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Rothamsted Report for 1947

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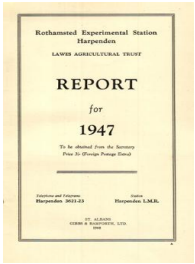

Woburn Experimental Station

H. H. Mann

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WOBURN EXPERIMENTAL STATION

By H. H. Mann

The general design and the principal results of the long-term experiments at Woburn were outlined in the Report for 1946 and are not repeated here.

The Station is on a light sandy soil, very deficient in lime and over a great depth of sand derived from the Lower Greensand. These conditions provide a great contrast with those at Rothamsted. The whole of the farming operations are much more influenced by weather conditions, especially by long and persistent droughts. On such a soil the conditions of 1947 were particularly trying. The winter precipitation was heavy for all months with 4·75 in. in November, 1946, and 4·89 in. in March, 1947. Frost and snow delayed the commencement of spring work, and there ensued a summer of almost unprecedented dryness, the rainfall from April to October being only 6·61 in. against a normal of 14·63 in. This did not seriously affect the yields of crops which had become well established before the long dry spell set in, but the effect on crops sown later or transplanted was disastrous; the yield of grass in the later part of the season was very small indeed.

A. Field experiments

1. *Continuous wheat and barley experiments*

The area which has been devoted to continuous wheat and barley growing since 1877 had become, for the third time since the experiment was started, so very weedy in 1946 that it was resolved to fallow the whole area, with frequent cultivations. So far as the wheat area is concerned the chief weeds have been the two grasses, both well known "twitches", *Holcus mollis* and a variety of *Agrostis* (probably *A. gigantea* var. *dispar*). These two grasses, which first became serious on the plots where, owing to acidity, wheat would no longer grow, gradually overspread the whole wheat area. With the usual amount of cultivation the *Agrostis* was gaining ground on the *Holcus*, but when an extra amount of autumn cultivation was given (as in 1945) the former almost disappeared while the *Holcus* was more in evidence than ever in the following year. It remains to be seen what relative effect the very intense cleaning of the land during the whole of the year 1947 has had on the two grasses, and observations on this point will be made during 1948.

The weed herbage of the continuous barley area was of a different character. Here, though the "twitches" were present, *Holcus mollis* was only found in small amount, and *Agrostis* was much less abundant than on the wheat area. On the other hand, wild oats, which were a comparatively unimportant pest till 1943, had increased so much in 1945 and 1946 that the crop of barley was very largely stifled. The phenomenon of the sudden rise of this weed to the position of a serious menace has been noticed in many parts of the country.

2. *Maintenance of fertility of light land*

One of the purposes of the Woburn Station is to determine the best method for the maintenance of the fertility of light land.

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Several long-term experiments have been in progress for a number of years on problems of special importance at the present time when the amount of farmyard manure available is becoming less and less. Reports on these experiments for 1947 are given below.

(a) *Alternate husbandry experiment.* Four rotations are compared:—

(i) Three years' ley, grazed

(ii) Three years' lucerne, cut for hay

(iii) Potatoes, wheat, one year ley cut for hay

(iv) Potatoes, wheat, sugar beet (previously kale)

and their effects on soil fertility are tested by the yields of potatoes followed by barley. The results in 1947 were generally similar to those in the preceding six test seasons, though the potato crop was small. The yields of potatoes after grazed ley or hayed lucerne were higher than after the arable rotations. The response of the potatoes to farmyard manure was less after grazed ley than after the other rotations.

(b) *Six-course rotation experiment on inorganic fertilisers.* The 1947 crops were the eighteenth in this experiment, which tests the effects of increasing amounts of N, P and K fertilisers on a rotation of barley, clover, wheat, potatoes, rye and sugar beet.

In 1947 there were clear responses to sulphate of ammonia applied on 17th April to barley, wheat and rye before the drought began to be serious but there was little or no response when the sulphate of ammonia was applied later to sugar beet (1st May) and potatoes (12th May).

(c) *Green-manuring experiment.* This experiment was laid out in 1936 and re-designed in 1945 to test the effects of ryegrass, clover (both undersown in the previous crop of barley), rape, lupins and fallow as preparations for cabbages transplanted in July and followed by barley. The results in 1947 were unusual. Plots which had carried good crops in the first half of the season were very dry when the cabbages were transplanted. The best cabbages were on the plots which had a bare fallow, and the worst on those where a large amount of clover or ryegrass was ploughed in shortly before the cabbages were transplanted. The barley crop showed similar results for the organic matter ploughed in during the summer of 1946. In the exceptional 1947 season the crops were smallest where most organic matter had been ploughed in.

(d) *The making of a market garden soil.* This experiment was started in 1942 to determine the relative value of farmyard manure, vegetable compost, sewage sludge and a compost made from sewage sludge and straw on a two-year rotation, viz., green peas and leeks, globe beetroot and winter cabbages. The year 1947 was a particularly difficult one for this experiment. The globe beetroot crop was late and the winter cabbage crop which followed it failed. The leek crop had to be watered twice to save it. The globe beetroot gave poor results with sewage sludge alone or in compost, but the green peas and leeks behaved similarly with all the organic manures. Crops, especially green peas, on plots without organic manures showed much greater effects of the drought.

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3. *Other field experiments*

For a number of years the Woburn farm has taken a share in the study of certain exotic crops which it was thought might be suitable for cultivation in this country. Three of these crops have again been grown in 1947, namely soya beans, an early ripening maize, and two varieties of sweet lupins. The year under report was favourable to all these crops. All seemed to have less difficulty than our local crops in establishing themselves under conditions when the soil was rapidly drying up, and the high temperatures which followed proved very favourable to the ripening of crops which do not mature easily in England.

The Manalta maize, which we originally got from Canada, sown on 5th May, ripened well and was reaped on 15th September, almost a record for this country, and gave a good crop. Several types of maize received from Canada, however, reputed to ripen in 95 days, but planted on 13th June, failed to ripen at all. The times of ripening given in the literature for varieties have evidently no meaning for this country with its much cooler summer than the areas where maize is usually grown.

The experiments with sweet lupins have led to two results. The first is that the amount of fodder that can be obtained from a yellow sweet lupin crop on the very suitable soil of Woburn was 14½ tons of green material per acre. This was grown between 22nd May and 21st August, or in 91 days. Though classed as a sweet lupin it was still somewhat bitter and sheep did not take to it readily, but ultimately ate at least all the leafy parts. The second point refers to the very great attractiveness of sweet lupins to rabbits, and the sweetest of the lupin varieties was eaten out completely in the area which was not specially protected.

B. Pot experiments

1. *Clover sickness*

Results of earlier work have been confirmed and, in addition, it was found that although fertilisers alone make very little difference to clover sickness, fertilisers combined with lime have a distinctly beneficial effect. On the other hand increasing the acidity of the soil at least to a pH value of 5·4 does not cause the soil to show symptoms of clover sickness.

In experiments on soil temperatures, partial waterlogging and the proportion of clover to soil, it was found that soil kept at 30° for a whole season showed more signs of clover sickness than any of the other treatments.

2. *Competition of crop plants and certain weeds*

Results on the competition of barley and *Agrostic* twitch were closely parallel to those already described with *Holcus mollis*.

3. *The nutrition of crops under very acid soil conditions*

In 1946, for the first time a healthy crop of barley had been grown in a soil at pH 4·3 after adding a large amount of soluble phosphate and a little calcium nitrate to the soil. In 1947 this was repeated without the addition of calcium nitrate and large plants were obtained, though with very little grain. Other crops reacted differently. Lucerne gave an abundant crop with soluble phosphate

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alone though the plants hardly grew on the untreated acid soil. With mustard the effect of phosphate was much smaller and with carrots it was very small.

C. Laboratory work

An investigation has been commenced on the sulphur present in various forms in soil samples taken at various intervals since 1876 from the Permanent Barley plots.

D. Staff

The Woburn Experimental Station has been under the charge o Dr. H. H. Mann during the whole period under report, while the farm has been under the management of Mr. J. R. Moffatt, who has directed the work from Rothamsted. Mr. T. W. Barnes has been chemist to the Station since 1929 and has remained in charge of the laboratory during the present year.