Details of the Classical and Long-term Experiments Up to 1967

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Saxmundham - Rotation I

Rothamsted Research

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THE SAXMUNDHAM EXPERIMENTS

Introduction. Long-term experiments began in 1899 on land a mile west of Saxmundham in East Suffolk. Until 1909 they were controlled by a sub-committee of the Education Committee of the East Suffolk County Council and supervised by Mr. Harry Fiske, a local farmer. Mr. A. W. Oldershaw directed the work for the County Council from 1911 to 1947, when the National Agricultural Advisory Service became responsible for the Station and Mr. P. J. O. Trist became Director. The foreman for the first 40 years was Mr. C. Cattermole, then Mr. H. Neal for nine years, and since 1948 Mr. V. Woolnough. The Station was acquired by the Agricultural Research Council in 1964 and placed in the care of Rothamsted.

There were originally 20 acres of land for the experiments. Only Harwood's Field of 7·7 acres remains; it contains the two rotation experiments that began in 1899. (The other land, Fiske's Field, was much used for grassland experiments reported by A. W. Oldershaw (1), and later for annual experiments with arable crops, until it was sold in 1951.)

ROTATION I

First period, 1899–1965

Rotation I was designed by Mr. A. Harwood, Chairman of the Educational Sub-Committee. It began in 1899 and is a four-course 'Norfolk' rotation of wheat, roots, barley and legumes. There are four ½-acre blocks, one for each crop. The root crop was usually mangolds and the legume beans, but turnips, swedes or sugar beet were sometimes grown in the root break and peas or clover as the legume. The sequence of types of crops has not deviated, and each of the four types has appeared in successive blocks in turn. Each block is divided into 10 plots for manurial treatments which consist of a $2\times2\times2$ factorial testing N, P and K plus two additional treatments, farmyard manure and bone meal.

The treatments were arranged in the same order in each block:

Treatment number (East)	
1	FYM
2	B
3	N
4	P
5	K
6	None
7	PK
8	NK
9	NP
10	NPK
(West)	

FYM	farmyard manure at 6 tons
B	bone meal at 4 cwt
N	nitrate of soda at 2 cwt supplying 0·3 cwt N

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P superphosphate at 2 cwt originally supplying about 0·3 cwt P_2O_5

K muriate of potash at 1 cwt originally supplying 0·5 cwt K_2O.

The weights of manures applied each year have been constant. No other rotation experiment in this country had so long a history without major modification, and the only change in the fertiliser treatments until 1964 was a small increase in amounts of P and K caused by increased concentration of the superphosphate and muriate of potash used.

Second period, 1966 onward

Since 1965 modified treatments have been applied to the main part of each plot of the experiment. The old treatments are maintained on small areas at the south end of each plot for observation and to provide soils for laboratory and glasshouse experiments. The aim of the changes was to produce consistently large yields from a rotation suited to the area, identifying causes of any poor crops and correcting faults in manuring. The experiment also shows the value of the reserves of phosphorus (accumulated on some plots from past manuring) and of potassium supplies from soil minerals. The manuring of all plots except those receiving bone meal was changed: FYM dressings to 12 tons, nitrogen test to 0·5 v. 1·0 cwt N as 'Nitro-Chalk' (N1, N2 respectively; N1 to treatments 4, 5, 6 and 7, N2 to treatments 3, 8, 9 and 10). Plots not given phosphate in the past now have 0·8 cwt P_2O_5, and they provide a useful comparison with the plots that continue to have 0·4 cwt P_2O_5 for each crop and already contain nearly enough residual phosphate from past manuring for maximum yields. The potassium test is of none against 1·0 cwt K_2O. The existing four-course rotation is maintained with spring beans as the legume and sugar beet on the root break; all crops receive the same manuring, except that for beans the N test is 0 v. 0·5 cwt N.

In 1967 plots given FYM (except the bean block) were also given 0·5 cwt N (N1). Additional nitrogen was supplied to cereals and sugar beet on all plots given N. After large losses of nitrate in drainage water in early May extra 0·25 and 0·5 cwt N top-dressings were applied to 'discard' areas of the barley plots. There was an immediate response, and the main parts of the barley plots were top-dressed with 0·25 and 0·5 cwt N (to N1 and N2 plots respectively) on 15 June. Tests were also made on small discard areas of the wheat; the crop responded visibly and yield increased. Sugar beet also suffered from shortage of nitrogen caused by leaching of the N applied in March and April. By early July the crop had stopped growing and was turning yellow. Extra dressings of 0·25 and 0·5 cwt N given to N1 and N2 plots on 18 July restored colour and growth.

References

The early results of the experiment were described by:

1. Oldershaw, A. W. (1934) *Jl R. agric. Soc.* **95**, 18–33.
2. Oldershaw, A. W. (1941) *Jl R. agric. Soc.* **102**, 136–155.
3. A complete account of the work until 1961 was given by Trist, P. J. O. & Boyd, D. A. (1966) *J. agric. Soc.* **66**, 327–336.
4. For soil analyses in 1959 see Cooke, G. W. *et al.*, (1958) Changes in the soil of a long-continued field experiment at Saxmundham, Suffolk. *J. Soil Sci.* **9**, 298–305.

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TABLE 21

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Crop		Mean yields Wheat	Barley	Mangolds	Beans and peas
		grain, cwt	grain, cwt	roots, tons	grain, cwt
Period of years		1900–64*	1900–64*	1906–64	1905–61
No. of years		65	65	59	45
Treatment					
1	FYM	19·2	16·5	18·6	21·7
2	B	14·2	10·7	11·6	15·3
3	N	14·0	11·1	4·9	11·3
4	P	13·6	9·9	11·3	17·0
5	K	10·1	7·8	3·9	11·4
6	None	10·2	8·0	4·0	10·9
7	PK	14·6	11·1	12·2	20·1
8	NK	15·3	12·3	5·5	12·1
9	NP	19·4	16·9	17·3	16·9
10	NPK	19·7	17·9	18·5	20·8

* Includes estimates for two years for which no grain yield was available.

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