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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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War Work at Rothamsted

Rothamsted Research

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WAR WORK AT ROTHAMSTED.

Some of the problems dealt with at Rothamsted during the War were described in the last Report (1914-1917). A connected account is now given so as to complete the record.

During the first year of the War (1914-15) very little direct War work was done at Rothamsted. Food was still coming into the country in large quantities and there was no great interference with food production at home. Supplies of fertilisers and feeding stuffs were ample. There was, however, fear of unemployment, and three schemes were examined at the request of the Board of Agriculture with the view of ascertaining whether they could usefully employ any considerable number of men, and if so, whether they would contribute to the national profit. These were a proposed development of Foulness Island in Essex, the suggested afforestation of the spoil heaps and pit mounds of the Black Country, and the reclamation of Pagham Harbour in Sussex. None of these schemes was further developed, though two of them—the planting of the spoil heaps in the Black Country and the reclamation of Pagham Harbour—possess aspects of permanent interest. The spoil heaps are useless and unsightly; they can, however, be planted with trees, when they take on a very different appearance, as shown by Reed Park, Walsall. Although the financial returns may not be great, the improvement in the amenities of the district would be considerable. The proposition is not agricultural, however.

The most important work began in 1916 when the food situation gave cause for much anxiety. The position was really very serious. The submarine menace was looming before us, terrible in its unfamiliarity, conjuring up visions of food shortage, if not of starvation: the only way out of the situation seemed to be the production of our own food in our own country. At the time we were producing only one-half of our total food—the remainder was coming from abroad. When the list was examined in detail the position was found to be more serious than it looked. The food produced at home included more of the luxuries than of the essentials; it included, for instance, the whole of the highest quality meat, but only one-fifth of the bread. The farmer was therefore called upon to perform a double task—he had to produce more food and different food; to give us, not one loaf out of every five that we eat, but three or four out of every five, and to do this without causing too great shortage of milk, meat, and if possible, beer. The situation presented many difficult administrative, financial and technical problems. The technical problems involving soils and fertilisers were dealt with at Rothamsted.

The fertiliser problems arose out of the necessity for making the very best use of the limited stocks of the ordinary fertilisers to which the farmer was accustomed, and of examining any and every substitute that promised help in eking out the supplies. Fortunately, a good deal of information could be drawn from the Rothamsted and other experiments as to the best way of using fertilisers on particular crops. This was systematised and put in order in a little handbook called "Manuring for Higher Crop Production,"

issued at a cheap price by the Cambridge University Press, so that farmers could readily obtain it. In addition, each month a series of Notes was issued in the Ministry's Journal showing how the available supplies might best be utilised.

It was more difficult, however, to give useful information about the substitutes that would be needed when the fertiliser supplies became too much reduced. Ordinarily, fertiliser trials have to be continued for two or three successive seasons before a definite opinion can be expressed on their merits: during the War, however, some sort of opinion had to be given in three or four weeks. Rapid methods of laboratory testing were therefore developed: growing seedlings were used to indicate whether (as not infrequently happened) toxic substances were present: rates of nitrification in soil were determined to find out how far the substance would yield nutrient material to the plant: farm crops were kept growing in pots to afford opportunities of testing any material that seemed promising. A considerable number of possible fertilisers were sent in for examination by the Food Production Department, the Board of Agriculture, the Ministry of Munitions, the National Salvage Council, and other bodies.

Much of the information was wanted for the purpose of economising sulphuric acid, so that the maximum quantity might be handed over to the Ministry of Munitions for the manufacture of explosives. In Peace time, the farmer had been the chief consumer of sulphuric acid; in 1917, however, the Ministry of Munitions were requiring all the acid they could find and were leaving much less than usual for the fertiliser manufacturers. The situation was serious: in pre-war days the farmer had required 870,000 tons of chamber acid per annum (equivalent to 580,000 tons of pure acid), and the extra food production programme was calling for even more than this. But the Ministry of Munitions was obdurate, and supplies were cut down at a rate which seemed to some of the more nervous to threaten a very serious situation: the production of sulphate of ammonia fell from 350,000 tons per annum to little over 250,000 tons, while that of superphosphate fell from 800,000 tons to 500,000 tons per annum.

Fortunately, a partial substitute for sulphuric acid was available in the form of nitre-cake, and although no fertiliser manufacturer liked it or had a good word for it, it seemed as if it might have to be used extensively in the manufacture of superphosphate and of sulphate of ammonia. Important and difficult technical problems were involved both at the factory and on the farm, necessitating a considerable amount of experimental work. Thanks to the co-operation of the manufacturers, working solutions of the difficulties were found, and there is little doubt that both sulphate of ammonia and superphosphate could have been made from nitre-cake had the necessity arisen. Fortunately it did not, and the situation was eased before it became too serious.

A considerable amount of work was also done in the examination of new sources of potassium compounds to take the place of the Stassfurt salts which had previously been our sole source of supply. A certain number of residues from manufacturing processes were available, but in the main they suffered

from one or other of two defects: very low content of potash likely to be useful to the plant, or the presence of toxic substances. After much sorting out of possible materials, it appeared that certain blast furnace flue dusts would prove suitable, and accordingly the Food Production Department took steps to make the necessary arrangements for distribution among farmers. Considerable quantities were used, often with distinct advantage.

Investigation was also made into the possibility of using to better advantage the farmyard manure produced on the farm.

At the conclusion of the Armistice there were vast stocks of explosives in hand, and Mr. Churchill set up a small Committee, under the late Lord Moulton, to devise means of disposal. The Director was appointed to serve on this Committee and much work was done at Rothamsted to test the possibility of converting surplus explosives into fertilisers. The case of ammonium nitrate was satisfactorily dealt with (p. 54), but cordite, T.N.T., and other explosives presented more difficulties. Means were devised for preparing nitrate of lime from cordite, but there was a loss of 25% of nitrogen and a poisonous impurity (oxypyruvic acid) was always present; this, however, could no doubt have been satisfactorily eliminated had the experiments continued. The difficulty was caused not by the nitro-glycerine but by the nitro-cellulose. T.N.T. proved more difficult to convert into fertilisers, and other means of disposal were adopted.

In addition, work was carried out in connection with the agricultural development of the Belgian Congo, which H.M. the King of the Belgians recognised by conferring upon the Director the Order of the Crown of Belgium.