This work is licensed under a Creative Commons Attribution 4.0 International License.

Thank you for using eradoc, a platform to publish electronic copies of the Rothamsted Documents. Your requested document has been scanned from original documents. If you find this document is not readible, or you suspect there are some problems, please let us know and we will correct that.

Report for 1962

Full Table of Content

ROTHAMSTED
EXPERIMENTAL STATION
REPORT FOR 1962

Field Experiments

Rothamsted Research

Rothamsted Research (1963) *Field Experiments ;* Report For 1962, pp 181 - 185 **- DOI: https://doi.org/10.23637/ERADOC-1-95**

This work is licensed under a Creative Commons Attribution 4.0 International License.

FIELD EXPERIMENTS SECTION G. V. DYKE

The field experiments at Rothamsted and Woburn are controlled by the Field Plots Committee: F. Yates (Chairman), G. V. Dyke (Secretary), F. C. Bawden, G. W. Cooke, P. H. Gregory, J. R. Moffatt, C. A. Thorold, R. G. Warren and D. J. Watson.

H. V. Garner, who resumed full-time work while G. V. Dyke was seconded to work for 6 months in Pakistan, retired on 31 March.

In 1962 the staff of the two farms laid out and harvested 3,884 full-scale plots. Table 1 shows how they were divided according to crops and types of experiment.

TABLE 1

Number of full-scale plots harvested 1962

	Grain	Roots	Hay	Grazing	Total
Classical experiments:					
Rothamsted	189	246	122	—	557
Woburn	50	—	—	—	50
Long-period rotation experiments:					
Rothamsted	507	419	176	64	1,166
Woburn	136	446	40	12	634
Crop-sequence experiments:					
Rothamsted	514	36	72	—	622
Woburn	120	60	—	—	180
Annual experiments:					
Rothamsted	239	236	—	—	475
Woburn	104	72	24	—	200
Total	1,859	1,515	434	76	3,884

There were another 58 full-scale plots for which yields were not required and 62 that were laid out and harvested by other staff. There were 1,225 microplots, bringing the total to 5,229.

Broadbalk. The season was notable for several wheat crops that yielded more than their appearance suggested likely. In particular, on plot 2A (FYM) of Broadbalk, the first crop after fallow yielded 40·9 cwt grain. This is the largest yield recorded on Broadbalk since 1938 when plot 2B yielded 44·6 cwt. The largest yield produced by inorganic fertilisers in 1962 was 32·4 cwt on plot 8 (second crop after fallow). In the last 25 seasons the most yield has come from FYM in 13 seasons, from one or other of the fertiliser treatments in 11 and once from castor meal. An odd feature of the results in 1962 was the absence of the usual progressive decline in yield on the FYM plot between 2nd, 3rd and 4th crop after fallow.

The mean yield on section Ia (11th crop after fallow, where weedkillers have been used since 1957) was more than the means of the 2nd, 3rd and

https://doi.org/10.23637/ERADOC-1-95

This work is licensed under a Creative Commons Attribution 4.0 International License.

4th crops after fallow. The management of section Ia has presented no difficulty; although no species of weed has been eliminated, many have decreased. A few (e.g. *Alopecurus myosuroides*) have increased slightly, but these will probably be controlled by new weedkillers. It was decided to cease fallowing and to introduce weedkiller sprays on section Vb nearest the drain from 1963. Only Section Va will be bare fallow in 1963.

Barnfield. Dung and the various mineral fertilisers were applied to the plots in the usual way. Mangolds and potatoes were grown, each plot being subdivided lengthwise. On Series A, AC and C sulphate of ammonia was applied at the following rates: none, 0·6, 1·2, 1·8 cwt N/acre. These treatments were applied in a random order to four sub-plots in each half-plot. No castor meal was applied. On Series N a similar set of treatments was applied, but nitrate of soda was used instead of sulphate of ammonia. The sub-plot area was 0·018 acre (except on strips 1 and 4), and an area of 0·0053 acre was harvested for yield. No nitrogen was applied to Series O. For a discussion of the results see p. 42.

Rothamsted ley–arable rotation. During 1962 several changes were introduced, mainly in the husbandry of the various types of grassland.

Dry matter yields of 3-year grazed leys estimated from sample cuts have been much lower than yields of conserved leys, and yields of arable crops after grazed leys have been little better (some have been worse) than those of other rotations (*Rep. Rothamst. exp. Sta.* for 1961, p. 176). Leys sown from 1962 onward, therefore, will all be conserved; grazing continues on 3-year leys sown in 1960 and 1961 and on some plots of the reseeded permanent grass. Plots of the old grazed ley rotation are sown with meadow fescue S215, timothy S51 and white clover S100; this sward receives phosphate annually and potash for each cut but no nitrogen, and is cut when growth reaches about 6 in. Plots of the old conserved ley rotation are sown with cocksfoot S37 and receive similar dressings of phosphate and potash, and in addition 0·6 cwt N/acre initially and after each silage cut except the last of the season. The intention is to compare a sward dominated by clover with a pure grass supplied with ample nitrogen fertiliser, both in production of fodder and in their effects on the yields of subsequent arable crops. The lucerne treatment (3 years lucerne conserved) continues unchanged.

On Highfield the plots of the original old grass sward have been subdivided to provide a comparison between the manuring systems applied to the new types of 3-year leys. They are cut frequently as for silage and are no longer grazed.

In autumn 1962 some plots of permanent reseeded grass on both experiments were ploughed up and sown with wheat in phase with the rotation plots in the same blocks. This will be done in the next two seasons in blocks coming into wheat. The remaining plots of reseeded grass will be subdivided and managed as the permanent old grass plots of Highfield. Ploughing for wheat is now done earlier than in the past to guard against attacks by dipterous stem-borers.

https://doi.org/10.23637/ERADOC-1-95

This work is licensed under a Creative Commons Attribution 4.0 International License.

The third test crop, barley, now tests (on $\frac{1}{8}$th plots) "Nitro-Chalk" applied at four rates:

none, 0·1, 0·2, 0·3 cwt N/acre (all rotations)—Highfield
none, 0·4, 0·6, 0·8 cwt N/acre (arable rotation)—Fosters
none, 0·2, 0·4, 0·6 cwt N/acre (other rotations)—Fosters

Since the subdivision of the potato plots into $\frac{1}{16}$ plots (sub-plot area 0·0055 acre) the yields have been estimated from areas of 0·0016 acre dug by hand; in 1962, however, an elevator-digger was used successfully.

A small area of lucerne in its third season on Fosters was found to be infested with stem eelworm (*Ditylenchus dipsaci*); more welcome was the discovery of mushrooms (*Psalliota* sp.) on reseeded plots near by in their thirteenth season.

Cultivation–weedkiller rotation experiments. Simazine satisfactorily controlled weeds in annual experiments with beans, and if satisfactory herbicides can be found for use with potato crops, it might be possible to have, at Rothamsted, rotations in which weeds in all crops could be controlled by herbicides. Replacing conventional field cultivations by sprays might cheapen production, and even if yields were slightly less it might well be economic, providing no harm resulted from their long-continued use.

In past experiments primary cultivations by a rotary cultivator or by rigid tines proved unsatisfactory because they failed to deal with weeds, but if herbicides can do this it might be advantageous to use these implements in place of the mouldboard plough, one function of which is to bury weeds. The mouldboard plough also buries organic matter and crumb structure, and brings to the surface dormant weed seeds; its replacement might eventually produce a surface zone of soil suitable for rapid seed germination, and relatively free from weed seeds, so lessening the need to use herbicides.

A four-course rotation experiment was started in Great Harpenden field in 1961 to test these ideas. The immediate and residual effects of herbicides, which may differ from year to year and crop to crop, are measured in wheat, potatoes, barley and beans, grown in ground assigned to either mouldboard plough, rigid-tine cultivator or rotary cultivator. Each crop is adequately fertilised and precautions are taken against fungus and insect attacks. Weeds are counted each year on the potato and bean plots, and the breakdown of some of the herbicides in the soil is being followed. The soil will be examined for differences in its physical state brought about by the different primary cultivations. A simpler experiment involving only barley and potatoes was started at Woburn. (J. R. Moffatt)

Short-term green-manuring experiments at Woburn. Four experiments have now been completed to amplify the results of the long-period green-manuring experiment (for a summary see p. 193).

The experiments were of two types; one of each type was started in 1960 and a second on a fresh site in 1961. The oats grown as test crop on one experiment in 1962 suffered severely from soil acidity and cereal-root eelworm, and the experiment is not discussed.

https://doi.org/10.23637/ERADOC-1-95

This work is licensed under a Creative Commons Attribution 4.0 International License.

***Type* (*a*)** green manures sown after early potatoes; effects measured in a spring cereal crop in the second season.

All combinations of:

Green manures ploughed in in February: none, trefoil, ryegrass, ryegrass with 0·6 cwt N/acre at the time of sowing.

"*Nitro-Chalk*" *to spring cereal:* none, 0·3, 0·6, 0·9 cwt N/acre applied in seedbed.

Basal manuring per acre:

To early potatoes: 10 cwt compound fertiliser (10% N, 10% P_2O_5, 18% K_2O).

To green manures: none.

To spring cereal: 3 cwt compound fertiliser (16% P_2O_5, 16% K_2O) combine-drilled.

In the 1960–61 experiment the test crop was Proctor barley.

***Type* (*b*)** green manures undersown in barley; effects measured in the succeeding crop of sugar beet.

All combinations of:

Green manures ploughed in in late January/February: none, trefoil, ryegrass, ryegrass with 0·6 cwt N/acre applied in autumn.

"*Nitro-Chalk*" *in seedbed to sugar beet:* none, 0·5, 1·0, 1·5 cwt N/acre.

Basal manuring per acre:

To barley nurse crop: compound fertiliser (16% N, 9% P_2O_5, 9% K_2O) combine-drilled at 2½ cwt (1960), 2 cwt (1961).

To green manures: none.

To sugar beet: 1961: 5 cwt salt and 0·45 cwt K_2O as muriate of potash ploughed in; 0·45 cwt P_2O_5 and 0·45 cwt K_2O as compound fertiliser (20% P_2O_5, 20% K_2O) in seedbed. 1962 as 1961 but salt applied after ploughing and no muriate of potash.

The sugar beet was Klein E.

In all the experiments trefoil was sown at 30 lb/acre and ryegrass (S22 Italian) at 40 lb.

Each experiment was laid down in 3 blocks of 16 plots with restricted randomisation.

Growth of green manures. The trefoil sown in 1960 carried few nodules and grew very poorly. The causes of this have been investigated separately (*Rep. Rothamst. exp. Sta.* for 1960, p. 86, and for 1962, p. 79). In the 1961–62 experiments the trefoil seed was inoculated, but the growth was again very poor. In all the experiments the ryegrass grew well.

The amounts of dry matter and N contained in the green manures were estimated from small samples of tops plus roots dug just before ploughing in (cwt/acre):

	For sugar beet			For barley	
	1961		1962	1961	
Green Manure	DM	N	DM	DM	N
Trefoil	7·0	0·10	6·6	7·2	0·14
Ryegrass	22·8	0·21	12·5	44·6	0·30
Ryegrass with N	72·7	0·66	40·7	28·6	0·35

Note: N figures for 1962 not yet known.

https://doi.org/10.23637/ERADOC-1-95

This work is licensed under a Creative Commons Attribution 4.0 International License.

Experiments of type (a). The barley grown in 1961 lodged on some plots, and the standard error per plot was more than 10%.

There was no clear response to any green manure (see Table 2), except that where the barley was not given "Nitro-Chalk", trefoil increased grain by 4 cwt and ryegrass, sown with 0·6 cwt N, by 7 cwt/acre.

TABLE 2

Barley, grain: cwt/acre

	N: cwt/acre				
	0	0·3	0·6	0·9	Mean
No green manure	18·2	28·1	34·4	31·8	28·1
Trefoil	22·5	27·5	32·8	30·7	28·4
Ryegrass	19·4	26·9	33·3	30·0	27·4
Ryegrass with N	25·6	30·7	29·8	29·4	28·9
Mean	21·4	28·3	32·6	30·5	28·2

The barley responded well to "Nitro-Chalk" up to 0·6 cwt N/acre, but 0·9 cwt N produced less grain than 0·6 cwt, whether or not a green manure had been ploughed in.

Experiments of type (b). Yields of sugar (averaging the two experiments) were substantially increased by each of the green manures; averaged over the four levels of "Nitro-Chalk" the increases were 7·9 cwt sugar per acre for trefoil, 3·0 cwt for ryegrass and 8·3 cwt for ryegrass with 0·6 cwt N (Table 3). The increases in the yields of sugar arose mainly from increased yields of washed roots, viz., 1·8 tons/acre after trefoil, 0·5 tons after ryegrass and 2·1 tons after ryegrass with N. The green manures all produced slight increases in the percentage of sugar in the roots; "Nitro-Chalk" applied to the beet, on the other hand, lowered the percentage of sugar, the highest rate of application by over 1%.

TABLE 3

Sugar beet, sugar: cwt/acre

Means of 1961 and 1962

	N: cwt/acre				
	0	0·5	1·0	1·5	Mean
No green manure	35·8	51·4	57·4	54·0	49·6
Trefoil	43·0	59·4	65·0	62·6	57·5
Ryegrass	36·4	54·8	59·2	59·8	52·6
Ryegrass with N	48·6	59·2	60·0	63·8	57·9
Mean	41·0	56·2	60·4	60·0	54·4

Trefoil gave almost exactly the same increase at each level of "Nitro-Chalk", suggesting that its action is at least in part independent of the N supplied by green crop (Table 3). Ryegrass without N had a very small effect when no N was given to the sugar beet, but gave its greatest increase (5·8 cwt sugar) at the highest level of N. By contrast, ryegrass treated with 0·6 cwt N gave the greatest increase (12·8 cwt) where no N was applied to sugar beet. With no green manure, and after trefoil, increasing the applied

https://doi.org/10.23637/ERADOC-1-95