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Rothamsted Report for 1932

[Full Table of Content](#)



Woburn Experimental Farm

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WOBURN EXPERIMENTAL FARM REPORT FOR 1931-32

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

A favourable period was experienced for the sowing of winter corn and the weather remained mild and open and without much rain through the early part of the winter. Throughout February and March cold east winds with night frosts checked the winter crops and made the period of sowing spring crops unfavourable. Growth was slow in April, but improved in May.

An abundant yield of hay was obtained and the sowing conditions for root crops were good. Corn crops made fair progress during June and July, and were reaped early in August.

The rainfall for the harvest year was 25.51 inches, as against 29.08 inches in 1930-31.

METEOROLOGICAL RECORDS.

	Rainfall.			Temperature (Mean).			
	Total Fall.	No. of Rainy Days	Bright Sunshine.	Max.	Min.	1 ft. in Ground.	Grass Min.
1931—	Ins.	No.	Hours.	°F.	°F.	°F.	°F.
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
1932—							
Jan. ..	1.44	16	42.5	47.6	36.6	41.9	33.5
Feb. ..	0.23	9	49.5	41.4	30.1	38.1	26.6
Mar. ..	1.79	13	123.0	48.0	30.4	39.5	25.7
April ..	2.21	22	117.1	51.2	37.4	44.7	34.6
May ..	4.92	21	106.0	57.9	43.0	52.2	41.2
June ..	0.67	5	177.5	66.4	46.7	61.8	44.6
July ..	3.80	15	116.4	68.5	53.4	64.4	50.7
Aug. ..	4.31	11	171.9	72.3	53.9	65.6	51.3
Sept. ..	2.01	19	109.0	63.4	46.9	57.5	44.5
Oct. ..	3.43	22	98.4	54.2	40.7	48.8	37.4
Nov. ..	1.22	14	43.2	48.2	38.0	43.7	34.7
Dec. ..	0.48	9	49.6	45.5	35.4	40.5	31.6
Total or mean of 1932 ..	26.51	176	1204.1	55.4	41.0	49.9	38.0

CONTINUOUS GROWING OF WHEAT AND BARLEY.

STACKYARD FIELD, 56TH YEAR

(No manure since 1926)

Wheat.—“Red Standard” wheat, dressed with “Corvusine,” was drilled on October 15th, 1931 and, watching being adequately provided, little damage was experienced from pheasants, though starlings were frequently troublesome. The wheat came up well, and showed a fair plant even on the very “acid” plots 2, 5 and 8; but

the limed portions were better, though lime had in no case been put on since 1918. The best yield was given on plot 11b, which received farmyard manure up to 1926. Owing to the initial weediness and favourable conditions for weed growth, the crops on many plots were seriously affected. Mayweed was thick over all the plots, as also was a newcomer, *Holcus mollis*. Twitch and coltsfoot were abundant, as was vetchling on the nitrate of soda plots. Never before in the 56 years' experience have the plots been so weedy. The crop results are given in Table I.

Table I.—CONTINUOUS GROWING OF WHEAT, 1932.
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, 1931 or 1932.	Dressed Corn per acre.	Total Corn per acre.	Weight per bushel.	Straw, Chaff, etc., per acre.
		Bushels	Cwt.	lb.	Cwt.
1	Unmanured	5.4	2.79	56.0	10.98
2a	Sulphate of Ammonia	—	—	—	5.61
2aa	As 2a, with 5 cwt. Lime, Jan. 1905, repeated 1909, 1910, 1911	5.3	2.70	54.0	8.50
2b	As 2a, with 2 tons Lime, Dec., 1897	6.8	3.51	56.0	9.64
2bb	As 2b, with 2 tons Lime, repeated Jan., 1905	6.5	3.45	57.0	9.07
3a	Nitrate of Soda=50 lb. Ammonia	4.9	2.56	57.0	9.21
3b	Nitrate of Soda=25 lb. Ammonia	4.2	2.13	55.0	7.32
4	Mineral Manures (Superphosphate and Sulphate of Potash)	5.8	2.91	55.5	13.23
5a	Mineral Manures and Sulphate of Ammonia	7.6	3.98	57.0	16.04
5b	As 5a, with 1 ton Lime, Jan., 1905	8.1	4.34	59.0	12.16
6	Mineral Manures with Nitrate of Soda	7.7	3.90	56.2	13.64
7	Unmanured	3.8	1.88	54.5	9.66
8a	Mineral Manures and, in alternate years, Sulphate of Ammonia	—	—	—	2.43
8aa	As 8a, with 10 cwt. Lime, Jan., 1905, repeated Jan., 1918	4.4	2.24	56.0	9.32
8b	Mineral Manures and Sulphate of Ammonia (omitted in alternate years)	—	—	—	4.28
8bb	As 8b, with 10 cwt. Lime, Jan., 1905, repeated Jan., 1918	7.6	4.01	58.0	10.89
9a	Mineral Manures and, in alternate years, Nitrate of Soda	6.5	3.38	57.0	14.55
9b	Mineral Manures and Nitrate of Soda (omitted in alternate years)	7.3	3.72	56.0	16.46
10a	Superphosphate and Nitrate of Soda	9.0	4.58	56.5	11.28
10b	Rape Dust	6.5	3.38	57.0	9.04
11a	Sulphate of Potash and Nitrate of Soda	9.9	5.17	57.5	14.43
11b	Farmyard Manure	12.3	6.22	55.0	19.00

Noticeably better crops than last year were given on Plots 1 (unmanured), 4 (mineral manures), and 11b (farmyard manure). In contrast to last year no yield was obtained on the plots previously treated with sulphate of ammonia without lime, 2a, 8a, and 8b.

Barley.—Seed, treated with "Corvusine," was drilled on March 16th. As in 1931, two varieties, "Plumage" and "Archer," were drilled in alternate strips.

On 8, 9, 10a and 11a, manurial treatment was renewed, minerals and sulphate of ammonia on 8, minerals and nitrate of soda on 9, superphosphate and nitrate of soda on 10a, and sulphate of potash and nitrate of soda on 11a. The quantities supplied were as given in the Table on page 96 of the 1931 Report, except that on 10a and 11a the amount of ammonium sulphate was reduced to the equivalent of 25 lb. of ammonia per acre.

As the season went on, spurry showed thickly on most of the plots, and, later, other weeds became prominent as with the adjoining wheat; mayweed, however, was not in such abundance. On the acid

Table II.—CONTINUOUS GROWING OF BARLEY, 1932.
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. For manures in 1932 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.
1	Unmanured	0.3*	No yield.	—	2.25	0.15	—	2.78
2a	Sulphate of Ammonia	0.7*	0.43	—	2.21	0.78	—	3.50
2b	As 2a, with 5 cwt. Lime, Mar., 1905, repeated 1909, 1910, 1912 and 1923	0.7*	0.50	—	2.07	0.43	—	2.71
2bb	As 2a, with 2 tons Lime, Dec., 1897, repeated 1912	0.7*	0.57	—	2.43	0.64	—	2.57
3a	As 2a, with 2 tons Lime, Dec., 1897, repeated Mar., 1905	2.2*	1.28	—	4.78	3.2**	—	6.78
3aa	Nitrate of Soda = 50 lb. ammonia	2.2*	1.21	—	4.42	2.7**	—	4.57
3b	As 3a, with 2 tons Lime, Jan., 1921	1.5*	0.71	—	4.28	1.36	—	5.57
3bb	Nitrate of Soda = 25 lb. ammonia	2.1*	1.07	—	5.07	1.43	—	5.28
4a	As 3b, with 2 tons Lime, Jan., 1921	0.5*	0.32	—	2.92	0.4**	—	2.46
4b	Mineral Manures (Superphosphate and Sulphate of Potash)	0.2*	0.14	—	1.25	0.2**	—	2.25
5a	As 4a, with 1 ton Lime, 1915	—	No yield.	—	—	No yield.	—	—
5a	Mineral Manures and Sulphate of Ammonia	—	No yield.	—	—	No yield.	—	—
5aa	As 5a, with 1 ton Lime, Mar., 1905, repeated 1916	2.8*	1.43	—	6.50	—	—	7.71
5b	As 5a, with 2 tons Lime, Dec., 1897, repeated 1912	4.2	1.73	39.0	6.75	4.9	42.0	5.04
6	Mineral Manures and Nitrate of Soda	1.0*	0.57	—	4.37	1.2**	—	—
7	Unmanured	12.5	5.57	46.0	11.00	7.78	45.0	16.28
8a	Mineral Manures and, in alternate years, Sulphate of Ammonia	—	No yield.	—	—	No yield.	—	—
8aa	As 8a, with 2 tons Lime, Dec., 1897, repeated 1912	—	No yield.	—	—	No yield.	—	—
8b	Mineral Manures and Sulphate of Ammonia (omitted in alternate years)	—	No yield.	—	—	No yield.	—	—
8bb	As 8b, with 2 tons Lime, Dec., 1897, repeated 1912	16.7	7.21	44.0	14.21	9.00	47.0	16.43
9a	Mineral Manures and, in alternate years, Nitrate of Soda	18.5	7.75	43.0	16.78	10.43	44.5	20.36
9b	Mineral Manures and Nitrate of Soda (omitted in alternate years)	21.8	8.98	43.2	20.46	11.61	44.7	21.57
10a	Superphosphate and Nitrate of Soda	2.1*	0.92	—	8.17	1.37	—	8.62
10b	Rape Dust	—	No yield.	—	—	No yield.	—	—
11a	Sulphate of Potash and Nitrate of Soda	3.0*	1.65	—	12.68	2.44	41.0	13.69
11b	Farmyard Manure	8.5	3.99	41.0	12.94	4.74	45.0	13.76

*Estimated from average bushel weight (42.7). **Estimated from average bushel weight (44.2).

Manuring in 1932:

- Plots.
- 1-7 Quantity per acre.
- 8a, 8b, 8aa, 8bb Unmanured.
- 9a, 9b 3 cwt. Superphosphate, 1½ cwt. Sulphate of Potash, 1½ cwt. Sulphate of Ammonia.
- 10a. 3 cwt. Superphosphate, 1½ cwt. Sulphate of Potash, 2.28 cwt. Nitrate of Soda.
- 10b. 3 cwt. Superphosphate, 2.36 cwt. Nitrate of Soda.
- 11a. Unmanured.
- 11b. 1½ cwt. Sulphate of Potash, 2.36 cwt. Nitrate of Soda.

plots 2a and 5a, sorrel to a great extent had replaced spurry, though it was not to be seen on the limed plots.

The barley began to look yellow and unhealthy, with very short straw. There was little difference between "Plumage" and "Archer."

The crop was cut with the scythe—August 15th to 23rd—and threshed in the field September 6th to 13th.

The results are given in Table II.

The harvest results were the lowest recorded since the cessation (after 1926) of manurial applications. Since the barley grew well at first, the chief adverse factor was, no doubt, the prevalence of weeds, especially spurry, mayweed, chickweed and *Agrostis*. On the unmanured (1932) plots the produce was in no case above 4 bushels per acre, that of the continuously unmanured plot being only 0.7 bushels per acre; farmyard manure (last applied 1926) gave considerably the highest return, *viz.* 9.3 bushels per acre (11b). The very acid plots, 2a, 5a, 8a and 8b, gave no yield whatever, but wherever lime had been previously given some produce was obtained. Lime, however, in addition to mineral manures alone, proved no benefit (4a, 4b); rape-dust also gave a very small yield. In the case of the plots which received manurial dressings in 1932, plots 8 and 9 showed by their yields, amounting to 15.2 bushels per acre on plot 8aa and 24.7 bushels per acre on plot 9b, that the land was capable of responding to a stimulus. The low yields of 10a and 11a have not been accounted for.

The yields from the plots which received nitrate of soda up to 1926 and nothing since were superior to those from plots receiving sulphate of ammonia up to 1926 and, likewise, nothing since that date.

"Archer" gave a greater yield than "Plumage," whether the plot was actually manured in 1932 or had received no manure since 1926.

ROTATION EXPERIMENTS

THE UNEXHAUSTED MANURIAL VALUE OF CAKE AND CORN (STACK-YARD FIELD)

Series C. The Alsike presented a good appearance until towards the end of January, 1932, when it became very weedy. A month later there was very little clover visible on either half. About the middle of March, a striking recovery set in and when cut for seed in July, the alsike yielded a crop far better than at once time seemed possible. The growth was patchy, but there were less weeds on the corn-fed half. The weights of clover (Alsike) hay per acre were: Corn-fed Plot, 15.2 cwt.; Cake-fed Plot, 10.2 cwt.

Series D. After ploughing up the red clover, alsike and tares of 1931, "Red Standard" wheat, at the rate of 12 pecks per acre, was drilled on October 16th. The wheat grew well throughout, giving an excellent crop for this light land. It was cut on August 16th. The results are given in Table III.

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Table III.—WHEAT AFTER CLOVER.
Produce per acre.

Plot.	Head Corn.		Tail Corn.	Straw, Chaff, etc.
	Bushels.	Weight per Bushel lb.	lb.	cwt.
1. Corn-fed ..	16.6	63.2	13	16.3
2. Cake-fed ..	18.5	63.2	22	20.5

The yield differences between the two plots were, as usual, small in comparison with the amounts of nitrogen supplied to the plots when the root crop was fed off in 1929 (corn plot, 24.6 lbs. per acre ; cake plot, 56.5 lbs. per acre of nitrogen).

GREEN CROP AND GREEN MANURING
EXPERIMENTS

(a) *Stackyard Field—Series A*

Upper half, 1932. Green Crops. Tares were drilled on April 11th, mustard on May 10th—the usual mineral manures (superphosphate 3 cwt., and sulphate of potash 1 cwt. per acre) being given previously. Fair crops were obtained, and these were successively fed off with sheep receiving for each crop 1½ cwt. per acre mixed linseed and undecorticated cotton cake. Second crops of tares and mustard were sown which grew slowly and gave small yields. They were in turn fed off with cake as before. The two feedings of cake provided an additional 15.92 lbs. of nitrogen per acre. After this the land was ploughed and prepared for wheat. Samples of the green crops were analysed (Table IV).

TABLE IV.—GREEN MANURING EXPERIMENT,
STACKYARD FIELD.
(Upper Half, 1932).

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.
Mustard unlimed	3400	690	1.92	13.2	1440	249	3.71	9.3	4840	939	22.5
Mustard limed ..	2020	376	2.06	7.7	1140	235	2.75	6.5	3160	611	14.2
Tares unlimed	8250	1659	2.72	45.1	460	96	2.94	2.8	8710	1755	47.9
Tares limed ..	8560	1669	3.00	50.1	460	93	2.98	2.8	9020	1762	52.9

Lower half, 1932. Wheat after Green crops fed off by sheep.

“Red Standard” wheat, at the rate of 12 pecks per acre, was drilled on October 23rd. The wheat was drilled closely in 7-inch rows instead of the usual 9 inch, but this did not have the hoped-for effect of keeping the weeds in check. The principal weeds were twitch, veronica, shepherd’s purse, mayweed, and chickweed ; they

were more plentiful on the tares portion than on the mustard one. The plant of wheat was never strong and was always inferior to the adjoining permanent wheat. But in the warmer weather of May, there was not the sudden failure and withering up which had been noticed generally in earlier years. In appearance there was nothing to choose between the two portions. The crop was cut August 16th. The results are given in Table V.

**Table V.—WHEAT AFTER GREEN CROPS, FED OFF BY SHEEP.
Produce per acre.**

Plot.	Head Corn.		Tail Corn.	Straw, Chaff, etc.
	No. of Bushels.	Weight per Bushel lb.	lb.	cwt.
1. After Tares fed off (unlimed) ..	6.0	58.0	16	9.8
2. After Tares fed off (limed) ..	8.2	57.0	54	14.5
3. After Mustard fed off (unlimed) ..	9.0	59.0	10	11.1
4. After Mustard fed off (limed) ..	5.7	58.5	6	8.0

These results are even lower than those of 1931, the first year in which the falling away of the crops in May had not been experienced.

(b) Lansome Piece. Green crops ploughed in.

Green crops of mustard and tares were sown in 1932. Tares were drilled on April 8th and mustard three weeks later. The green crops were ploughed in and second crops drilled in July, these in turn being ploughed in. Table VI gives the weights of green and dry matter and nitrogen supplied in each crop.

**Table VI.—GREEN MANURING EXPERIMENT, 1932.
Lansome Piece.**

Plot.	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.
1. Mustard old series	2240	352	2.20	7.7	2980	492	2.83	13.9	5220	844	21.6
2. Tares old series	2700	505	2.11	10.7	5380	933	2.98	27.8	8080	1438	38.5
3. Mustard new series	2440	386	2.41	9.3	2820	418	3.13	13.2	5260	804	22.5
4. Tares new series	2150	389	2.65	10.3	3000	630	3.05	19.2	5150	1019	39.5
5. Control new series	2500	410	2.29	9.4	560	105	2.86	3.0	3060	515	12.4

It will be observed that a considerable amount of nitrogen was supplied on the control plot by weeds. Wheat was sown, following the ploughing-in of the second green crops.

LUCERNE INOCULATION, LANSOME FIELD, 1932

Inoculated and uninoculated seed were sown in strips on April 21st, with a small proportion of mustard seed for the purpose of a cover crop. The lucerne grew well, and a first cutting was taken on August 16th. The average yield of hay was just over 13 cwt. per acre. No significant effect of inoculation was observed, in contrast to the results obtained in 1927-29, when a 23 per cent. increase was secured. The experiment is being continued.

MANURING OF GRASS LAND, BROAD MEAD, 1932

The five plots of this area were again closely grazed, and the herbage continued to improve. That on the farmyard manure plot has become much less rank. The limed plot—which remains distinguishable from the others by its profusion of daisies—is still the most closely grazed plot.

POT-CULTURE EXPERIMENTS

Green Manuring. To test whether quantities of green manure greater than those grown in the experiments in Lansome and Stackyard fields would give increased yields in the following cereal crop, a series of pot cultures was done. Earthenware drainpipes 20 inches in depth, open at the bottom to allow free drainage, were sunk into the ground and filled in March, 1929, with soil from the headland of Stackyard Field. The experiment was in quadruplicate, and three successive crops of mustard and of tares, were grown in 1929 and turned in. Wheat was grown in 1930, the green cropping was repeated in 1931, and wheat again grown in 1932.

The results follow :

Average Produce of Corn, 1930 and 1932, after Green-manuring (1929 and 1931)

	Corn Grammes	Straw Grammes
1. Without Green-manure	78.7	130.1
2. Mustard.. .. .	90.9	193.9
3. Tares	86.8	166.5

It appears that a more liberal green manuring than that used in the field condition has but little effect on the yield of grain, though the effect on the straw is greater. There is no marked difference between the effects of tares and mustard.

Pot experiments in which drainage is permitted or prevented, at different periods, are now in progress.

WOBURN FARM

REPORT BY H. G. MILLER, 1932

The weather, though favourable to the root crops and grassland was much less favourable to corn crops. The spring rains, coming shortly after the application of manures, caused serious leaching. The contrast between yields of barley, and in particular wheat, in the 6 course Rotation Experiment at Woburn and Rothamsted is most striking. The Woburn wheat was practically a

failure, the mean yield being only 5.3 cwt. per acre while at Rothamsted it was 27.3 cwt. And the barley plots at Woburn gave only about half the Rothamsted yield, although in the former there was a much better response to nitrogen.

The details of the cropping are given on pp. 133, 135. Butt Furlong oats proved most disappointing. Despite folding with sheep in the winter, even dung on certain portions of the field, and a dressing of artificials, the spring oats showed all the symptoms of acute nitrogen starvation. They refused to develop, weeds got a hold and there was serious trouble with poppies. These were reported bad about 1925, but since 1928 had been practically absent.

The attempt at growing brussels sprouts was a failure due to the extensive damage done by hares; while for those that did escape there was again no demand. There was a good crop of beans in Warren Field but more than an acre round the outsides was completely destroyed before germination by rats.

Grassland is the one crop which escapes damage by game and pests. That sown down recently has come on surprisingly well and is frequently remarked on by neighbours as being the best in the neighbourhood. In Warren Field the differences between the 5 seeds mixtures still persist clearly, but there is remarkably little difference between the indigenous and commercial plots of the same seeds mixture. This year it showed itself for only about a week in June, when the flowering heads on the commercial appeared slightly earlier and were slightly more numerous. From the appearance of this field in both 1931 and 1932 it was very difficult to justify the greater cost of the indigenous strains, or the cost of the dearer as compared with the cheaper mixtures. Mixture IV (see 1930 Report, p. 104) cost 38/6; V, 38/3; III, 35/6; I, 35/- and II (as I but with commercial strains), only 24/6. As at Rothamsted, the plots with meadow fescue appear to be the more palatable.

A nitrogenous top-dressing was again applied to the seven intensive grazing plots to encourage an early spring bite, but for the last two seasons the response to this has been remarkably small. This is similar to experience at Rothamsted and leads us to doubt its value as a general practice where stock receive winter trough feeding on good grassland.

The mixtures sown in 1931 in Road Piece and Great Hill have filled up well but the narrow strips where the lucerne in the mixtures was inoculated are not obviously superior to the rest of the area. The Eastern half of this area was cut for hay, then grazed, but the Western half was grazed throughout the year. Already this seems to have had a weakening effect on the lucerne in the mixtures.

Livestock

In autumn, 1931, 54 ewes were put to the ram. The 50 that lambed produced 84 lambs alive at the end of April. There were born, alive or dead, 14 triplets and 26 doubles. Unfortunately the extra good condition of the ewes, resulted in heavier losses than usual, both of triplets and ewes. "Steaming up" did not pay. But we ascribed the prolificacy of the ewes to attention at flushing time, with supplementary concentrates, and therefore tried an experiment on this point. As already described for Rothamsted, the Woburn results confirmed the negative results obtained there.

Fifty first-class half-bred ewe lambs were bought at Newtown St. Boswells in August, 1931, from the well-known Border farm of Blackhaugh. They were treated well all autumn and run with a Southdown ram. 28 lambed, producing 32 lambs and, although they lambed after the main flock, the lambs thrived well and grew quickly. This was a quite satisfactory result, but, considering the condition of the ewe-lambs, we had hoped for a still bigger crop. The two ewes that reared doubles nursed their lambs well and seemed to have plenty of milk.

With pigs, evidence was obtained at both farms during the year which threw doubts on the value of green food for fattening pigs, even when only recently weaned. This is now one of the subjects of a carefully designed experiment at Rothamsted.

We were less successful at the local Bedfordshire Show than in previous years with pigs, winning only 2 third prizes and a "highly commended." But at the London Dairy Show, with three entries in the class for recorded bacon pigs, we won three second-class awards.

The bullock feeding boxes, which had stood empty so long, have now been adapted for pig feeding, without destroying them for their original purpose.

DATES OF SOWING AND HARVESTING, AND YIELD PER ACRE, WOBURN, 1932

Field.	Crop.	Variety.	Principal Cultivations and Dates.	Manuring, cwt. per acre.	Sowing Dates.	Cutting Dates.	Carting Dates.	Yield per acre.
<i>I. Arable, non-experimental, and Replicated Experiments—</i> Warren Field	Beans		Sept. 14-26, tractor plough. Oct. 17-21, tractor cultivator, roll and harrow. April 21, horse hoe. May 6-10, horse hoe. March 31-April 2, plough and harrow. May 5 and 12, harrow. June 20-30, single. June 6, 7, 17, July 4, horse-hoe all plots. May 17-18, plough. June 3, cross harrow and roll. June 17-20, July 4-15-29, horse hoe. May 17-18, plough. May 25, double harrow and roll. July 20, 27, Aug. 8, 23, horse hoe.		Oct. 26	Aug. 16	Sept. 1-3	18 cwt.
Butt Close (1)	Sugar Beet	Kuhn		see p. 163	May 5-12	Nov. 7-12	Nov. 7-12	see pp. 164-165
(2)	Kale	Thousand-head		see p. 166	June 4	Dec. 19— Jan. 20	—	see p. 166
(3)	Brussels Sprouts			2 cwt. S/Amm.	May 25	Fed to stock	—	—
Butt Furlong	Oats after Sugar Beet	Garton's Marvellous	Feb. 15-17, plough. Feb. 20, double harrow and roll. March 8, Cambridge roll. April 26, double harrow. Cultivations same as above.	12 tons dung	Feb. 27 April 26 (undersown)	Aug. 11-18	Sept. 8-20	—
Lansome Piece	Oats after ley fed off with sheep			1 S/Amm.	"	"	"	—
(1)	Brussels Sprouts		March 18-April 13, plough in dung. May 18-19, tractor spring hoe, harrow, and roll. June 31, July 10, July 19, 26, Aug. 6, Aug. 23, horse hoe.	15 tons dung 1 cwt. S/Amm.	May 19-25	Fed to stock	—	—
(2)	Kale Micro Plots	Marrow Stem	March 21, plough and harrow. March 26-28, hand digging. May 11-June 12, hand hoe. May 17, harrow. Sown to replace brussels sprouts taken by vermin. Cultivations as brussels sprouts.	see p. 167	Mar. 7	Oct. 4-5, 19, Nov. 1 & 18	—	see p. 168
(3)	Kale	Thousand-head			June 20	Fed to stock	—	—

DATES OF SOWING AND HARVESTING, AND YIELD PER ACRE, WOBURN, 1932 (Continued)

Field.	Crop.	Variety.	Principal Cultivations and Dates.	Manuring, cwt. per acre.	Sowing Dates.	Cutting Dates.	Carting Dates.	Yield per acre.
II. Classical and Rotation Experiments Stackyard	Permanent Wheat	Red Standard	Oct. 9-14, 1931, plough. Oct. 15, 1931, harrow. Feb. 15-23, hand hoe and remove twitch. April 7 and May 20, harrow. May 11, hand hoe.	see p. 95	Oct. 15	Aug. 9	Aug. 30	see p. 95
	Permanent Barley	Plumage and Archer	Jan. 22-27, plough. Feb. 25, Mar. 15, May 20, harrow. June 8-15, July 5-10, hand hoe.	see p. 96	Mar. 16	Aug. 20-22	Sept. 5-10	see p. 96
	Wheat	Red Standard	Oct. 19-20, 1931, plough. Oct. 22, 1931, April 7, May 12, May 21, harrow.	After green crops in 1931, fed off (2 crops)	Oct. 23	Aug. 16	Sept. 1	see p. 99
Series A (a)	Tares	—	Jan. 22-27 plough. Feb. 25, harrow. Mar. 1, cultivate. Mar. 16, April 6, cultivate and harrow. April 6, roll. May 21, harrow, feed off with 20 sheep also getting 1½ cwt. mixed cotton and linseed cake. Aug. 3-5, plough. Aug. 10, harrow. Oct. 14-24, feed off with 6 to 8 sheep with 1½ cwt. mixed cotton and linseed cake with 1 cwt. of hay.	3 super. 1 s/pot.	April 11 Aug. 11	—	—	—
Series A (b) (1)	Mustard	—	Jan. 22-27, plough. Feb. 25, harrow. Mar. 1, cultivate. Mar. 16, April 6, cultivate and harrow. April 6, roll. Feed off with 20 sheep also getting 1½ cwt. mixed cotton and linseed cake. Aug. 3-5, plough. Aug. 10, harrow. Oct. 14-24, feed off second crop mustard with sheep (6 to 12) also getting 1½ cwt. mixed cotton and linseed cake with 1 cwt. hay.	3 super. 1 s/pot.	May 9 Aug. 25	—	—	—

DATES OF SOWING AND HARVESTING, AND YIELD PER ACRE, WOBURN, 1932 (Continued)

Field.	Crop.	Variety.	Principal Cultivations and Dates.	Manuring, cwt. per acre.	Sowing Dates.	Cutting Dates.	Carting Dates.	Yield per acre.
6 Course Rotation	Clover	Alsike	May 7, 1931, roll.	see p. 131	May 7	June 27	July 20	see p. 135
	Sugar Beet	Kuhn	Feb. 24, plough in rye, and harrow. April 7, cultivate three times. May 10, harrow. June 3, hand hoe. June 29-30, horse hoe. July 7-8, hand hoe. Aug. 2, horse hoe.	see p. 131	May 10	—	Nov. 2-4	see p. 135
Series C	Barley	Plumage-Archer	Jan. 12-13, plough in sugar beet tops. Mar. 16, cultivate, harrow twice, and roll. Mar 17, roll.	see p. 131	Mar. 17	Aug. 15	Sept. 2	see p. 135
	Wheat	Yeoman	Oct. 22, 1931, plough and harrow twice. May 10, hand hoe. June 5, cut out thistles.	see p. 131	Oct. 23	Aug. 11-12	Aug. 30	see p. 135
	Forage Potatoes	Rye, Vetches Beans Ally	Oct. 21-22, 1931, plough and double harrow. Oct. 23, 1931, plough in wheat stubble. Spring 1932, plough in rye. May 12, harrow ridges. June 29, cut out thistles and horse hoe.	see p. 131	Oct. 23	May 31- June 1	June 14	see p. 135
Series D	Clover	Alsike	May 8, 1931, clover sown under barley; after removal of barley, crop allowed to grow.	—	May 8	Aug. 10-15	Sept. 10	see p. 97
	Wheat	Red Standard	Oct. 3-6, 1931, plough. Oct. 16, 1931, drill and harrow. April 7-21, May 20, harrow.	see p. 97	Oct. 16	Aug. 16	Aug. 26-27	see p. 98
Lansome Piece	Green Crops		Oct. 11, 1931, plough. Oct. 23, 1931, Feb. 2-3, cultivate. Feb. 8, harrow. Feb. 18-19, plough. Feb. 25, cultivate and harrow. April 8, harrow in vetches. May 9, harrow in mustard. July 7-8, plough in green crops. Sept. 29-30, plough in second green crop.	3 super. 1 s/pot.	(First crop) Vetches, April 8, Mustard, May 9. (Second crop), Vetches, July 9, Mustard, Aug. 6	—	—	see p. 99

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DATES OF SOWING AND HARVESTING, AND YIELD PER ACRE, WOBURN, 1932 (Continued)

Field.	Crop.	Variety.	Principal Cultivations and Dates.	Manuring, cwt. per acre.	Sowing Dates.	Cutting Dates.	Carting Dates.	Yield per acre.
III. <i>Grassland</i> Warren Field			Chain harrow, Feb. 14-20.	—	—	June 7-8	June 16-17	25 cwt.
Broad Mead (1) (2) (3) (4)			Chain harrow, Feb. 14-20.	1 s/amm. on all plots at weekly intervals from Feb. 14	—	Grazed	—	—
Great Hill (6) Bottom (7) Honey Pot (5) Long Mead			Chain harrow, Feb. 14-20.	No manure	—	Grazed	—	—
Mill Dam Close			Chain harrow, Feb. 14-20	No manure	—	Grazed and cut over	—	—
Great Hill			Chain harrow and patched March.	No manure	—	Grazed and cut over for hay	—	—
Road Piece			Chain harrow and patched March. Rest of field grazed and cut over.	—	—	Grazed and cut over 4 acres No. 2 mixture cut for hay. June 6, Aug. 6th Grazed.	June 17 Sept. 6	25 cwt. 20 cwt.
Butt Furlong								