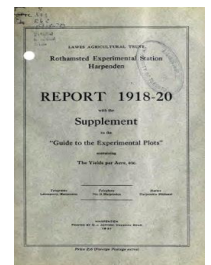


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Report 1918-20 With the Supplement to the Guide to the Experimental Plots Containing the Yields per Acre Etc.



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Cultivation Experiments

Rothamsted Research

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but it can be done with a tractor. The Hyatt Roller Bearings Co. kindly lent us a reliable high-class dynamometer with which were taken measurements for cross ploughing land previously ploughed in autumn. These show that the effect of chalking is to increase the speed of ploughing and to reduce the draw bar pull on the three-furrow plough by no less than 200lbs.

Average.	COCKSHUTT PLOUGH.		RANSOME PLOUGH.	
	No Chalk	Chalked.	No Chalk.	Chalked.
Miles per hour	2.18	2.23	1.98	2.21
Draught per plough, lb.	513	453	537	475
Per sq. in. in furrow sect'n, lb.	7.25	6.46	7.67	6.8
Draw bar pull, lb.	1538	1358	1610	1425

We propose to extend these measurements to plots treated with other fertilisers: farmyard manure, green manure, folded land, etc. The "secondary effects" of artificials, studied here by Sir A. D. Hall, may prove to have a measurable economic value when one adds up all the tractor cultivations of the year. This will form an important part of the programme of the soil physics laboratory.

THE POSSIBILITY OF INCREASED OUTPUT FROM THE LAND.

It is often urged as a reproach to agricultural experts that in spite of the multitudinous experiments of the last 20 years the output from the land is no more than it was 50 years ago. The statement is not entirely correct, but there certainly has been no increase in output from the land comparable with that in industry. One important reason is that much less cultivation is done now than was usual 50 years ago, and in consequence the crop is not given a full chance of making good growth. With the advent of the tractor it will, we hope, become possible to remedy this defect and to enable some of the newer aids to crop production to attain their full effect.

The results described in previous reports show that the output from the land is much increased by the proper use of artificial fertilisers on carefully selected suitable varieties of crops. In the case of cereals good results have been obtained by the use of spring dressings of nitrogenous manures, these being required to replace the nitrates washed out during the winter (see p. 35). Experiments, however, show remarkable differences in effectiveness according to the time of application. It is impossible on present data to formulate hard and fast rules, but as shown below it appears that a small dressing (1 cwt. sulphate of ammonia or less) may go on fairly late, while a larger dressing should go on early.

THE AMOUNT OF FERTILISER TO USE.

For many years the Rothamsted data have shown that the yield of crops increases with the amount of manure supplied, but beyond a certain point the increase is no longer proportional to the added manure. In the old experiments the unit dressing was

200lbs. of ammonium salts per acre, and the dressings were increased up to 800lbs. per acre. It was then found that the effect of the last 200lbs. of fertiliser, *i.e.*, of the increase from 600 to 800lbs. was very small and unprofitable, while the first 200lbs. had proved distinctly useful. This is in accordance with the Law of Diminishing Returns. It was assumed, therefore, that the law held for light as well as for heavy dressings of manure and a deduction was made for which the evidence was rather slender, that a small dressing of manure gave the largest rate of profit, while further dressings gave a relatively smaller return.

Recent work, however, has disturbed this view. 200lbs. per acre of ammonium salts is too large a unit for modern practice, hence more interest attaches to the effect of the smaller than to the larger dressings. Examination of the Broadbalk results shows that the largest return is given, not by the first dressing, but by the second.

The conditions of an experimental field are not quite those of practice, and accordingly a new experiment has been started to see if under ordinary conditions of farming the highest rate of profit is given by good rather than by small dressings of fertilisers. The results of the first year (1920) suggest that this may be so.

INCREASE IN WHEAT CROP, 1920, FROM SPRING DRESSINGS OF SULPHATE OF AMMONIA AND SUPERPHOSPHATE (p. 79).

Date of Application of Manure	GRAIN : BUSHELS PER ACRE.			STRAW : CWTS. PER ACRE.		
	Feb. 10	March 6	May 10	Feb. 10	March 6	May 10
Single Dressing	Nil.	0.9	2.7	2.7	6.9	9.4
Double Dressing	7.0	—	3.7	11.7	—	12.7

While the single dressing (100lbs. sulphate of ammonia per acre) gave no appreciable increase in grain, and only a few cwts. of additional straw, the double dressing gave increases of no less than 7 bushels of grain and 12 cwts. of straw. Late application of the double dressing, however, was risky, giving an unhealthy straw liable to lodge and prone to disease.

If funds allow, the experiment will be developed on a much fuller scale : it certainly is of great importance in fertiliser practice.

INVESTIGATIONS ON ARTIFICIAL FERTILISERS.

The artificial fertiliser position has been profoundly modified by the War, and extensive factories now manufacture nitrogenous fertilisers from the air. Of these nitrate of lime, nitrate and muriate of ammonia, and nitrolim have been or are under investigation at Rothamsted.

A further important source of organic nitrogenous manure is sewage. The total amount of nitrogen contained in the sewage of the United Kingdom is estimated at 230,000 tons per annum, which is equivalent to 1,150,000 tons of sulphate of ammonia—