soda, 100 lb. Sulphate of Magnesia, per acre. Since 1906, 3 cwt. Superphosphate and ¼ cwt. Sulphate of Potash only.

³ Previous to 1882 Farmyard Manure as 10b.

⁴ Previous to 1882 Farmyard Manure as 11b.

⁵ 9 years only, 1898-1906.

⁶ 15 years only, 1882-1896.

⁷ Omitting 1904 and 1905 when there was no crop.

TABLE II.
CONTINUOUS GROWING OF BARLEY. Stackyard Field, 1877-1926

Plot.	Manures Applied Annually per acre.	Average Produce of Dressed Corn per acre.				Average Weight per bushel.				Average Produce of Straw, Chaff, etc., per acre.			
		20 years, 1877-96. cwt.	10 years, 1897-1906. cwt.	10 years, 1907-16. cwt.	10 years, 1917-26. cwt.	20 years, 1877-96. lb.	10 years, 1897-1906. lb.	10 years, 1907-16. lb.	10 years, 1917-26. lb.	20 years, 1877-96. cwt.	10 years, 1897-1906. cwt.	10 years, 1907-16. cwt.	10 years, 1917-26. cwt.
1	Unmanured ...	10.12	5.63	4.80	3.88	51.6	52.4	50.2	50.2	12.77	6.85	7.78	6.91
2a	¹ Sulphate of Ammonia (= 50 lb. Ammonia till 1906, 25 lb. since) ...	15.61	1.92	0.18	0.75	51.9	53.0 ⁷	51.4 ⁹	51.4 ⁹	18.91	3.47	0.41	1.30
2aa	As 2a, with 5 cwt. lime, Mar. 1905; repeated 1909, 1910 and 1912, and 10 cwt. lime in 1923 ...	—	—	—	—	—	—	—	—	—	—	—	—
2b	As 2a, with 2 tons lime, Dec. 1897, repeated 1912 ...	—	—	3.38	2.53	—	—	51.1 ¹⁰	51.2	—	—	6.35	5.60
2bb	As 2b, with further 2 tons lime, Mar. 1905 ...	—	10.36 ⁵	6.93	4.04	—	52.4 ⁵	50.9	50.9	—	11.34 ⁵	10.36	7.45
3a	Nitrate of Soda (= 50 lb. Ammonia) ...	—	—	7.04	3.96	—	—	51.6	50.1	—	—	9.53	7.34
3b	Nitrate of Soda (= 25 lb. Ammonia) since 1907 only ...	16.40	11.40	7.40	5.33	51.4	51.8	50.3	50.3	21.49	13.97	12.95	9.18
4a	² Mineral Manures ...	—	—	6.69	3.99	—	—	49.8	49.8	—	—	10.36	7.25
4b	As 4a, with 1 ton lime, Mar. 1915... ...	10.37	7.93	6.07	4.67	51.7	53.1	50.5	50.5	12.13	8.60	9.26	7.20
5a	Mineral Manures and Sulphate of Ammonia as 2a ...	—	—	—	5.33	—	—	—	50.4	—	—	—	8.26
5aa	As 5a, with 1 ton lime, Mar. 1905, repeated 1916 ...	18.63	3.52	1.37	2.38	53.2	53.1	50.9 ¹¹	51.2 ¹²	22.51	5.27	3.16	4.24
5b	As 5a, with 2 tons lime, Dec. 1897, repeated 1912 ...	—	—	9.66	7.30	—	—	52.2	50.7	—	—	14.46	10.69
6	Mineral Manures and Nitrate of Soda (= 50 lb. Ammonia till 1906; 25 lb. since) ...	—	16.85 ⁵	9.97	6.19	—	—	54.2 ⁵	50.4	—	19.18 ⁵	14.20	8.91
7	Unmanured ...	20.51	17.01	9.52	7.70	52.7	53.5	50.6	49.8	27.34	21.17	14.43	10.91
8a	Mineral Manures; Sulphate of Ammonia (= 100 lb. Ammonia till 1906; 50 lb. since) in alternate years, beginning with 1883 ...	9.37	6.50	4.07	3.34	51.1	52.4	50.4	50.4	11.59	7.11	6.44	5.76
		17.11 ⁶	6.66	1.60	0.85	52.7 ⁶	53.8	51.2 ¹³	50.1 ¹⁴	21.24 ⁶	7.49	2.35	1.27

Years when

8a	Sulph. Ammonia (8a and b applied 8aa and bb Sulph. Ammonia (8a and b omitted) 8bb)	21.14 ⁶	7.29	1.60	0.85	52.5 ⁶	53.9	51.2 ¹³	50.1 ¹⁴	28.09 ⁶	9.13	2.35	1.27
8aa		—	18.87 ⁵	11.05	7.29	—	54.1 ⁵	51.4	51.4	—	22.19 ⁵	15.58	10.92
8b		14.73 ⁶	6.41	0.72	0.46	53.1 ⁶	53.9	51.3 ¹⁵	51.0 ¹⁶	17.24 ⁶	7.44	1.26	0.94
8bb		—	14.11 ⁵	7.36	5.21	—	54.3 ⁵	51.3	51.1	—	14.59 ⁵	10.63	8.51
9a	Nitrate of Soda applied 9b Nitrate of Soda omitted	23.18 ⁶	21.00	12.26	9.23	51.8 ⁵	53.3	50.9	50.4	34.70 ⁶	26.92	19.26	13.67
9b		14.82 ⁶	11.53	7.81	6.19	53.3 ⁶	53.7	50.6	50.8	16.75 ⁶	12.84	11.32	9.48
9b	alternate years, beginning with 1883 ... Mineral Manures: Nitrate of Soda as 9a, yearly till 1882, omitted in 1883 and alternate years since ... 10a Unmanured 1882-1906 ³ (except rape cake in 1889 as 10b), Superphosphate 3cwt., Nitrate of Soda (= 25 lb. Ammonia) 1907-1926 ... 10b Farmyard Manure (= 100 lb. Ammonia) 1877-87, unmanured 1888, rape cake 1889-1906 (= 50 lb. Ammonia in 1889, 100 lb. thereafter), rape dust (= 25 lb. Ammonia) 1907-26 ... 11a Unmanured 1882-1906. ⁴ Sulphate of Potash 1 cwt., Nitrate of Soda (= 25 lb. Ammonia) 1907-26 ... 11b Farmyard Manure (= 200 lb. Ammonia till 1906, 100 lb. since) ...	18.82 ⁶	16.27	12.26	9.23	52.7 ⁶	53.5	50.9	50.4	24.91 ⁶	18.91	19.26	13.67
10a		19.17 ⁶	16.27	7.81	6.19	52.5 ⁶	53.5	50.6	50.8	26.55 ⁶	20.85	11.32	9.48
10b	12.36 ⁶	8.21	8.80	6.76	51.9 ⁶	53.2	50.6	50.4	14.89 ⁶	9.25	13.72	10.17	
11a	—	16.41	8.44	4.08	—	53.1	51.2	51.3	—	20.12	11.84	7.29	
11b	15.50 ⁶	10.78	11.13	8.31	52.6 ⁶	53.3	50.3	50.7	18.39 ⁶	12.33	17.26	11.98	
		18.69	18.09	14.89	12.26	53.1	53.8	51.6	51.3	22.45	21.71	20.52	17.79

¹ Till 1907 Ammonia Salts (equal weights of Sulphate and Muriate of Ammonia) were applied; since 1907 Sulphate of Ammonia only has been used.
² Minerals for first 30 years were:—3½ cwt. Superphosphate, 200 lb. Sulphate of Potash, 100 lb. Sulphate of Soda, 100 lb. Sulphate of Magnesia, per acre. Since 1906, 3 cwt. Superphosphate and ½ cwt. Sulphate of Potash only.
³ Previous to 1882 Farmyard Manure as 10b.
⁴ Previous to 1882 Farmyard Manure as 11b.
⁵ 9 years only, 1898-1906.
⁶ 15 years only, 1882-1896.
⁷ Omitting 1905 and 1906.
⁸ 1912 only.
⁹ 1919, 1920, 1921, 1922 and 1926 only.
¹⁰ Omitting 1908.
¹¹ 1907, 1909, 1910, 1912 and 1916 only.
¹² Omitting 1918, 1924 and 1925.
¹³ 1907, 1909, 1910 and 1912 only.
¹⁴ Omitting 1923, 1924 and 1925.
¹⁵ 1907, 1909 and 1912 only.
¹⁶ 1919, 1920, 1921, 1922 and 1926 only.

1928.—CLOVER.

Red clover was sown in the barley crop of 1927, and gave a good plant. In the middle of March it became patchy and the parasitic eelworm *Tylenchus dipsaci* was found to be present. Although the crop improved later, it was patchy at harvest, and no reliance can be placed on the difference recorded on the two plots :—

Produce per acre of Red Clover.

	cwt.
1. (Cake plot)	33.4
2. (Corn plot)	59.6

The aftermath, although regular, was of small amount, and, owing to the lateness of the season, it was ploughed in.

(b) Series D.

1927.—CLOVERS.

Mixed clovers were sown in the barley crop of 1926: red clover 7 lb., alsike 3 lb., trefoil 3 lb. per acre. Owing to the season the crop was cut late. The actual yields of hay per acre were :—

Corn-fed plot, 60.7 cwt.; cake-fed plot, 42.5 cwt.

The cake-fed plot was damaged by rabbits and its yield was appreciably reduced.

Owing to the late season no second cut was taken.

1928.—WHEAT.

“ Little Joss ” wheat made satisfactory early growth, but began to look yellow in May. With warmer weather it recovered somewhat. The yields were as follows :—

Wheat after Clovers, Produce per Acre.

Plot.		Head Corn.		Tail Corn Weight.	Straw, Chaff, etc.
		Bushels.	Weight per Bushel.		
1	Corn-fed	17.6	lb. 59.7	lb. 116	cwt. 15.2
2	Cake-fed	18.6	60.4	139	17.2

It should be noted that the swedes failed in 1925 and 1921; hence there has been no corn or cake-feeding on these plots since 1916.

3.—GREEN MANURING EXPERIMENTS.

(a) Stackyard Field. Series A.

Upper Half.

1927.—WHEAT.

Following the green crops of 1926, “ Little Joss ” wheat was sown, and up to April looked very well. Then the usual signs

of failure began to appear, and a considerable growth of poppies was also noted. The yields were very poor, as has been the case for years past :—

Wheat after Green Crops, Produce per Acre.

Plot.		Head Corn.		Tail Corn Weight.	Straw, Chaff, etc.
		Bushels.	Weight per Bushel.		
1	After Tares fed off ...	4.9	lb. 58.5	lb. 24	cwt. 11.4
2	After Tares fed off, limed 1923 ...	2.4	58.5	18	10.7
3	After Mustard fed off ...	6.8	58.0	24	9.2
4	After Mustard fed off, limed 1923 ...	2.0	58.0	14	6.9

The application of lime has again produced no improvement ; if anything the reverse. The problem of accounting for these poor yields of wheat from a plant that always looks exceedingly promising in its early stages, and which follows an excellent growth of tares or mustard, is one that still defies solution.

1928.—GREEN CROPS FED OFF BY SHEEP.

After the wheat harvest, tares and mustard were sown as usual, and mineral manures (super 3 cwt. sulphate of potash 1 cwt.) were applied to both plots. A good crop of each resulted, which was fed off by sheep that also received 3 cwt. of linseed and cotton cake per acre. The land has been ploughed and sown to wheat.

Lower Half.

1927.—GREEN CROPS FED OFF BY SHEEP.

Tares and wheat were sown, mineral manures (super. 3 cwt., sulphate of potash 1 cwt.) being also applied. Excellent crops were obtained. These were fed off with sheep that also consumed 3 cwt. of linseed and cotton cake per acre.

1928.—WHEAT.

During the preparation of the land after the green-crops a good deal of twitch was removed. The wheat came up well and, up to February, was in excellent condition. After this it began to fall off as usual. By July the appearance was very poor, and but low yields were obtained :—

Wheat after Green Crops, Produce per Acre.

Plot.		Head Corn.		Tail Corn Weight.	Straw, Chaff, etc.
		Bushels.	Weight per Bushel.		
1	After Tares fed off ...	7.1	lb. 58.7	lb. 41	cwt. 9.1
1a	After Tares fed off, limed 1924 ...	7.4	58.7	51	9.8
2	After Mustard fed off ...	7.9	58.9	32	9.7
2a	After Mustard fed off, limed 1924 ...	3.7	60.0	24.5	5.5.

These results urgently call for enquiry. The low yields follow the application of mineral manures in the previous season, when an excellent green crop was obtained, and the land was further enriched by the 3 cwt. per acre of cake received by the sheep folded on the tares and mustard. A further point at present inexplicable is the depressing effect of lime on the wheat grown on the mustard plot.

(b) Lansome Field.

1927.—WHEAT.

Little Joss wheat followed the green crops of 1926 that had been ploughed in. At first the plant looked weaker on the mustard plots, but improved later. In the early months of 1927 difference was observed between the old plots begun in 1892 and the new series commenced in 1922, the former being much the worse. By June the growth of mayweed on the old plots was so great that, to prevent it from seeding, it was decided to cut this area at once, and to plough the land. Mayweed was less serious on the new plots, and was pulled out by hand, but, even on this area, the yields were almost too small to record; in all cases they were less than 1 bushel per acre:—

Wheat after Green-Crops Ploughed in, Produce per Acre.

	Plot.	Corn.	Straw, Chaff, etc.
Old Plots	{ 1. After Mustard ploughed in } { 2. After Tares ploughed in }	plots	harvested green; no yields taken
New Plots	{ 3. After Mustard ploughed in	lb. 8	cwt. 2.4
	{ 4. After Tares ploughed in ...	24	2.6
	{ 5. Control (no green-crop) ...	20	4.4

1928.—GREEN CROPS.

Mustard and tares were drilled and mineral manures (super. 3 cwt. and sulphate of potash 1 cwt. per acre) applied. A fair crop was obtained and the mayweed seemed somewhat reduced.

The crop was ploughed under in mid-July and a second crop sown. These did not attain much size up to the time they were ploughed under in preparation for the succeeding wheat crop. Mayweed was still very noticeable, especially on the old plots.

4.—THE RELATIVE VALUES OF LIME AND CHALK FOR LIMING PURPOSES. STACKYARD FIELD. SERIES B.

1927.—OATS.

In the preceding year seeds were grown on one half of the area and lucerne on the other half (Report 1925-26 pp. 109-110). The whole area was ploughed in the winter and oats were sown. A good growth was secured, that on the seeds area being the better. The figures in the following table refer to this area only :—

Lime and Chalk Experiment—Stackyard Field—Series B.
Oats, 1927, Produce per Acre.

Plot.	Applications per acre in 1919.	Head Corn Bushels.*	Tail Corn Weight.	Straw, Chaff, etc.
			lb.	cwt.
1	No Chalk	25.4	132	13.1
2	Chalk= 10 cwt. lime	33.9	114	17.1
3	Chalk= 1 ton lime	33.4	156	15.8
4	Chalk= 2 tons lime	37.2	192	19.0
5	Chalk= 3 tons lime	35.6	180	16.3
6	Chalk= 4 tons lime	32.1	156	16.8
7	No Lime	31.6	216	17.9
8	Lime 10 cwt.	28.3	222	16.8
9	Lime 1 ton	29.4	228	16.6
10	Lime 2 tons	34.6	252	18.9
11	Lime 3 tons	27.0	180	16.4
12	Lime 4 tons	33.2	104	18.8

* Weight per bushel taken on whole produce=33 lb.

Subject to the restriction that the duplicate control plots (Nos. 1 and 7) differ in yield, it appears that, on the average, the chalk series gave 1 cwt. more corn, but less straw, than the lime series. Hence, over the duration of this experiment there has been little to choose between lime and the equivalent quantity of chalk; further, no additional benefit has been obtained from dressings of lime (or its equivalent in chalk) exceeding 2 tons per acre.

This experiment has now been discontinued.

5. MANURING AND LIMING OF GRASS LAND—
BROAD MEAD.

Since 1901 manurial experiments on grass land have been conducted in Broad Mead. As a rule the land has been alternatively grazed and hayed. Since 1925 the field has been grazed each year. In addition to these manurial experiments there were two other series of experiments in this field, the one being on different varieties of lime (Buxton, chalk, magnesian, lias, and

oolite limes), the other on different forms of lime (lump lime, ground lime, ground limestone, ground chalk). These series received nothing except the lime and the droppings of the grazing animals.

Owing to a re-arrangement of the programme of work, it has been decided to give up the two last sets of experiments (on liming) and to retain only the original manurial series of 1901, less one unimportant plot.

It is appropriate, therefore, to summarise the results of the two sets of experiments on liming which are now to be discontinued. These have shown that the use of lime of any kind or form has been beneficial, although, as shown in the manurial experiment (see (c) below), the addition of fertilisers produces a further improvement.

(a) Varieties of Lime.

The experiment began in 1910; three applications at 2 tons per acre were given during the period 1910-1928. All the different varieties of lime have improved the pasture, in the order—chalk, Buxton, lias and oolite, magnesium.—The unmanured plot remained rough and unattractive to stock; on the limed plots the effect appeared to be an improvement in quality of herbage rather than a change in botanical composition.

(b) Forms of Lime.

This series began in December, 1924. A single application was given at the following rates:—Lump lime, ground lime, 2 tons per acre; ground limestone, and ground chalk, 4 tons per acre. Up to the time of discontinuing the experiment, benefit had been obtained only from the two first materials.

(c) Manurial Experiment.

As stated above, this experiment is being continued as a demonstration of the advantage of lime with mineral manures on grass land. Lime at 2 tons per acre has been applied to one plot six times in the full period of 1901-1928. Little effect was seen until 1910, when 3 cwt. of super and 1 cwt. of sulphate of potash were put on, similar dressings being given also in 1913 and 1920. This plot, although giving a small hay yield, is now much the best for grazing. Next in order are the two plots receiving basic slag and super, with the addition of sulphate of potash in each case. As would be expected, the proportion of clover in the herbage has increased. The biggest hay yield comes from the farmyard manure plot, although its quality is inferior. Finally, the unmanured plot remains rough and neglected by stock, and provides an excellent contrast to the other plots.

REPLICATED EXPERIMENTS.

Below is given a list of the replicated experiments done at Woburn during 1927 and 1928, together with the page numbers on which the tables of results will be found. One experiment of 1926 which did not appear in the last Report is included.

Year.	Crop.	Nature of Experiment.	Results.
1926	Potatoes ...	Nitrogenous Fertilisers : Sulphate of Ammonia and Cyanamide, each in Single and Double Dressings ...	See p. 155
1927	Potatoes ...	Effect of Superphosphate ...	See p. 156
1927	Potatoes ...	Nitrogenous Fertilisers : Sulphate of Ammonia, Urea and Cyanamide, each in Single and Double Dressings ...	See p. 157
1927	Sugar Beet ...	(a) Comparison of Nitrogenous Fertilisers : Sulphate and Muriate of Ammonia and Cyanamide : (b) Preparation of Seed Bed ...	See p. 160
1928	Barley ...	Effect of Fertilisers on yield and quality ...	See p. 154
1928	Potatoes ...	Nitrogenous Fertilisers : Sulphate of Ammonia and Cyanamide, each with and without Nitrate of Soda Nitrophoska and Compound " B " ...	See p. 158
1928	Potatoes ...	Effect of Superphosphate ...	See p. 156
1928	Sugar Beet ...	Nitrogenous Fertilisers : Sulphate of ammonia and Muriate of ammonia, each applied with seed. Nitrochalk as top-dressing ...	See p. 162
		Potassic Fertilisers : Muriate of Potash, Potash Manure Salts... Nitrophoska ...	
1927 and 1928	Lucerne ...	Effect of Inoculation ...	See p. 164

OTHER EXPERIMENTS.

A number of smaller experiments were also undertaken, as follows :—

Year.	Crop.	Nature of Experiment.	Results.
1926	Mangolds ...	Effect of Ammonia Salts and Potash	See p. 164
1926	Potatoes ...	Effect of Ammonia Salts and Potash	See p. 164
1927	Mangolds ...	Top-dressing Experiment : Sulphate of Ammonia, Nitrate of Soda, Common Salt ...	See p. 164

WOBURN EXPERIMENTAL STATION
DATES OF SOWING AND HARVESTING, AND YIELD PER ACRE, 1927

Field.	Crop.	Variety.	Sowing began.	Sowing finished.	Cutting began.	Carting began.	Carting finished.	Yield per Acre.
Stackfield Field—								
Permanent Wheat...	Fallow	...	...	...	...	...	...	...
Permanent Barley...	Fallow	...	...	...	...	...	...	...
Series A (a)	Green Crops	Tares	April 26, '27	April 26, '27	Sept. 8, '27 (fed off)	...	...	...
		Mustard	June 3, '27	June 3, '27	Aug. 27, '27 (fed off)	...	Sept. 7, '27	...
Series A (b)	Wheat	Little Joss	Oct. 21, '26	Oct. 21, '26	Aug. 30, '27	Sept. 19, '27	Sept. 19, '27	2½ cwt.
Series B	Spring Oats	Abundance	April 20, '27	April 20, '27	Aug. 30, '27	Sept. 19, '27	Sept. 19, '27	11 cwt.
Series C	Barley	Plumage Archer	Mar. 29, '27	Mar. 29, '27	Sept. 13, '27	Sept. 21, '27	Sept. 23, '27	7¼ cwt.
Series D	Clover	Mixed Seed	May 27, '26	May 27, '26	July 26, '27	Aug. 3, '27	Aug. 3, '27	50 cwt.
	Sugar Beet	Dutch	June 9, '27	June 16, '27	...	Nov. 25, '27	Jan. 13, '28	3 tons
Butt Close	Potatoes	Arran Comrade	June 25, '27	June 25, '27	...	Oct. 27, '27	Nov. 3, '27	4 tons
	Swedes	...	July 9, '27	July 9, '27	...	...	...	fed off.
Butt Furlong	Wheat	Little Joss	Oct. 20, '26	Oct. 20, '26	Sept. 2, '27	Sept. 9, '27	Sept. 19, '27	9 bush.
	Potatoes	King Edward	May 25, '27	May 25, '27	...	Oct. 19, '27	Nov. 3, '27	4 tons
	Wheat	Little Joss	Oct. 26, '26	Oct. 26, '26	Sept. 1, '27	Sept. 20, '27	Sept. 20, '27	24 lbs.
Lansome Field	Winter Oats	Grey and Black	Nov. 10, '26	Nov. 10, '26	Aug. 5, '27	Sept. 1, '27	Sept. 1, '27	32 bush.
	Potatoes	Eclipse, Majestic, King Edward.	May 10, '27	May 23, '27	...	Oct. 3, '27	Oct. 18, '27	8 tons (E. & M.) 6½ tons (K.E.)
Mill Close	Lucerne	...	July 13, '27	July 13, '27	Oct. 13, '27	Oct. 21, '27	Oct. 21, '27	...
	Mangolds	Yellow Globe	May 17, '27	May 26, '27	...	Nov. 6, '27	Nov. 23, '27	17 tons
Road Piece	Spring Oats	Abundance	April 21, '27	April 21, '27	Aug. 29, '27	Sept. 12, '27	Sept. 12, '27	12 cwt.
	Seeds	...	May 21, '26	May 21, '26	July 29, '27	Aug. 11, '27	Aug. 11, '27	35 cwt.
Great Hill	Seeds	...	May 24, '26	May 24, '26	Aug. 4, '27	Aug. 17, '27	...	...
Warren Field	Wheat	Little Joss	Dec. 14, '26	Dec. 14, '26	Aug. 24, '27	Sept. 5, '27	Sept. 5, '27	18 cwt.
	Winter Beans	...	Nov. 11, '26	Nov. 16, '26	Aug. 23, '27	Sept. 13, '27	Sept. 13, '27	8 bush.

WOBURN EXPERIMENTAL STATION
DATES OF SOWING AND HARVESTING, AND YIELD PER ACRE, 1928

Field.	Crop.	Variety.	Sowing began.	Sowing finished.	Cutting began.	Carting began.	Carting finished.	Yield per Acre.
Stackyard Field— Permanent Barley...	Fallow	...	...	...	...	...	...	...
	Fallow	...	...	...	...	...	...	...
	Wheat	Little Joss	Nov. 1, '27	Nov. 1, '27	Aug. 27, '28	Sept. 4, '28	Sept. 4, '28	7½ bush.
	Potatoes	Majestic and Ally	May 5, '28	May 10, '28	...	Oct. 12, '28	Oct. 13, '28	12 tons
Series A	...	...	...	...	...	...	...
Series B	...	...	...	...	...	...	...
Series C	...	Red Clover	May 28, '27	May 28, '27	July 3, '28	July 9, '28	July 9, '28	23½ cwt. hay
Series D	Wheat	Little Joss	Oct. 29, '27	Nov. 6, '27	Aug. 27, '28	Sept. 3, '28	Sept. 3, '28	(one crop only)
	Barley	Chevalier Type	Mar. 15, '28	Mar. 17, '28	Aug. 9, '28	Aug. 30, '28	Sept. 3, '28	20½ bush.
	Sugar Beet	Dippe	May 18, '28	May 18, '28	...	Nov. 3, '28	Nov. 19, '28	18 cwt.
Butt Furlong	Potatoes	King Edward	May 14, '28	May 15, '28	Oct. 9, '28	Oct. 9, '28	Oct. 10, '28	10 tons (washed)
	Swedes	...	June 4, '28	June 4, '28	...	Oct. 15, '28	Oct. 15, '28	4½ tons
	Seeds	...	June 1, '27	June 1, '27	...	June 28, '28	June 29, '28	10 tons
Lansome Field	Barley	Chevalier Type	Mar. 14, '28	Mar. 14, '28	Aug. 16, '28	Aug. 31, '28	Sept. 1, '28	40 cwt.
	...	...	...	...	...	...	...	18 cwt.
Mill Dam Close	Lucerne	...	...	...	...	...	...	34 cwt. hay
	...	...	...	...	...	...	...	(list cutting only)
Road Piece Field	Barley	Chevalier Type	Mar. 18, '28	Mar. 18, '28	Aug. 11, '28	Aug. 29, '28	Aug. 30, '28	15 cwt.
	Seeds	...	May 31, '27	May 31, '27	...	July 2, '28	July 2, '28	25 cwt. hay
Great Hill	Spring Oats	Swedish Victory	Mar. 1, '28	Mar. 2, '28	Aug. 3, '28	Aug. 20, '28	Aug. 21, '28	5-6 qrs.
	Spring Oats	Swedish Victory	Feb. 24, '28	Feb. 25, '28	Aug. 8, '28	Aug. 22, '28	Aug. 25, '28	5-6 qrs.
	Mangolds	Yellow Globe	May 30, '28	May 31, '28	Oct. 29, '28	Nov. 19, '28	Nov. 27, '28	25 tons
Warren Field	Fallow	...	...	...	...	...	...	...