ROTHAMSTED RESEARCH

Report for 1957

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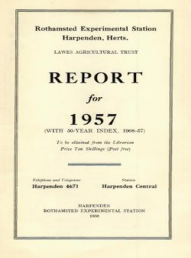

Woburn Experimental Station

C. A. Thorold

C. A. Thorold (1958) *Woburn Experimental Station ;* Report For 1957, pp 214 - 218 **- DOI: https://doi.org/10.23637/ERADOC-1-90**

WOBURN EXPERIMENTAL STATION

C. A. THOROLD

Dr. H. H. Mann retired from his appointment as Assistant Director, and his duties were assumed by C. A. Thorold, as Officer in Charge, Woburn Experimental Station. A. Peacock, laboratory assistant, resigned in October.

In the first three months of the year, the weather was relatively mild, but April and May were cold, dry and deficient in sunshine, as shown in Table 1 below. Conditions were better during June and the first week of July; in August and September the weather was generally cool, wet and cloudy, so that some difficulty was experienced in the satisfactory harvesting of crops.

TABLE 1

Monthly mean temperatures (means of maximum and minimum), total rainfall and daily means of bright sunshine for months of April to September 1957, *with departures from long-period means in brackets*

Month	Mean temperature, °F.	Rainfall, inches	Bright sunshine (daily mean), hours
April	47·1 (+0·7)	0·20 (−1·34)	4·81 (−0·10)
May...	50·0 (−2·0)	1·34 (−0·60)	5·70 (−0·37)
June	59·4 (+1·9)	2·13 (+0·17)	9·21 (+2·58)
July	62·1 (+0·7)	2·52 (+0·29)	4·52 (−1·51)
August	59·7 (−1·0)	3·54 (+1·23)	4·45 (−1·40)
September	54·9 (−1·8)	2·82 (+1·04)	3·39 (−1·26)

FIELD EXPERIMENTS

Permanent wheat and barley

Following a period of fallow, it was decided that these areas should be cropped again in 1957–58. Since it was of interest to observe how wheat cropped on the barley land and barley on the wheat land, the Field Plots Committee decided that on all the full-sized plots there should be a comparison of winter wheat *v.* winter barley *v.* spring wheat *v.* spring barley. In the smaller plots of only half the standard width the comparison should be restricted to winter wheat *v.* spring barley. In accordance with these arrangements, both winter wheat (Squareheads' Master) and winter barley (Pioneer) were sown in the permanent wheat and barley areas, in the autumn of 1957. The appropriate strips of spring wheat and spring barley will be sown in both areas in the spring of 1958.

Six-course rotation experiment

The undersown red clover failed in the winter of 1955, and crimson clover was sown in March 1956. There was again a spring

https://doi.org/10.23637/ERADOC-1-90

sowing in 1957, in accordance with a decision of the Field Plots Committee that spring-sown crimson clover should be substituted for under-sown red clover in this experiment.

The root crops (potatoes and sugar beet) yielded relatively well, but cereal crop yields were poor in 1957. The mean yield of sugar-beet roots was over 14 tons/acre, although the sugar percentage was slightly smaller (17·5 per cent) in 1957 as compared with 1956 (18·1 per cent), the mean yield of total sugar per acre (49·8 cwt.) was greater than the corresponding figure in 1956 (38·9 cwt.). The mean yields of potatoes, as total tubers per acre, were 12·2 tons (1957) and 10·9 tons (1956). Amongst the cereal crops, rye did fairly well, giving a mean yield of 24·8 cwt. grain and 28·9 cwt. straw/acre. Yeoman wheat was very poor (10·0 cwt. grain/acre), some of the plots being badly damaged by birds. In 1957 the mean yield of barley grain was 28·4 cwt./acre, as compared with 34·0 cwt. in 1956.

Green manuring experiment

There are sequences of barley with undersown green manures, followed by early potatoes with catch-crop green manures. The main theme is the evaluation of undersown green-manure crops (with and without the return of cereal straw) and of catch-crop green manures after early potatoes.

As in the Market Garden experiment referred to below, early potato yields were relatively small, being only 3 tons/acre, while the mean yield of barley grain was 19·4 cwt./acre.

Ley and arable rotations experiment

The results from this experiment have been summarized and discussed by H. H. Mann and D. A. Boyd in a paper to be published in the *J. agric. Sci.* This experiment was started in 1938, to determine whether the presence of a continuously growing crop (either a clover and grass ley, or a hayed crop of lucerne) would leave the land in a more fertile condition than if it were under continued arable cropping, with adequate manuring. At the time the experiment began there was little information on the subject; the Woburn conditions, with light but deep soil, seemed well suited for such a test. Accordingly an experiment was laid out in which the fertility after 3 years of a grazed grass and clover ley, or a 3 years' crop of lucerne cut for hay each year, was contrasted with that obtained after 3 years of arable cropping (potatoes followed by wheat or rye) succeeded by either sugar beet or a hay crop. The treatments were identical in other respects, except that the nitrogenous dressings were suited to the crops grown. The results appear to provide a verdict in favour of ley farming, the land being apparently more fertile after 3 years ley, whether this is grazed grass and clover or hayed lucerne, as contrasted with a continuous arable rotation. The advantage seems to persist into the second crop (barley) after the leys have been buried. Other considerations which have been taken into account in connection with this experiment are the effect of season on the general result, and the extent to which the amount of nitrogen in the soil has been affected by the various treatments.

https://doi.org/10.23637/ERADOC-1-90

Market Garden experiment

The theme of this experiment is the modification of a farm soil towards a condition better suited for market-garden crops, through dressings of bulky organic manures, with and without the use of inorganic nitrogen.

Leeks were planted in August 1956 and harvested in the period 28 March to 2 May. The mean yield for all plots was 4·5 tons/acre, which compares favourably with the yield of 2·5 tons obtained in 1956. The early potatoes gave a relatively poor yield of 4·6 tons, as compared with 8·1 tons in 1956. However, it should be noted that the planting date in 1956 was 23 March, whereas in 1957 it was 1 April. It seems likely that early development in 1957 was adversely affected by the cold and dry spell which occurred in April and May. On the other hand, Globe beet yielded relatively well at 8·4 tons/acre of saleable bulbs. The beet seed had been drilled on 15 May; consequently development was mainly under relatively good growing conditions in June and July. Globe beet had given a smaller yield (6·3 tons) in 1956, when the seed was sown on 28 April. The treatment combination which gave the largest yield of beet bulbs in 1957 (13·8 tons) was dung at 20 tons/acre, plus inorganic nitrogen (" Nitro-chalk ") at 0·3 cwt./acre. In the absence of either organic or inorganic nitrogen applications, the yield was only 2·3 tons/acre. Apart from quite evident beneficial effects from nitrogen applications to the crops, there are certain obvious effects on the weed flora (H. H. Mann, " Weed herbage of slightly acid arable soils as affected by manuring " (*J. Ecol.* **45** (1957), 149–156)).

Irrigation experiment

Beans were substituted for potatoes in 1957, because potato-root eelworms had been found in the experiment area. The Cut Grass block, which was planted with cocksfoot (S 37) in 1954, continued

TABLE 2

Weights of dry grass (G) and of nitrogen (N) removed (cwt./acre) at each cutting, with and without irrigation, and at different rates of nitrogen application, in 1957

Date of cut	Level of nitrogen application: Without irrigation, 0·30 cwt. G	0·30 cwt. N	0·60 cwt. G	0·60 cwt. N	With irrigation, 0·30 cwt. G	0·30 cwt. N	0·60 cwt. G	0·60 cwt. N
23 April ...	8·4	0·2	15·5	0·5	9·0	0·3	16·0	0·5
24 May ...	12·4	0·3	15·1	0·5	15·7	0·4	17·8	0·6
19 June ...	2·1	0·1	3·4	0·2	11·5	0·3	15·9	0·5
12 July ...	6·3	0·3	7·8	0·4	14·8	0·5	17·9	0·7
29 July ...	11·6	0·4	14·3	0·7	7·8	0·3	7·9	0·4
16 Aug. ...	4·6	0·2	4·5	0·2	5·4	0·2	5·3	0·3
10 Sept. ...	9·6	0·4	12·0	0·6	8·3	0·4	9·4	0·4
5 Nov. ...	8·0	0·3	11·7	0·5	9·0	0·4	11·0	0·5
Total ...	63·0	2·2	84·3	3·6	81·	2·8	101·2	3·9

There were eight nitrogen applications, at 0·30- and at 0·60-cwt. levels, respectively, totalling 2·4 and 4·8 cwt. nitrogen/acre.

Irrigation amounted to 1·65 inches in May, 2·25 inches in June, and 1·0 inch in July (total 4·90 inches).

https://doi.org/10.23637/ERADOC-1-90

to be virtually free of other grasses and legumes. Interest therefore attaches to the amount of nitrogen in the cut grass. T. W. Barnes has again been responsible for the systematic irrigation carried out in this experiment. He has determined the nitrogen content of samples of grass taken at each cutting, as was also done in 1956. The percentages of nitrogen reflect the levels of " Nitro-Chalk " applied. In 1956 this fertilizer was given at two levels, equivalent to 0·15 and 0·30 cwt. nitrogen/acre, respectively. Then the mean nitrogen percentage of the cut grass at the lower level of application was 2·39 per cent, and at the higher level 2·71 per cent. In 1957 each application was double that of 1956 (0·30 cwt. *v.* 0·60 cwt. nitrogen/acre), and the respective mean nitrogen percentages of the cut grass were 3·59 and 4·19 per cent. It should be noted that " Nitro-Chalk " was given in March of both years, and subsequently after each cut except the last—a total of six applications in 1956 as against eight applications in 1957. The yields of grass, expressed as dry matter, and the calculated amounts of nitrogen removed by the crop in 1957 are set out in Table 2 below.

Bean experiment

In an experiment carried out in Warren Field, autumn-sown beans (S.Q. Giant) and spring-sown beans (Albyn Tick) were grown in adjacent plots. The mean for all autumn-sown plots was 20·1 cwt./acre, whilst the spring-sown beans gave a relatively poor yield of 8·3 cwt./acre. In previous years, when spring-sown beans were grown at Woburn, higher yields were obtained (16·7 cwt. in 1956 and 17·8 cwt. in 1953).

Jerusalem artichoke

Small plots of " Topine " and of a variety originally introduced from Russia were grown in 1957 for multiplication purposes.

Eelworm occurrences

Sugar beet has replaced potatoes as the first test crop in the Ley and Arable Rotations experiment, through the incidence there of potato-root eelworm (*Heterodera rostochiensis*). The Nematology Department reported the presence of lucerne-stem eelworms (*Ditylenchus dipsaci*) in four lucerne plots of the same experiment. In two of these plots the lucerne was in its third year and due to be ploughed, but the two other affected plots were ploughed prematurely (2nd year lucerne) as a control measure. Cereal-root eelworms (*Heterodera major*) were found on oats in Butt Furlong, where there had been eight cereal crops in the last 10 years. This area will be used by the Nematology Department for long-period field experiments.

Buried samples of aluminium alloys

On behalf of the British Non-Ferrous Metals Research Association, arrangements had been made in 1952 for aluminium-alloy specimens to be buried in Lansome Piece. Some of the buried specimens had been dug up in 1954. Mr. Hector S. Campbell, Head of the Corrosion Section, British Non-Ferrous Metals Research

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Association, visited the Woburn Experimental Station on 4 September and removed further specimens, leaving others which are due to be dug in 1962.

Laboratory

The laboratory has been renovated and redecorated, and the glasshouse and cage reconditioned. Major improvements are the installation of Calor Gas supply, better darkroom facilities and thermostatically controlled electric heating. In spite of interruptions through these operations, T. W. Barnes carried out the normal programme of laboratory work in connection with the field experiments, but there was little opportunity for novel investigations.

The writer is greatly indebted to Dr. H. H. Mann for much assistance and advice. The Woburn Experimental Station continues to benefit in numerous ways through his unique knowledge of the experiments; his participation is greatly appreciated.