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Report for 1948

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Rothamsted Experimental Station
Harpenden

LAWES AGRICULTURAL TRUST

REPORT
for
1948

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Rothamsted Ley-arable Experiment

The Plot Committee

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Rothamsted Ley-Arable Experiment, started 1948

After eleven years experience with the ley-arable experiment at Woburn, two similar but more comprehensive experiments were begun at Rothamsted in the autumn of 1948. The general purpose is the same as at Woburn, but since permanent grass plots are included it will be possible in the newer experiments to compare the two systems, permanent grass plus permanent arable, with alternating grass and arable. There are also additional cropping and manurial treatments included, and the productivity of the grass is estimated by the live weight increase and grazing days of sheep as well as by sampling methods. Moreover the Rothamsted experiments provide a direct comparison of the output from permanent grass as compared with temporary grass under the same conditions; and in one of the experiments a comparison of old permanent grass with reseeded permanent grass. The experiments have been started on two fields: (1) Highfield, on part of the land formerly occupied by the R.A.S.E. grazing experiment. This is a very old grass field and the new experiment has been established on the ploughed up turf. (2) Fosters Field, an old arable field. The treatments whose output and effect on soil fertility are under test are:

1. Three year ley, grazed by sheep.
2. Three year cut grass, as for drying.
3. Three year lucerne, cut as for hay.
4. Three year arable rotation: one year seeds for hay, potatoes, barley.

The three test crops which follow all the above preparatory treatments are wheat in the first testing year, potatoes in the second year, and barley in the third. Outside this sequence of treatment crops and test crops there are permanent grass treatments: on Highfield (1) old grass and (2) reseeded grass. On Fosters reseeded grass only. All the permanent grass plots are grazed with sheep for two years and hayed in the third year. The experiment on Highfield is set out in 6-plot blocks and on Fosters in 5-plot blocks. Each plot in a block is assigned to one of the rotation or permanent grass treatments. The method is illustrated by the following scheme showing the cropping in the 6-plot blocks of Highfield commencing in 1949 and covering the first six-year cycle.

Phase A	Phase B	Plots (1)	(2)	(3)	(4)	(5)	(6)
1949	1952	L	Lu	CG	H	G	R
1950	1953	L	Lu	CG	P	G	R
1951	1954	L	Lu	CG	B	G	R
1952	1949	W	W	W	W	G	R
1953	1950	P	P	P	P	G	R
1954	1951	B	B	B	B	G	R

L = 3-year ley Lu = lucerne CG = cut grass
G = old permanent grass R = reseeded grass
H = 1 year arable hay P = potatoes
B = barley W = wheat

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There are two blocks started in phase A (treatment crops followed by test crops) and a further two blocks in phase B which is three years behind phase A and leads off with the three test crops before the treatment crops come into operation. In 1949 there will thus be four blocks started as above in each field; on Fosters there is no treatment G, but otherwise the arrangements are the same. In 1950 an exactly similar set of four blocks will be started in each field, and again in 1951, when all six stages of all the rotations will be represented in duplicate. In 1952 measurement fertility effects built up by the leys, lucerne and other treatment crops, will begin in the test crops on two blocks in each field.

Manuring: Phosphate and potash in the form of a compound fertiliser with 13% P_2O_5 and 13% K_2O are applied in standard amounts to all crops according to their requirements in dressings providing in all 2·4 cwt. P_2O_5 and 2·4 cwt. K_2O per acre over the six-year cycle. The manurial tests are made on nitrogen fertiliser and dung. The treatment crops are grown at two levels of nitrogenous manuring appropriate to the crops (lucerne has no nitrogen); and the effects of the crop grown at each level of manuring is measurable at two nitrogen levels in the subsequent test crops. The schedule for nitrogen application is as follows:

Crop	N cwt. per acre Low Level	High Level	Applied
Wheat	0·3	0·6	Spring top dressing.
Potatoes ..	0·5	1·0	In ridges.
Barley	0·2	0·4	In seedbed.
One year Hay ..	0·3	0·6	Early spring.
3 year Ley ..	0·15	0·3	Every year—half in spring, half in summer.
Cut Grass ..	0·15	0·3	In early spring and after 1st, 2nd, 3rd cut yearly.
Lucerne ..	none	none	
Permanent Grass / Reseeded ..	0·15	0·3	Yearly. In the first two years in divided dressings (half in spring, half in summer); in the third (hay) year in a single early spring dressing.

Dung is also tested at 15 tons per acre in the ridges on potatoes both in the arable rotation and as the test crop. It is applied on quarter plots to show the combinations of dung and levels of nitrogen (O v D) (N_1 v N_2). As the experiment develops the dressings of dung are arranged on the sub-plots so as to bring out direct, cumulative and residual dung effects. The size of the main plots is 1/11 acre, the largest obtainable in the fields in question. When the experiment is fully started there will be 72 of these main plots on Highfield and 60 on Fosters. Fertiliser effects of nitrogen and dung are measured on a quarter plot basis, except that on permanent and reseeded grass and three-year ley the grazing unit which tests the direct effect of nitrogenous applications is a half-plot of 1/22 acre.