ROTHAMSTED RESEARCH

Report for 1930

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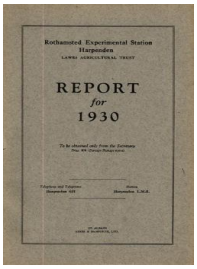

Barley

Rothamsted Research

Rothamsted Research (1931) *Barley ;* Report For 1930, pp 21 - 25 **- DOI: https://doi.org/10.23637/ERADOC-1-63**

Thanks also to the sympathetic co-operation of the North Metropolitan Electric Power Supply Company, the farm is now to be connected up with their system. The buildings lie well off the track of the supply cables, nevertheless the company has been good enough to erect a special line, asking only a nominal guaranteed revenue, in order that we may be able to investigate the possibilities of using electricity in agriculture. The work will fall into three divisions:

(1) Use of appliances already known to be effective, so as to gain experience with them, to record their performance and to see how they compare in convenience, effectiveness, and cost with the older appliances. These will be fully demonstrated to all agriculturists interested.

(2) Tests for electrical engineers and implement makers of promising electrical devices not yet in common use about which more information is wanted.

(3) Investigations of possible new applications of electricity in agriculture.

It is hoped to begin work during the coming season.

The Committee has been fortunate in obtaining much valuable assistance from the General Electric Company and from Mr. R. Borlase Matthews, the well known electrical expert.

THE FIELD EXPERIMENTS.

CEREAL CROPS—BARLEY

An inquiry made in 1930 from the chief barley merchants in England, showed that about 65 per cent of the barley grown in England is sold for malting, a further 20 per cent is sold for seed, chicken mixtures, barley meal, etc., and the remaining 15 per cent is retained on the farm and crushed or ground for the animals.

This 65 per cent of barley sold by the farmer does not completely satisfy the maltsters demands. Only about one half of the barley used for malting is British grown[1]; the remainder comes from overseas. It is obviously important that the farmer should try to supply as much as possible, and with this end in view the Institute of Brewing has since 1922 carried out extensive investigations in co-operation with Rothamsted and the National Institute of Agricultural Botany to furnish all necessary information. The samples of barley grown in the various experiments are malted, and the more promising are brewed, so as to discover the effect of soil, season, manuring and variety on the malting and brewing qualities.

The characteristic of the season 1930 was the large response to nitrogenous manures, and the small returns from potash and phosphate. This held true of all the centres, with minor variations. At Rothamsted the increase was of the order of 4½ cwt. (9 bushels) of grain, and 4½ cwt. straw for 1 cwt. of sulphate of ammonia; at Woburn the return was even higher: over 11 bushels of grain. Phosphatic and potassic fertilisers, on the other hand, gave no

1 "Report on the Agricultural Output and Food Supplies of Great Britain," 1929, Ministry of Agriculture. The proportions vary as between brewing and distilling; about three-fifths of the malt used in brewing is from British grown barley, as against one-third of the malt used in distilling.

https://doi.org/10.23637/ERADOC-1-63

TABLE I.—Highest yields on Experimental Plots at Rothamsted, 1920–1930.

PRODUCE PER ACRE.

Years.	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Wheat in cwt.—Grain	20.4	19.9	19.7	16.2	25.7	13.6	25.7	27.3	36.5	21.8*b*	31.2
Ref. in Report ..	p. 79	p. 92	p. 86	p. 102	p. 112	p. 154	p. 137	p. 135	p. 129	p. 95	p. 132
Straw	45.4	37.5	37.4	38.6	39.7	25.0	48.4	55.8	62.0	57.6	81.2
Ref. in Report ..	p. 74	p. 85	p. 86	p. 108	p. 112	p. 132	p. 147	p. 135	p. 129	p. 87	p. 132
Barley in cwt.—Grain	23.4	22.1	19.1	18.6	22.3	23.2	22.3	23.8	20.5	30.5	30.5
Ref. in Report ..	p. 76	p. 90	p. 103	p. 114	p. 117	p. 151	p. 149	p. 132	p. 133	p. 98	p. 132
Straw	29.1	25.9	24.6	21.1	26.1	23.9	40.6	28.3	37.4	44.9	42.5
Ref. in Report ..	p. 81	p. 101	p. 101	p. 117	p. 117	p. 151	p. 149	p. 130	p. 133	p. 98	p. 131
Oats in cwt.—Grain ..		22.0		21.4	17.5	26.0	30.2	22.3	22.0*a*	15.9	16.8*c*
Ref. in Report ..		p. 93		p. 116	p. 128	p. 145	p. 146	p. 153		p. 93	p. 144
Straw		47.0		41.3	33.6	45.5	58.6	22.7		28.7	35.3
Ref. in Report ..		p. 93		p. 116	p. 128	p. 151	p. 146	p. 153		p. 93	p. 144
Hay—Cwt.	88.3	65.9	29.1	132.4	73.4	90.3	86.7	70.7	76.4	50.3	91.4
Ref. in Report ..	p. 70	p. 82	p. 95	p. 104	p. 104	p. 128	p. 128	p. 126	p. 126	p. 86	p. 121
Clover—Cwt.	24.1	54.9	26.4	78.8	72.3		32.2		28.0*a*		73.0*d*
Ref. in Report ..	p. 83	p. 102	p. 98	p. 112	p. 114		p. 125				p. 132
Potatoes—Tons	11.8	4.3	10.7	16.6	11.9	11.0	12.3	8.0	11.1	6.8	11.1
Ref. in Report ..	p. 81	p. 98	p. 94	p. 118	p. 120	p. 139	p. 140	p. 140	p. 142	p. 99	p. 146
Swedes in tons—Roots ..	21.7		32.6	17.1	21.6		21.8	15.2	22.8		
Ref. in Report ..	p. 77		p. 94	p. 119	p. 122		p. 136	p. 150	p. 152		
Tops	4.3			1.8	4.4		3.9	5.3	1.1		
Ref. in Report ..	p. 77			p. 119	p. 122		p. 136	p. 150	p. 152		
Mangolds in tons—Roots.. ..	37.7	31.0	31.6	37.4	34.2	27.1	34.7	17.3	29.3	20.7	30.9
Ref. in Report ..	p. 69	p. 81	p. 81	p. 103	p. 103	p. 127	p. 127	p. 125	p. 125	p. 85	p. 149
Tops	7.3	5.3	6.34	5.2	7.2	7.3	6.1	4.8	6.1	4.2	8.2
Ref. in Report ..	p. 69	p. 81	p. 81	p. 103	p. 103	p. 127	p. 127	p. 125	p. 125	p. 85	p. 149
Sugar Beet in tons—Roots ..							12.1	4.0	9.5	9.2	8.0
Ref. in Report ..							p. 142	p. 146	p. 147	p. 102	p. 132
Tops							26.0	13.0	12.6	6.9	11.7
Ref. in Report ..							p. 142	p. 146	p. 147	p. 102	p. 132

(*a*) Non-experimental.

(*b*) On great Harpenden (non-experimental) the yield was 31½ cwt. per acre of grain as estimated by the sampling method and on Little Hoos it was 29¼ cwt. per acre of grain as measured from the threshing machine.

(*c*) Little Hoos and Long Hoos non-experimental oats yielded 22 cwt. per acre of grain. Yield on p. 132 is dry matter.

The 1926 sugar beet was grown on freshly broken grass land well manured; the others are grown in the rotations.

increases in grain on either farm ; indeed heavy dressings of phosphate appeared slightly to depress the yield of grain at Woburn, as had happened in some of the previous years. The straw was increased, though barely significantly, by phosphate, especially at Rothamsted ; possibly also, though not significantly, by potash. The figures, set out side by side, are as follows

Varying Nutrient	Rothamsted heavy soil Doses of Nutrient					Woburn light soil Doses of Nutrient				
	0	1	2	3	4	0	1	2	3	4
	Grain : cwt. per acre					Grain : cwt. per acre				
Nitrogen	21	25	27	22	31	13.6	18.9	18.2	20.7	23.0
Phosphate	28	26	27	25	26	22.0	22.1	22.1	19.4	20.5
Potassium	30	33	40	36	33	19.3	20.7	19.6	21.1	20.4
	Straw : cwt. per acre					Straw : cwt. per acre				
Nitrogen	23	27	30	23	35	29	36	37	46	45
Phosphate	30	24	31	39	37	36	38	37	38	39
Potassium	30	33	40	36	33	33	33	33	34	36

In another experiment at Rothamsted (p. 134) the returns from nitrogenous manure were lower, and less than last year.

On the light limestone soil at Wellingore the return from nitrogen was as high as at Woburn and there was a further return from potash, and a still further return from potash and phosphate, though not from phosphate alone. The result is similar to that of 1929, except that the yields are smaller and certain small effects then observed with phosphate alone hardly appeared in 1930. On the light chalk soil of Sparsholt the nitrogen was less effective, giving an additional 4 bushels per cwt. sulphate of ammonia. Phosphate and potash were ineffective excepting only where nitrate of soda had been used. On the light chalk soil at Wye muriate of potash and salt had no effect on yields of grain or of straw.

Of the nitrogenous manures nitrate of soda was most effective, as in 1929, excepting only at Wellingore where it was no better than sulphate of ammonia or cyanamide. At Rothamsted, cyanamide was less effective than in 1929 ; the difficulty of applying it to barley is that it should be put on the land a few days before seeding, but this proved impossible. A method sometimes advocated on the Continent was therefore used, and the cyanamide was put on three days after the seed was sown. The result showed that this is not the proper way ; we should in future put on the cyanamide first, and harrow the soil before drilling the seed. In this way no time would be lost, and the risk of damage to the seed would be minimised. Whenever possible a few days should elapse between harrowing in the cyanamide and sowing the seed.

The effect of the phosphatic fertilisers was tested on the exhausted land of Rotation I (four course) : superphosphate proved considerably more effective than rock phosphate.

Behaviour of Different Varieties of Barley. For the past two years Spratt Archer and Plumage Archer have been sown in alternate strips in Hoosfield so as to compare their behaviour towards the different fertilisers. The differences are small, but the experi-

https://doi.org/10.23637/ERADOC-1-63

ment is being continued. The method is in 1931 being adopted on the permanent barley plots at Woburn, Plumage and Archer being here compared.

Effect on Quality. The effect of nitrogenous fertilisers on yield and quality of the grain is well illustrated by a series of experiments repeated during the three years 1927 to 1929, comparing the effects of 1 and of 2 cwt. of sulphate of ammonia.

The 1 cwt. dressing raised the yield by 3 to 5 cwt. of grain per acre, and 3.6 to 7.7 cwt. of straw without injury to the nitrogen content, 1,000 corn weight, or malting properties. Two cwt. per acre of sulphate of ammonia, however, added little to the yield, and considerably injured the quality. The figures are given in Table II.

The chemical factors involved in quality are discussed on p. 55

Growing for Quality. The general results of the experiments are as follows :

(1) Early sowing is essential for high quality.

(2) The preceding crop is not of great importance provided the land can be cleared in time. A cereal crop is the most convenient because it allows ample time for preparation. A root crop fed off has the disadvantage that the land may be occupied too long.

(3) Modern varieties of barley stand up to nitrogenous manures better than the older ones. It is therefore quite unnecessary to withhold manure. The farmer should aim at large crops, and so long as the treatment gives a good increase, such as that shown in Table II, by 1 cwt. sulphate of ammonia, no harmful effect on quality need be feared.

(4) When clover is sown in the barley a dressing of muriate of potash (1 cwt. per acre), or 30 per cent potash manure salts (1½–2 cwt. per acre) may benefit the barley and will help the clover in the next year. If the land recently had a dressing of superphosphate none need be given to the barley ; otherwise a dressing of 2 cwt. per acre should be given.

TABLE II.—Effect of Increasing Amounts of Sulphate of Ammonia on the Yield and Quality of Barley at Rothamsted.

Yield.

Sulphate of Ammonia cwt./ac.	Grain : cwt. per acre. 1927	1928	1929	Straw : cwt. per acre. 1927	1928	1929
None	11.8	14.3	20.1	15.4	24.4	20.3
1	17.0	17.8	23.1	20.4	32.1	23.9
2	18.9	17.3	25.2	22.2	34.5	24.9

Quality of Barley.

S/Am.	Nitrogen per cent. on dry matter. 1927— All Plots.	Plots Malted.	1928	1929	1,000 corn weight, dry. 1927— all Plots.	Plots. Malted	1928	1929
None	1.458	1.427	1.928	1.464	36.0	36.3	38.2	39.7
1cwt/ac	1.451	1.470	2.049	1.459	35.6	34.8	38.1	39.6
2cwt/ac	1.488	1.510	2.174	1.482	34.6	34.6	37.2	37.0

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Quality of Malt.

S/Am.	Extract, lb. per barrel, on dry matter.			Diastatic Power, Lintner.			Colour.		
	1927 Plots Malted	1928	1929	1927 Plots Malted	1928	1929	1927	1928	1929
None	(99.6)	95.8	98.8	(43.5)	59.0	38.5	4.2	5.4	4.8
1cwt/ac	(99.1)	95.0	98.7	(39.5)	64.0	38.0	4.0	3.9	4.8
2cwt/ac	(98.1)	94.2	98.8	(41.0)	69.0	41.0	4.7	5.2	4.8

Valuation of Barley and Malt.

S/Am.	Barley. Shillings per qr. of 448lb.			Malt. Shillings per qr. of 336lb.		
	1927.	1928.	1929.	1927.	1928.	1929.
None	38	37	35	68	(2)	54
1 cwt/ac.	41	37	35	68	(1)	54
2 cwt/ac.	39	37	42	68	(3)	54

Notes.—The bracketed Malt Extracts and Diastatic Powers refer to the results on single plot samples: others are means of replicates.

Diastatic Power is depressed with increasing colour.

The 1928 Malts were noted as "unsaleable" by the valuers, but placed in the relative order given in brackets.

WHEAT

No crop is more discussed than this. It is easy to grow and it is especially suited for the somewhat dry regions which in Australia, Canada and Russia are now being populated; hence a large increase in the amount grown and sent to these shores.

We could, however, grow much larger quantities ourselves if we desired. The present method of growing wheat gives about 33 bushels to the acre which is quite unprofitable. Considerably higher yields, however, are possible. Recent Rothamsted experiments have shown the remarkable effects of a summer fallow in raising the yield; where rents are low the cost is small, the necessary cultivations being done entirely by tractor. With the ordinary methods our highest yields, as shown in Table I (p. 22) were usually about 37 bushels per acre from 1920 to 1925 (excluding 1924); since then they have been 50 to 55 or more. The 1930 Great Knott crop yielded 27 cwt. of grain (50.5 bushels) per acre, and 54 cwt. of straw on the unmanured land; nitrogenous top dressings added nothing to the grain and 8 cwt. to the straw, which caused the crop to lodge. The preparation had been a fodder crop folded by sheep, which had paid for itself, then the summer fallow. In these circumstances one might expect damage from the wheat bulbfly (*Hylemya coarctata Fall*), and it was present and destroyed many tillers, but there still remained a good crop.

In another experiment, made in Long Hoos field, the wheat followed a seeds ley. The yield without nitrogen averaged only 15.2 cwt. of grain (28.4 bushels) and 21.9 cwt. of straw. There had been much loss of plant during the winter. Four varieties were tested: Square-Head's Master, Million III, Yeoman II and Swedish Iron; of these the Square-Head's Master gave the lowest yield, 13.1 cwt. of grain per acre, and Swedish Iron as in 1929 the highest, 18.5 cwt. per acre, but on all alike nitrogenous manuring, whether applied early or late, was almost ineffective. Muriate of ammonia applied late appeared somewhat to reduce the yield both of grain

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