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Woburn Experimental Farm Report for 1931

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WOBURN EXPERIMENTAL FARM REPORT FOR 1931

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

The season was very unfavourable, for corn crops in particular. Wheat came up well in the mild winter, but the cold and cheerless spring and an almost sunless rainy summer prevented crops from maturing well. But these conditions were favourable to grass, and gave heavy crops of hay and grass for feeding. A sunny period towards the end of June fortunately favoured the getting in of hay. Root and forage crops did fairly well, and spraying with Bordeaux mixture saved the potato crop. The corn harvest was prolonged by the uncertain weather, but the experimental crops were gathered in with fair success.

Woburn Meteorological Records, October, 1930—December, 1931.

	Rainfall.			Temperature (Mean).			
	Total Fall.	No. of Rainy Days (0.01 in. or more).	Bright Sun-shine.	Max.	Min.	1 ft. in Ground.	Grass Min.
1930—	ins.	No.	Hours.	°F.	°F.	°F.	°F.
Oct. ..	1.01	14	126.5	57.2	44.3	50.8	39.2
Nov. ..	3.74	19	64.8	50.0	35.7	43.5	32.4
Dec. ..	2.28	19	18.9	43.8	34.1	40.0	32.1
1931—							
Jan. ..	1.24	19	52.7	42.3	31.8	37.5	28.0
Feb. ..	1.70	21	59.3	43.6	32.9	38.0	30.4
March	0.08	6	146.3	46.7	30.4	39.6	25.8
April ..	3.54	19	105.8	52.4	39.6	46.2	36.4
May ..	2.82	20	159.8	60.1	43.6	53.7	40.3
June ..	2.84	13	173.4	66.2	50.2	61.6	48.6
July ..	3.74	17	137.2	67.1	52.0	63.3	49.0
Aug. ..	3.65	18	133.9	65.1	49.8	60.0	47.6
Sept. ..	2.44	13	106.2	59.6	45.0	55.6	42.0
Oct. ..	0.64	5	100.9	55.2	37.8	49.3	35.5
Nov. ..	2.61	17	59.8	50.5	40.0	45.1	35.5
Dec. ..	0.88	12	34.6	45.4	35.9	41.5	33.2
Total or Mean of 1931 ..	26.18	180	1269.9	54.5	40.7	49.3	37.7

FIELD EXPERIMENTS

I.—CONTINUOUS GROWING OF WHEAT AND BARLEY. STACKYARD FIELD, 55TH YEAR.

Wheat.

“Square Head’s Master” was drilled on October 2nd, 1930, after dressing with “Corvusine,” and the crop came up well. No manures were applied, the last having been put on the crop of 1925-6, after which followed two years’ fallow (1927-8), wheat sowing being resumed in October, 1928. Accordingly the present is the third crop since fallowing, and the fifth since any manurial application. The harvest results are given in Table I.

**Table I.—CONTINUOUS GROWING OF WHEAT, 1931
Stackyard Field—Produce per acre.**

Plot.	Manures Applied Annually to 1926 (before the two years Fallow 1926-28). For amounts see Report 1927-28. No Manures in 1929, 1930 or 1931.	Dressed Corn per acre.	Total Corn per acre.	Weight per bushel.	Straw, Chaff, etc., per acre.
		Bushels	Cwt.	lb.	Cwt.
1	Unmanured	2.4	1.37	58.0	7.21
2a	Sulphate of Ammonia	2.6	1.50	—	4.64
2aa	As 2a, with Lime, Jan. 1905, repeated 1909, 1910, 1911	3.6	2.14	—	6.64
2b	As 2a, with Lime, Dec. 1897	10.9	5.82	57.0	12.57
2bb	As 2b, with Lime, repeated Jan. 1905	—	1.89	—	6.00
3a	Nitrate of Soda	4.9	2.75	59.0	4.75
3b	Nitrate of Soda	4.2	2.25	56.0	3.87
4	Mineral Manures (Superphosphate and Sulphate of Potash)	6.8	3.60	55.8	9.60
5a	Mineral Manures and Sulphate of Ammonia	11.8	6.51	59.7	17.47
5b	As 5a, with Lime, Jan. 1905	5.7	3.14	59.0	10.51
6	Mineral Manures with Nitrate of Soda	9.2	4.86	58.6	11.53
7	Unmanured	3.3	1.73	57.0	4.17
8a	Mineral Manures and, in alternate years, Sul- phate of Ammonia	5.4	2.92	58.0	8.85
8aa	As 8a, with Lime, Jan. 1905, repeated Jan. 1918 Mineral Manures and Sulphate of Ammonia (omitted in alternate years)	12.9	7.21	60.0	14.85
8b	As 8b, with Lime, Jan. 1905, repeated Jan. 1918 Mineral Manures and, in alternate years, Nitrate of Soda	8.1	4.34	58.0	9.60
8bb	As 8b, with Lime, Jan. 1905, repeated Jan. 1918 Mineral Manures and, in alternate years, Nitrate of Soda	10.2	5.60	59.0	12.25
9a	Mineral Manures and Nitrate of Soda (omitted in alternate years)	6.2	3.46	61.0	10.05
9b	Superphosphate and Nitrate of Soda	8.9	4.89	60.0	13.07
10a	Rape Dust	4.8	2.54	59.0	5.20
10b	Sulphate of Potash and Nitrate of Soda	5.6	3.07	59.0	4.14
11a	Farmyard Manure	7.9	4.25	59.5	9.73
11b	Farmyard Manure	7.0	3.80	60.5	13.50

This season's crop may fairly be taken as representative, and the results as comparable with those of 1929, the first year after the two years' fallow. On every plot, even on 2a and 8a, known to be very acid, there was a crop of some kind, and not one that came at first and then died amidst a mass of weeds. The crop on plot 2a (sulphate of ammonia only) was 2.6 bushel per acre, the best since 1900. But in spite of the early promise, the lack of sunshine caused the grain yield to be disappointingly small in relation to the straw. The unmanured produce was 2.8 bushels per acre only, the mineral manure plot (Plot 4) gave 6.8 bushels, and the farmyard manure plot (11b) 7.0 bushels per acre respectively. These figures compare with 10 bushels, 17.8 bushels and 21.3 bushels of corn per acre, respectively, in 1929, the first year after the two years' fallowing.

The highest yield was 12.9 bushels, on Plot 8aa, which had received sulphate of ammonia with minerals and lime in earlier years, and which in 1929 had yielded only 7.9 bushels of corn per acre. Indeed, the highest yield of corn in 1931 were obtained on plots previously treated with sulphate of ammonia (2b, 5a, 8aa, 8bb), while nitrate of soda showed a distinct lowering, Plot 3a having fallen from 12.8 bushels in 1929 to 4.9 bushels, Plot 6 from 12.8 bushels to 9.2, and Plot 9a from 17 bushels to 7.5 bushels.

The yield of the farmyard manure plot has fallen from 21.3 bushels in 1929 to 7.0 bushels in 1931, a value only slightly above that from the rape dust plot. Plot 2b, which last had lime in December, 1897 and in 1929 gave a grain yield of 1.1 bushels per acre only, produced—without any further application of lime or any artificial fertiliser—no less than 10.9 bushels of corn per acre in 1931.

Mayweed and vetchling were the chief weeds. Mayweed did not thrive on the acid plots (2a, 5a, 8a), but appeared wherever lime had been applied.

Table II.—CONTINUOUS GROWING OF BARLEY, 1931.
Stackyard Field — Produce per acre.

Plot	Manures Applied Annually to 1926. (before the two years Fallow 1926-28). For amounts see Report 1927-28. No manures in 1929 or 1930. For manures in 1931 see footnote.	Plumage.			Archer.				
		Dressed Corn per acre bushel.	Total Corn per acre cwt.	Weight per bushel lb.	Straw, Chaff, etc., per acre cwt.	Dressed Corn per acre bushel.	Total Corn per acre cwt.	Weight per bushel lb.	Straw, Chaff, etc., per acre cwt.
1	Unmanured	9.2	3.98	45.5	10.65	13.3	5.98	48.5	12.35
2a	Sulphate of Ammonia	9.5	No yield.	No yield.	11.61	13.4	No yield.	5.55	44.0
2aa	As 2a, with Lime, Mar., 1905, repeated 1909, 1910, 1912 and 1923	6.9 *	3.93	42.0	11.00	13.3	5.23	43.0	11.93
2b	As 2a, with Lime, Dec., 1897, repeated 1912	5.8 *	2.96	43.1 *	9.57	12.7	5.28	44.0	10.57
2bb	As 2a, with Lime, Dec., 1897, repeated Mar., 1905	8.0	2.71	43.1 *	11.78	9.2	3.71	40.0	11.50
3a	Nitrate of Soda	10.5	3.78	47.0	10.28	14.3	6.14	46.0	9.86
3aa	As 3a, with Lime, Jan., 1921	10.0	4.36	44.0	10.28	14.3	4.78	46.0	12.14
3b	Nitrate of Soda	8.0	3.93	40.0	12.21	10.6	4.86	44.0	9.28
3bb	As 3b, with Lime, Jan., 1921	16.0	3.00	38.0	10.21	12.0	7.68	47.0	13.61
4a	Mineral Manures (Superphosphate and Sulphate of Potash)	7.4	6.68	44.3	14.21	17.7	4.71	45.0	11.25
4b	As 4a, with Lime, 1915	No yield.	2.82	40.0	11.04	11.5	No yield.	No yield.	No yield.
5a	Mineral Manures and Sulphate of Ammonia	10.5	4.98	42.0	12.00	9.5	3.43	38.0	10.78
5aa	As 5a, with Lime, Mar., 1905, repeated 1916	11.3	4.37	40.5	13.43	15.5	6.72	48.0	13.54
5b	As 5a, with Lime, Dec., 1897, repeated 1912	10.7	4.12	41.6	14.25	13.1	5.27	44.0	13.11
6	Mineral Manures and Nitrate of Soda	10.3	3.86	40.5	9.73	9.8	4.18	45.5	9.14
7	Unmanured	23.5	No yield.	No yield.	19.43	21.4	No yield.	No yield.	17.28
8a	Mineral Manures and, in alternate years, Sulphate of Ammonia	32.0	10.29	47.0	19.43	21.4	9.93	50.0	24.28
8aa	As 8a, with Lime, Dec., 1897, repeated 1912	28.8	No yield.	No yield.	22.27	32.0	No yield.	No yield.	24.28
8b	Mineral Manures and Sulphate of Ammonia (omitted in alternate years)	25.8	13.28	45.0	22.27	32.0	14.43	50.0	22.32
8bb	As 8b, with Lime, Dec., 1897, repeated 1912	24.6	11.99	45.6	23.46	27.9	11.49	45.6	22.32
9a	Mineral Manures and, in alternate years, Nitrate of Soda	5.9	10.31	43.5	22.00	24.1	10.07	46.2	21.95
9a	Mineral Manures and Nitrate of Soda (omitted in alternate years)	21.6	10.54	46.7	18.12	29.7	13.47	50.0	20.49
10a	Superphosphate and Nitrate of Soda	21.6	2.36	43.0	9.48	5.7	2.51	48.0	8.72
10b	Rape Dust	19.8	8.73	43.5	19.73	29.0	12.11	45.8	22.32
11a	Sulphate of Potash and Nitrate of Soda	19.8	7.92	42.8	21.28	24.3	10.04	44.5	22.11
11b	Farmyard Manure								

* Estimated.

Manuring in 1931.

Plots—

Quantity per acre.

- 1-7 Unmanured.
- 8a, 8b, 8aa, 8bb. 3 cwt. Superphosphate, 1½ cwt. Sulphate of Potash, 1½ cwt. Sulphate of Ammonia.
- 9a, 9b 3 cwt. Superphosphate, 1½ cwt. Sulphate of Potash, 2.25 cwt. Nitrate of Soda.
- 10a. 3 cwt. Superphosphate, 2.36 cwt. Nitrate of Soda.
- 10b. Unmanured.
- 11a 1½ cwt. Sulphate of Potash, 2.36 cwt. Nitrate of Soda.
- 11b

Barley

Two different varieties, "Plumage" and "Archer" were sown on all the plots in alternate longitudinal strips, each from 5 to 10 rows wide, according to the width of the plots; and, in addition, Plots 8, 9, 10a, 11a were remanured but not relimed in order to see the relative influence of certain manures on the two varieties. The manures supplied were:

Plot.	Ammonia per acre.		Superphosphate per acre.		Sulphate of Potash per acre.	
	1926 and before	1931	1926 and before	1931	1926 and before	1931
8—Sulphate of Ammonia and Minerals ..	lb. 50	lb. 50	cwt. 3	cwt. 3	cwt. ½	cwt. 1½
9—Nitrate of Soda & Minerals	50	50	3	3	½	1½
10a—Super and Nitrate of Soda	25	50	3	3	—	—
11a—Sulphate of Potash and Nitrate of Soda	25	50	—	—	1	1½

The seed was drilled on March 19th. A furrow along certain plots, the result of ordinary instead of the usual one-way ploughing, caused some unevenness of germination and growth.

Spurry was very thick on Plot 2a (sulphate of ammonia alone), but where lime had been used (2b, 2bb, 5aa, 5b, 8aa, 8bb) with sulphate of ammonia, the barley continued to thrive. The farmyard manure plot (11b) was quite fair, but the crop on 10b (rape dust) failed almost entirely. As the season progressed, the barley did not seem to thrive as well as the adjoining wheat crop, and Plots 2a, 5a, 8a and 8b (all unlimed) carried little more than spurry. On the plots (4a, 4b) which had had minerals only but no nitrogen, the crop on the unlimed half (4a) was decidedly superior to that on the limed portion (4b), this being the reverse of what had been noted before. The results are given in Table II. Since fallowing, the drop in yield is shown by the following returns:

	1929. bushels.	1930. bushels.	1931. bushels.
No Manure	20.3	12.8	10.7
Minerals only	23	14	16.9
<i>Treatment prior to 1926 (1)</i>			
Sulphate of Ammonia with lime ..	24.9	15.0	10.1
Sulphate of Ammonia with lime and minerals	24.2	18.1	13.4
Nitrate of Soda alone	33.4	14.6	8.6
Nitrate of Soda with minerals	30.6	18.3	11.9
Farmyard Manure	34.7	21.7	22.1

(1) After 1926 there have been two years of fallow and then the crops have been grown without manure.

The two varieties behaved rather differently. During the period of growth, "Archer" appeared to be the more delicate and more affected by the weather, yet on the fully-manured plot (9) it gave the same yield as Plumage, and on the plots deficient in potash, phosphate or nitrogen, it gave higher yields. The results were :

Plot.	Yield, lb. per acre.		Plumage as Percentage of Archer.
	Plumage.	Archer.	
Fully manured 9	1249	1208	103.4
No manure 1	446	670	66.6
No Nitrogen 4a	748	860	87.0
No Phosphate 11a	978	1356	72.1
No Potash 10a	1180	1509	78.2
Very acid plots 8a & b, 2a, 5a	no grain	no grain	—
Rather acid plots 2 & 5b	391	638	61.3
Only faintly acid plot 3	422	546	77.3

A curious result was obtained, however, on the plots which had formerly received nitrate of soda and were therefore less acid than the rest, and had also been limed. Here the earlier additions of lime did not benefit the Plumage, though it did improve the Archer.

Lime added to very acid plots.				Lime added to slightly acid plots.			
	Plumage	Archer	Plumage as per centage of Archer		Plumage	Archer	Plumage as per centage of Archer.
Twice limed (2bb)	304	592	51.4	Unlimed (3a, 3b)	432	476	90.8
Twice limed (2b)	332	586	56.7				
Five times limed (2aa)	440	622	70.7	Limed (3aa, 3bb)	412	616	66.9

The yields of straw varied in much the same way as the yields of grain, except that nitrogen deficiency lowered the yield to approximately the same extent for both varieties.

Weeds.

Polygonum convolvulus was abundant on Plot 5a, which had had minerals, but absent from 3a, which had had none. Mayweed was much less common on the barley plots than on the wheat.

2.—ROTATION EXPERIMENTS

THE UNEXHAUSTED MANURIAL VALUE OF CAKE AND CORN (STACKYARD FIELD)

Series C.

The swede crop of 1930—about 12 tons per acre, being 1¼ tons more on the cake-fed than on the corn-fed plot—was pulled in January, 1931, and fed off by 40 sheep.

"Plumage Archer" barley, at the rate of 3 bushels per acre, was drilled on March 16th, on the land ready earliest, and over the

remainder on April 8th. Despite the late sowing, the barley came up well. Meantime, alsike clover had been undersown, to form the crop of 1932, and grew very well. The barley crop was cut on August 24th, and the results are given in Table III.

Table III.—BARLEY AFTER SWEDES.
Produce per acre.

Plot.	Nitrogen in corn or cake, per cent.	Nitrogen supplied by corn or cake, lb. per acre.	Head Corn.		Tail. Corn. Weight. lb.	Straw, Chaff, etc. cwt.
			Bush.	Weight per Bushel. lb.		
1. Corn-fed	1.75	30.4	28.6	51.2	19	19.8
2. Cake-fed	4.32	77.3	28.0	50.5	23	19.3

On this rotation corn and cake had been respectively fed with roots in the years 1923, 1927 and now again in 1931, but so far, without increasing the yield of barley from the cake-feeding by more than 1.3 to 2 bushels per acre.

During the feeding-off of the roots the cake plot had received more than $2\frac{1}{2}$ times as much additional nitrogen from the cake as the corn plot had received, yet the yields on the two crops are identical. In 1930 the cake plot had given 9 bushels of corn per acre more than the corn plot.

Series D

The barley crop of 1930 had been considerably laid and the undersown red clover was very patchy, very poor during the winter and dead by the end of March. It was ploughed up and alsike was sown on April 8th, but came very slowly. Tares were then drilled in—3 bushels of seed per acre—on May 28th, and came up moderately well mixed with alsike; the crop, cut on September 29th, yielded:

				Tares—as Hay *—per acre.
				cwt.
Corn-fed plot	15.9
Cake-fed plot	13.9

* Reckoned on a basis of 15% moisture.

The land was ploughed after removal of the hay crop and put into wheat.

3.—GREEN CROP AND GREEN MANURING EXPERIMENTS

(a) *Stackyard Field—Series A*

Upper half. 1931. Wheat after Green Crops fed off by Sheep. In 1930 it was found possible to grow and to feed off two crops. The sheep had also received $\frac{3}{4}$ cwt. of cotton cake per acre, while feeding on each crop. "Red Standard" wheat, at the rate of 3 bushels per acre, was drilled on October 18th; it came up well, and, as usual at this early period, looked as well as any wheat on the farm; in contradistinction to the usual experience, it did not fall away in May, and

also the wheat after tares looked better than that after mustard. The crop was cut August 18-19. The results are given in Table IV.

Table IV.—WHEAT AFTER GREEN-CROPS, FED OFF BY SHEEP. Produce per acre, 1931.

Plot.	Head Corn.		Tail Corn. lb	Straw, Chaff, etc. Cwt.
	No. of Bushels.	Weight per Bushel. lb.		
1. After Tares fed off (unlimed)	10.5	60.0	5½	12.0
2. After Tares fed off (limed)	8.7	59.7	9	9.1
3. After Mustard fed off (unlimed)	8.7	60.0	7	7.3
4. After Mustard fed off (limed)	8.6	58.4	8¾	7.3

Lower Half

After ploughing up the wheat stubble of 1930, the land was cultivated during the winter, and a good deal of twitch removed. Tares (3 bushels per acre) were drilled on May 7th and mustard (30 lb. per acre) on May 26th—both lots coming up well. They were fed off by sheep with mixed linseed and cotton cake (1½ cwt. per acre of the cake giving 4.74 per cent. of nitrogen). The land was then ploughed and second green-crops were drilled on August 17th, these being likewise fed off and the land prepared for wheat. The second green crops did not grow well, owing to the want of warmth; consequently only ½ cwt. per acre of mixed cake was given to the sheep.

Table V gives the respective weights of green and dry matter and of nitrogen from the green-crops grown.

Table V.—GREEN MANURING EXPERIMENT, Stackyard Field (Lower Half), 1931.

Plots.	First Crop.				Second Crop.				Total.		
	Green Matter per acre. lb.	Dry Matter per acre. lb.	Nitrogen per cent.	Nitrogen per acre. lb.	Green Matter per acre. lb.	Dry Matter per acre. lb.	Nitrogen per cent.	Nitrogen per acre. lb.	Green Matter per acre. lb.	Dry Matter per acre. lb.	Total Nitrogen, per acre lb.
Tares (unlimed)	6831	1238	3.79	46.3	582	109	4.69	5.1	7413	1347	51.4
Tares (limed)	14437	2151		80.4	825	155		7.3	15262	2306	87.7
Mustard (unlimed)	4000	842	2.10	17.7	1005	178	3.69	6.6	5005	1020	24.3
Mustard (limed)	3587	765		16.1	918	162		6.0	4505	927	22.1

(b) *Lansome Piece. Green-crops ploughed in.*

Here, as in Stackyard Field, it had been possible in 1930 to grow and plough down two successive green-crops before drilling "Red Standard" wheat at the rate of 3 bushels per acre, on October 17th. This came up well and the land was kept very fairly clean throughout the season. The newer series looked rather better than

the old, and the tares plot somewhat better than the mustard plot. The results are given in Table VI.

Table VI.—GREEN MANURING EXPERIMENT, Lansome Piece, 1931. WHEAT AFTER GREEN CROPS PLOUGHED IN.

Produce per acre.

Plot.	Head Corn.		Tail Corn. lb.	Straw, Chaff, etc. cwt.
	Bushels per acre.	Weight per Bushel. lb.		
1. Mustard plot : old series..	9.8	58.5	3	10.1
2. Tares plot : old series ..	14.1	56.5	4	16.2
3. Mustard plot : new series	13.0	56.2	15	14.6
4. Tares plot : new series ..	12.4	53.4	22	22.2
5. Control : new series (weeds only)	9.1	58.3	2	10.9

The yield of straw from the tares plots exceeds that from the mustard.

4.—PERMANENT PASTURE, MANURIAL EXPERIMENT. BROAD MEAD

The five plots in Broad Mead comprising this series were grazed in 1931, no further manurial application being given. All the plots improved considerably through the closer grazing of them with both cattle and sheep, but the finest and best grazed plot was, however, undoubtedly Plot 4 (limed), which again was characterised by the presence of many daisies ; these occur only sparsely on the other plots.

5.—FORAGE CROPS, LANSOME FIELD

Mixtures of wheat and beans did well together, and the crops stood up well, except that when tares were used along with wheat, they had the effect of throwing the wheat down.

WOBURN FARM : REPORT OF H. G. MILLER, 1931

The sowing down of the poorest parts of the farm to grass, commenced the previous year, has now been completed. In April, 1931 Road Piece and Great Hill were sown down under barley. The wet season caused this to grow rankly, and in a few of the low-lying parts of the field it was badly lodged. The grain yields were considerably lower than the appearance of the crop had indicated, and delays arose through wet weather and the demands of the experimental plots.

The following mixtures were sown :

- No. 1. 25 lb. Provence Lucerne (per acre).
1 ,, Kentish Wild White Clover.
- No. 2. 25 ,, Provence Lucerne.
1 ,, Perennial Birdsfoot Trefoil.
1 ,, Wild Trefoil.