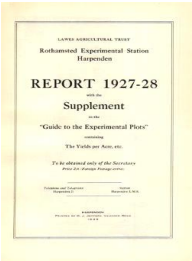
ROTHAMSTED RESEARCH

Report for 1927-28

Full Table of Content



Potatoes

Rothamsted Research

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as to be of maximum service to those who are seeking to help the farmer.

Two important conferences were called at Rothamsted in the winter 1928-29 to discuss the agricultural situation. From these it was quite clear that the old four-course rotation is no longer a suitable basis for arable husbandry. Roots are too expensive and uncertain. Wheat-growing in general does not pay. This is not peculiar to England: one of the remarkable agricultural changes of the twentieth century is the shifting of wheat cultivation from the wetter to the drier regions of the world. It is taking place in Australia and Canada just as much as here: regions of 30-inch annual rainfall which produced wheat in the nineteenth century do so no longer: wheat has gone into regions of 24 inches or less. Here in England wheat is similarly being restricted more and more to the dry Eastern counties, where it will doubtless continue.

But it also appears that grass farming pure and simple, however well done, is no complete remedy. For the grass farmers must buy store animals in spring, and sell animals in summer and autumn: where too much land is in grass, prices of spring stores are forced too high and of autumn animals too low.

The new agriculture that is emerging out of the present series of changes includes the following features:—

(1) a closer connection between arable and grass land than formerly, especially an improvement in the grass and the lengthening of the grazing season; longer leys in arable regions and use of prolific fodder crops such as lucerne; the fattening of young animals on grass, as far as is practicable, instead of keeping them to be fattened during the following winter;

(2) the growth of cheap winter food for animals to ensure cheap production of milk in winter and to avoid the necessity for the present forced sales of unfinished animals in autumn;

(3) the substitution of crops of value, such as potatoes, sugar beet, Brussels sprouts, cabbages, etc., for the present root crops; extension of fruit growing and market gardening;

(4) improvements in the methods of fallowing;

(5) the use of poultry, pigs, etc., to complete the conversion of home-grown produce into more valuable products such as fresh meat and eggs, thus avoiding the necessity for forced sales of grain.

All these problems are being studied on the Rothamsted and Woburn farms, and the information yielded by the experiments is applied to them as rapidly as is possible.

CROP EXPERIMENTS.

Replacement of the Old Root Break.

Potatoes. If potatoes are to be grown at all they must be grown well, and in particular must be adequately fertilised.

Since 1921, an experiment has been made each year to discover the effects of sulphate of ammonia and sulphate of potash on potatoes: the results show that the two fertilisers are closely

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linked, and neither gives its best effect without the other. The results were, in tons per acre :—

		1927				1928		
Sulphate of Ammonia.		0	2	4		0	1½	3
		cwt. per acre.				cwt. per acre.		
Sulphate of Potash	0	6.54	7.06	7.16	0	6.60	8.75	8.26
Cwt. per acre.	2	6.56	7.74	7.85	1	7.67	9.03	11.05
	4	6.90	7.70	7.45	2	7.06	8.79	10.63

With sufficient potash and phosphate the increases given by 1 cwt. sulphate of ammonia per acre have been, at Rothamsted :—

Year.	Date of Planting.	Date of Lifting.	Yield without Sulphate of Ammonia Tons per acre.	Increase in cwt. for 1 cwt. Sulphate of Ammonia.
1925	April 25 ...	October 6 ...	7.25	24
1926	April 24 ...	October 21 ...	7.8	26
1927	May 23 ...	October 6 ...	6.5	10
1928	April 17 ...	October 19 ...	7.6	20

Excepting only in 1927, when the potatoes were set very late, the increases are round about the usual 20 cwt. per acre.

At Woburn, the increments have been more varied :—

Year.	Date of Planting.	Date of Litting.	Yield without Sulphate of Ammonia Tons per acre.	Increase in cwt. for 1 cwt. Sulphate of Ammonia.
1926	May 10 ...	Oct. 11-12 ...	6.5	9
1927	June 25 ...	Oct. 27-28 ...	6.5	9
1928	May 5-9 ...	Oct. 24-26 ...	11.9	30

With sufficient sulphate of ammonia the increases given by 1cwt. sulphate of potash are much more variable : they have been, at Rothamsted :—

Year.	Date of planting.	Yield without Potash. Tons per acre.		Increase for 1cwt. Sulphate of Potash. Cwt.		Increase for 1 cwt. Muriate of Potash. Cwt.		Hours of Sunshine, July, Aug., Sept.
		No dung.	Dung.	No dung.	Dung.	No dung.	Dung.	
1922	April 22-24 ...	2.48	9.21	58	20	67	18	379
1923	May 4-5 ...	9.73	11.70	25	10	30	23	668
1924	May 6-10 ...	6.20	9.18	10	No increase	9	6	523
1925	April 29–May 4	5.03	—	40-46	*	48	—	441
1926	April 23 ...	—	9.45	*	20-23	—	22	479
1927	May 23 ...	—	6.92	*	Depression	—	1½	420
1928	April 17-20 ...	—	7.69	*	—	—	28(1)	681

(1) Mean of muriate and 30 per cent. potash manure salts.
* No experiment made.

The effectiveness of the potassic fertiliser is lessened by late planting : indeed, for potatoes, as for sugar beet, we know of no profitable scheme of manuring a late planted crop.

Potassic fertilisers are clearly much more dependent on the season than nitrogenous fertilisers : the explanation is that they increase the efficiency of the leaf, an action which is advantageous

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in sunless seasons; also they increase the vigour of the plant, thus helping it in seasons of spring drought or other difficulties.

Sulphate of potash in our experiments usually excels the other potassic fertilisers for yield, though not by much, muriate running it very close and the 30 per cent. potash salt is not far behind. The average yields, in tons per acre, of the last six years for the dressing of 2 cwt. sulphate of potash[1] per acre and equivalent amounts of the other salts, have been :—

	No Potash.	Sulphate of Potash.	Muriate of Potash.	Potash Manure Salts 30%.
1922	F.Y.M. 8.03	9.55	9.21	—
	no F.Y.M. 2.48	8.30	8.32	—
1923	F.Y.M. 11.70	12.47	13.03	12.07
	no F.Y.M. 9.73	12.23	12.00	11.43
1924	F.Y.M. 9.18	8.82	8.70	9.22
	no F.Y.M. 6.20	7.27	7.15	7.77
1925	no F.Y.M. 5.03	9.68	9.42	9.36
1926	F.Y.M. 9.45	11.36	11.52	10.97
1927	F.Y.M. 6.92	7.38	7.16	6.86
		7.35	7.04	6.46 double dressing

F.Y.M. = Farmyard Manure.

The figures from 1925 onwards, when the new methods were introduced, have more value than those for the earlier years.

Superphosphate was included in the tests in 1928. The results show an average gain of 5 cwt. potatoes per cwt. of 36 per cent. superphosphate at Rothamsted, and the following at other centres, adequate supplies of sulphates of ammonia and of potash being given :—

Wisbech	... ...	3 cwt. potatoes.
Stowbridge	... ...	19 cwt. ,,
Woburn	... ...	8 cwt. ,,
Rothamsted	... ...	5 cwt. ,,
Aberystwyth	... ...	Nil

Average : 7 cwt. potatoes per cwt. superphosphate.

At three of the five centres increases in yield continued (though not at this rate) up to 8 cwt. superphosphate, at one (Aberystwyth) there was no clear increase, and at one (in Lincolnshire) there was apparently a decrease : this is being more fully examined this year. The yields are given on pp. 143, 156, 170-4.[2]

The effect of the superphosphate is dependent on the presence of sufficient nitrogen and potash as shown in the following yields at Rothamsted in tons per acre :—

Varying nitrogen, adequate potash 1928.

	Sulphate of Ammonia. 0 cwt.	1½ cwt.	3 cwt.
With super	7.67	9.03	11.05
No super	7.62	9.15	9.76
Gain due to super	Nil	Nil	1.29

[1] Rather less on the farmyard manure plots of 1922, 3 and 4.
[2] Full Report.

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Varying potash, adequate nitrogen 1928.

	Sulphate of Potash. 0 cwt.	1 cwt.	2 cwt.
With super	8.26	11.05	10.63
No super	8.00	9.76	9.74
Gain due to super (3-cwt. per acre)	0.26	1.29	0.89

It has now become possible to arrange for a satisfactory investigation into the influence of manuring on the quality and keeping value of potatoes. Dr. Lampitt, Head of Messrs. J. Lyons' laboratories, is conducting cooking tests (boiling and frying) of all our samples fresh from the field and after storage, and with his help we hope also to obtain the percentages of dry matter, starch, nitrogen and other constituents likely to influence quality.

Sugar Beet. The Beet Sugar Factories—Anglo-Dutch Group—generously made grants in 1927, 1928 and 1929, enabling us to carry out extensive fertiliser trials at Rothamsted and Woburn, and to repeat typical experiments elsewhere. These trials, being in much more detail than was previously possible, have brought out a number of important points, but they have also shown that we do not yet properly understand the manuring of sugar beet and, therefore, are not obtaining as large yields as we ought. The Continental recommendations which most farmers follow are not altogether suitable to English conditions.

In 1927, sowing was unavoidably delayed at Rothamsted and the purpose of the experiment was to discover whether in these conditions, which are always liable to arise in a heavy soil, any fertiliser scheme could make up for lost time. Unfortunately, none of the forms or combinations of nitrogen, potash, phosphate proved successful, and we do not yet know how to get over the difficulties of late sowing.

The other experiments of 1927 and those of 1928 were to discover the effects of the various fertilisers on the crop, both on roots and leaves, the latter being important as stock food.

The leaves behave normally towards fertilisers. Nitrogenous fertilisers deepen their colour and increase their size: an additional hundredweight of nitrate of soda gave about one ton of additional leaf per acre.

The roots, however, are much less affected than the leaves and are not nearly so responsive as mangolds. One ton of mangold leaf will commonly give about 4 to 6 tons of root, but one ton of sugar beet leaf may give only one ton of root and sometimes much less. Sulphate of ammonia applied with the seed had but little effect: muriate of ammonia was rather better, but nitrate of soda was best of all. None of the nitrogenous fertilisers, however, did much to increase the yield, while they all lowered the sugar content and the weight of root formed per 100 parts of leaf. Phosphate had but little effect either on yield or sugar content. Potassic fertilisers also had only little action, but, of these, potash manure salts was somewhat better than the muriate.

The results suggest that sodium, perhaps magnesium and chlorine, play some part in the nutrition of the sugar beet, and that the plant cannot make full growth unless they are supplied.

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