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Rothamsted Report for 1936

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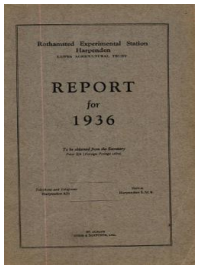

Report for 1936

Rothamsted Research

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WOBURN EXPERIMENTAL FARM REPORT FOR 1935-36

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The season 1935-1936 was wet and cold, with much rain in January, June, July (6.42 inches) and September. Seed bed preparation for autumn-sown crops was difficult, and wheat tillered slowly. The heavy July rainfall delayed cereal ripening and encouraged weeds and potato disease, but kale and grass benefited. Harvesting conditions were difficult but yields were better than expected.

METEOROLOGICAL RECORDS

Month	*Rainfall*		Bright Sunshine	*Temperature (Mean)*			
	Total Fall	No. of Rainy Days		Maximum	Minimum	1 ft. in Ground	Grass Minimum
1935	Ins.		Hours	°F.	°F.	°F.	°F.
Oct. ..	2.84	18	107.5	55.8	42.2	49.4	38.4
Nov. ..	3.48	20	62.0	49.4	39.1	44.6	35.5
Dec. ..	1.95	19	32.4	41.5	32.7	37.9	29.6
1936							
Jan. ..	3.29	21	42.2	43.5	33.1	38.4	30.1
Feb. ..	1.91	16	80.0	41.0	29.7	36.5	26.1
Mar. ..	1.34	16	89.0	50.9	38.0	43.1	34.9
April ..	1.29	13	131.4	50.1	36.3	45.3	32.5
May ..	1.25	8	161.8	61.3	42.7	55.7	39.5
June ..	3.58	16	169.0	66.9	48.9	61.0	46.6
July ..	6.42	21	134.0	66.4	52.3	62.1	50.2
Aug. ..	.34	8	179.2	69.8	50.8	63.8	45.7
Sept. ..	3.00	19	95.0	64.0	51.1	59.7	48.5
Oct. ..	1.80	17	110.3	55.5	40.4	49.1	36.0
Nov. ..	2.14	17	44.3	47.0	34.7	43.3	32.6
Dec. ..	1.38	16	51.5	46.1	34.9	40.5	31.2
Total or mean for 1936 ..	27.74	188	1287.7	55.2	41.1	49.9	37.8

CONTINUOUS GROWING OF WHEAT AND BARLEY

Stackyard Field, 1936. 60th year (no manure since 1926). First crop after a second two years' fallow (1934 and 1935); previous two years' fallow (1927 and 1928).

(*a*) *Continuous Wheat.* During 1934 and 1935 no seeding of weeds was allowed and the land was kept well ploughed and stirred. Although twitch in its various forms (*Holcus mollis* and *Agrostis stolonifera*) were eradicated, mayweed, spurry, vetchling and sorrel survived.

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Red Standard wheat, sown in October, germinated slowly and unevenly. The unmanured plots had much mayweed, but the very acid ones (2a, 5a, 8a, 8b), while over-run with spurry, were singularly free from mayweed and *Holcus*. On the limed plots (2b, 5b, 8aa, 8bb) mayweed again made its appearance. Sorrel also grew freely on the acid plots. Vetchling and mayweed occurred mostly on the nitrate and farmyard manure plots. *Holcus* and vetchling seemed to be absent from the sulphate of ammonia plots. The results are given in Table 1.

TABLE I

Continuous Growing of Wheat, 1936—*after 2 years'* (1934—1935) *fallowing and previous fallowing*, 1927 and 1928.

Stackyard Field — *Produce per acre*

Plot	Manures Applied Annually. (Before the Fallow.) For amounts see Report 1927-1928 No manures since 1926	Dressed Corn per acre. Bushels.	Total Corn per acre. lb.	Weight per bushel. lb.	Straw, Chaff, etc., per acre. lb.
1	Unmanured	10.7	608	56.1	1,327
2a	Sulphate of Ammonia	—	—	—	—
2aa	As 2a, with Lime, Jan., 1905, repeated 1909, 1910, 1911	11.8	714	60.0	1,109
2b	As 2a, with Lime, December, 1897	13.7	832	60.0	1,288
2bb	As 2b, with Lime, repeated Jan., 1905	10.2	615	60.5	1,029
3a	Nitrate of Soda	13.8	812	58.5	1,260
3b	Nitrate of Soda	13.4	776	57.5	1,185
4	Mineral Manures (Superphosphate and Sulphate of Potash)	15.8	898	55.8	1,814
5a	Mineral Manures and Sulphate of Ammonia ..	15.3	928	58.7	1,524
5b	As 5a, with Lime, Jan., 1905	14.8	887	59.0	1,526
6	Mineral Manures and Nitrate of Soda	11.4	688	59.7	1,058
7	Unmanured	13.0	788	57.2	1,454
8a	Mineral Manures and, in alternate years, Sulphate of Ammonia	4.0	235	59.2	383
8aa	As 8a, with Lime, Jan., 1905, repeated Jan., 1918	15.8	948	59.5	1,548
8b	Mineral Manures and Sulphate of Ammonia (omitted in alternate years)	1.1	65	59.2	112
8bb	As 8b, with Lime, Jan., 1905, repeated Jan., 1918	13.1	774	58.5	1,306
9a	Mineral Manures and, in alternate years, Nitrate of Soda	10.9	657	59.5	1,073
9b	Mineral Manures and Nitrate of Soda (omitted in alternate years)	11.0	652	59.0	1,046
10a	Superphosphate and Nitrate of Soda	7.1	429	60.0	634
10b	Rape Dust	7.2	423	58.0	630
11a	Sulphate of Potash and Nitrate of Soda	9.7	587	60.0	890
11b	Farmyard Manure	14.3	856	59.0	1,358

In general the yields of 1936, after the second two years' fallowing, resemble those of 1929 after the first two years' fallowing, although no manures have been applied since 1926. But on the limed plots the 1936 yields were much greater than in 1929 :

	Plot				
	2aa	2b	2bb	8aa	8bb
	grain, lb. per acre				
1929	100	64	316	464	548
1936	714	832	615	948	774
Total lime added, tons per acre ..	1	2	4	1	1

(The dates of the lime applications, making up the above totals, are given in Table I.)

Evidently these plots provide valuable experimental material for the study of the relation of liming to soil acidity and crop yield.

(*b*) *Continuous Barley*. During the fallow, plots 2a, 5a, 8a and 8b had abundant growth of sorrel and spurry, and the latter was mown to prevent seeding. Mayweed and vetchling were prominent on the

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nitrate plots. Plumage Archer was sown in March, and ripened unevenly with a damp and weedy straw. (Table II). The yields are of the same order as those after the first two years' fallowing.

TABLE II

Continuous Growing of Barley, 1936—after 2 years' (1934—1935) fallowing and previous fallowing, 1927 and 1928

Stackyard Field — *Produce per Acre*

Plot	Manures Applied Annually (Before the Fallow) For amounts see Report 1927-1928 No Manures since 1926	Dressed Corn per acre. Bushels	Total Corn per acre. lb.	Weight per bushel. lb.	Straw, Chaff, etc., per acre. lb.
1	Unmanured	19.8	970	47.8	1,746
2a	Sulphate of Ammonia	—	—	—	—
2aa	As 2a, with Lime, Mar., 1905, repeated 1909, 1910, 1912 and 1923	19.5	1,039	46.2	2,172
2b	As 2a, with Lime, Dec., 1897, repeated 1912 ..	19.0	910	44.0	1,738
2bb	As 2a, with Lime, Dec., 1897, repeated Mar., 1905	15.6	832	48.5	1,530
3a	Nitrate of Soda	23.6	1,210	48.5	1,964
3aa	As 3a, with Lime, Jan, 1921	15.3	750	47.0	1,409
3b	Nitrate of Soda	19.2	964	46.5	1,726
3bb	As 3b, with Lime, Jan., 1921	14.7	732	46.5	1,280
4a	Mineral Manures (Superphosphate and Sulphate of Potash)	18.2	898	48.0	1,569
4b	As 4a, with Lime, 1915	20.2	1,079	48.9	1,711
5a	Mineral Manures and Sulphate of Ammonia ..	—	—	—	—
5aa	As 5a, with Lime, Mar., 1905, repeated 1916 ..	11.0	564	47.0	1,375
5b	As 5a, with Lime, Dec., 1897, repeated 1912 ..	17.4	879	48.2	1,650
6	Mineral Manures and Nitrate of Soda	22.9	1,168	49.0	1,919
7	Unmanured	16.3	823	47.7	1,543
8a	Mineral Manures and, in alternate years, Sulphate of Ammonia	—	—	—	—
8aa	As 8a, with Lime, Dec., 1897, repeated 1912 ..	22.5	1,149	48.7	1,673
8b	Mineral Manures and Sulphate of Ammonia (omitted in alternate years)	—	—	—	—
8bb	As 8b, with Lime, Dec., 1897, repeated 1912 ..	24.2	1,262	48.7	1,911
9a	Mineral Manures and, in alternate years, Nitrate of Soda	28.1	1,435	49.1	2,177
9b	Mineral Manures and Nitrate of Soda (omitted in alternate years)	28.2	1,405	48.7	2,152
10a	Superphosphate and Nitrate of Soda	16.5	826	47.5	1,564
10b	Rape Dust	9.6	483	46.7	1,058
11a	Sulphate of Potash and Nitrate of Soda	23.4	1,175	48.2	1,961
11b	Farmyard Manure	29.7	1,529	49.6	2,413

ROTATION EXPERIMENTS

THE UNEXHAUSTED MANURIAL VALUE OF CAKE AND CORN (STACKYARD FIELD) 1936.

Series C. (Clover following barley).

The Alsike clover, sown in March 1935, was poor and weedy, and eelworms were present. The yields in cwt. per acre, were: cake-fed plot, 19.8; corn-fed plot, 20.2 The clover was ploughed up in September and sown to wheat.

Series D. Wheat after Clover

"Red Standard" wheat drilled in October, was affected by the early frosts, but recovered. The yields were:

Plot	*Head Corn*		*Tail Corn*	*Straw, Chaff, etc.*
	Bushels	Weight per Bushel.		
		lb.	lb.	cwt.
1 After cake-feeding	19.9	64.3	8½	18.1
2 After corn-feeding	17.5	64.6	6½	15.0

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This rotation being now concluded, the land will be fallowed and thoroughly cleaned in preparation for a new experiment.

Green Manuring Experiment

Stackyard Field (Series A)

This experiment has now been re-designed on modern statistical principles and will be fully described in next year's Report. Four crops—mustard, tares, clover and rye grass— are to be used, and the test crop will be kale instead of wheat. The results for the closing year of the old experiment were as follows :

(*a*) *Upper part.* After the wheat crop of 1935, mustard and tares were sown on the appropriate plots. They made good growth and were turned in and sown to kale.

(*b*) *Lower part.* This area had been sown to wheat after the mustard and tares of 1935. The green crops were too poor to be fed by sheep, so they were ploughed in in August 1935 giving, for mustard and tares respectively, 1,875 lb. and 4,981 lb. of green matter per acre, and 8.33 lb. and 24.6 lb. of nitrogen per acre. No second sowing was made. The wheat yields of 1936 were :

Plot	Grain bushels per acre	Straw cwt. per acre
Mustard unlimed	10.2	10.1
Mustard limed	8.1	9.4
Tares unlimed	11.4	11.0
Tares limed	8.9	11.1

Lansome Field (Green-manuring). 1936. *Green crops after wheat*

The first crops of tares and mustard were ploughed in, in July, and a second sowing made, the crop being turned in later, in preparation for wheat. In both crops mustard made the better growth.

Lansome Field. Lucerne inoculation experiment

The plots were harrowed and received 10 tons of farmyard manure per acre. Three cuttings were taken, the yields, in tons per acre, being 21.3 green, or 4.4 hay for the uninoculated plots, and 21.1 green or 4.3 hay for the inoculated. As before, inoculation shows no benefit either on yield, or on nitrogen percentage. The lucerne is now five years old and is still growing very well.

POT CULTURE EXPERIMENTS

The main programme was the continuation of work on problems which have arisen in connection with the field experiments. The experiments on " clover sickness " in different kinds of clover, begun in 1931, have now definitely established that the clover sickness which is so common on the light soils of Woburn is something apart from eelworm attack, though the two are very frequently found

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co-existent. Heating of the soil to 135-140 °F. prevents for a time the advent of clover sickness and also cures it, if present. In 1936 the still more important discovery was made that a liberal application of farmyard manure was successful in preventing clover sickness from appearing in the crop, while any kind of artificial manure failed to stop its appearance.

The study of questions relating to acid soils, such as those produced by the continued use of sulphate of ammonia on a lime-deficient soil, have again taken a good deal of time. Some of the important results are (*a*) excellent crops of barley can be grown on these soils without any addition of lime provided they receive a good dressing of farmyard manure, (*b*) the addition of calcium salts of any kind cannot replace the use of caustic lime in bringing back the fertility of acid soils, (*c*) even large dressings of phosphates do not bring back the fertility of these soils, as has been stated by many workers on the subject. This would, of course, have been the case if the loss of fertility had been due to the presence of aluminium salts in toxic quantities on such acid soils.

The work on the effect of manuring with various forms of green manure plant material, in comparison with farmyard manure and of sulphate of ammonia has continued. The results obtained do not lend themselves to a summary, but it is hoped that they will be published during the coming year.