ROTHAMSTED RESEARCH

Report for 1981 - Part 1

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Field Experiments Section

J. McEwen

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FIELD EXPERIMENTS SECTION

J. McEWEN

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Introduction

The four usual activities of the Section continued during the year. We gave advice and assistance to sponsors of all field experiments at all stages from planning and provision of instructions to the Farm, to publication in the *Yields of the Field Experiments*, provided a specialised service for the conduct of small-plot field experiments, assisted visitors by organising suitable programmes often including demonstrations of the field experiments and initiated and conducted a small programme of field experiments with emphasis on the multidisciplinary approach.

Field Experiments Committees

The field experiments at Rothamsted and Woburn are controlled by the Working Party for Field Experiments whose membership during the year included: E. Lester, Chairman, W. Day, R. A. French, D. C. Griffiths, A. E. Johnston, A. H. Joicey, R. Moffitt, A. W. Neill, W. Powell, R. D. Prew, R. K. Scott, A. G. Whitehead, and F. V. Widdowson, with G. V. Dyke and J. McEwen as joint secretaries. The Working Party and its associated Commodity Groups and subcommittees held 24 indoor meetings and made 18 tours of experiments in the field.

The total number of plots remained just below 10 000 (Table 1); at Woburn a decline in the number of root plots taken for yield was balanced by an increase in the number of microplots.

Small-plot Experiments

The Small-plot staff did all operations on 47 experiments, with a total of 1670 plots and some operations, mainly application of treatment sprays, on 11 other experiments with a total of 802 plots. The fairly small increase in numbers of plots requiring the spraying service conceals a considerable increase in effort because many of the plots, particularly of the multidisciplinary experiments, require frequent applications—on six occasions to the winter wheat experiment, on eight to the winter beans. (Wilson, Jones, Ponsonby and Turnell)

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TABLE 1

Number of plots in 1981

	Grain	Roots	Hay and green crops	Total
Full-scale plots (yields taken)				
Classical experiments				
Rothamsted	552	19	237	808
Saxmundham	360	—	80	440
Long-period rotation experiments				
Rothamsted	432	40	156	628
Woburn	248	—	84	332
Crop sequence experiments				
Rothamsted	734	54	187	975
Woburn	583	60	—	643
Saxmundham	40	—	—	40
Annual experiments				
Rothamsted	1534	104	64	1702
Woburn	401	60	—	461
Saxmundham	36	—	—	36
Totals				
Rothamsted	3252	217	644	4113
Woburn	1232	120	84	1436
Saxmundham	436	—	80	516
Totals	4920	337	808	6065
Full-scale plots (no yields taken)				
Rothamsted				706
Woburn				179
Microplots				
Rothamsted				1707
Woburn				977
All plots total				9634

The Classical Experiments

Despite occasional changes of variety and cropping the Classicals afford our best opportunity for examining the effects of season on the same site and with constant treatments. Table 2 shows the yields of crops from selected treatments on Broadbalk and Hoos Barley.

On Broadbalk winter wheat plots given sufficient nutrients gave very good yields, comparable with those of 1980. Unusually, of the selected treatments, FYM alone gave the best yield, 8·7 t ha^{-1} on wheat after potatoes. Responses to the largest dressings of N on fertiliser plots and to extra N on FYM plots may have been prevented by increased mildew which was controlled inadequately by the prochloraz fungicide used. On one of the plots, FYM + N2, in a section (third wheat after fallow) not usually included in this report, a yield of 10·1 t ha^{-1} was recorded. Because yields of other treatments on this section were generally less than after potatoes and because the yield of FYM + N2 on other sections averaged only 8·6 t ha^{-1} and nowhere exceeded 9 t, our first recorded yield in excess of 10 t on this experiment appears anomalous.

Potatoes on Broadbalk were planted almost a month later than in 1980, into a cold, wet and cloddy seedbed. Tops were destroyed on 24 August to permit early lifting and timely sowing of the following wheat. Probably as a result of the short growing season yields were half those of 1980, similar to those of 1979 which had a similarly late planting date.

Spring barley on Hoosfield did not match the outstanding yields obtained in 1980 but as in both previous years the combination of FYM and nitrogen fertiliser gave substantially more than fertilisers alone.

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TABLE 2

Broadbalk and Hoos Barley: yields of crops from selected treatments

Grain at 85% dry matter, t ha^{-1} and total tubers, t ha^{-1}

		Wheat (Broadbalk) (a) After 2-year break* (b) After wheat since 1952			Barley (Hoos) after barley			Potatoes (Broadbalk)		
Treatments	Variety	1981 F	1980 F	1979 F	1981 G	1980 G	1979 J	1981 PC	1980 PC	1979 PC
None	(a)	3·8	2·2	2·6	1·0	1·1	0·9	5·4	10·8	6·1
	(b)	1·7	1·9	1·0						
N3PKMg(Na)	(a)	8·6	8·5	7·3	4·9	6·2	4·6	22·6	55·3	30·0
	(b)	6·1	6·6	6·3						
N4PKMg(Na)	(a)	8·4	8·8	7·6	—	—	—	25·4	50·7	31·1
	(b)	6·6	7·1	6·6						
FYM	(a)	8·7	6·4	6·9	4·4	6·8	3·3	21·9	52·5	24·0
	(b)	7·3	6·4	5·3						
FYM+N2	(a)	8·5	8·5	8·3	5·5	7·0	5·8	29·9	59·7	29·7
	(b)	8·5	8·4	6·6						
FYM+N2PK	(a)	8·0	8·4	8·7	—	—	—	27·7	52·9	25·6
(since 1968)	(b)	—	—	—						
					Date of planting			13/5	18/4	24/5

*Potatoes, beans for 1979 wheat; potatoes, potatoes for 1980 wheat; fallow, potatoes for 1981 wheat

Symbols: F=Flanders, G=Georgie, J=Julia, PC=Pentland Crown
N2, N3, N4='Nitro-Chalk' at 96, 144, 192 kg N ha^{-1}
P =Superphosphate annually, at 35 kg P ha^{-1}
K =Sulphate of potash annually, at 90 kg K ha^{-1}
Mg =Kieserite applied at 35 kg Mg ha^{-1} every third year
(Na) =Sulphate of soda annually until 1973
FYM =Farmyard manure annually, at 35 t ha^{-1}

Garden clover. The experiment continued to receive basal aldicarb in spring together with basal N, P, K, Mg and Ca. The test of five benomyl sprays was repeated cumulatively during the autumn and winter. Survival into the third year since resowing in spring 1979 was good and yields were even greater than in 1980. Without benomyl the total yield of dry matter from the four cuts taken was 15·5 t ha^{-1}, with benomyl it was 17·4 t ha^{-1}, exceeding the previous record yield of 16·9 t ha^{-1} established in the second year of the experiment in 1855. (McEwen)

Field experiments

Members of the Section were actively involved in several multidisciplinary experiments. The spring bean series was continued and a new series on winter beans was started (pp. 32–36). Existing experiments on subsoiling and deep PK were continued and a further experiment testing a range of rates of P and K to the subsoil and frequencies of application was started (pp. 262–263). The experiment started in 1977 on factors affecting the yield of herbage crops (*Rothamsted Report for 1977*, Part 1, 123) was successfully completed (pp. 254–256). The series on leafless peas was continued. (McEwen and Yeoman)

Maize. The experiment on continuous maize at Woburn (*Rothamsted Report for 1977*, Part 1, 128) completed its 11th year. The penalties for continuity of cropping appear to be slight or non-existent. From 1979 to 1981 forage yields have been substantial and increasing, even on land not given soil sterilant, they were 12·6, 13·7 and 15·9 t ha^{-1} of dry

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matter in the 3 years respectively on plots given 150 kg N ha^{-1}—the most effective rate. (Barnard, with Hornby, Plant Pathology Department)

The series of annual experiments on forage maize at Rothamsted testing combinations of nitrogen fertiliser rates applied 4 weeks before sowing with rates applied to the seedbed (*Rothamsted Report for 1979*, Part 1, 106) completed its third and final year. In all years there were substantial responses to nitrogen applied at either time, the total required for maximum yield was on average about 120 kg N ha^{-1} with benefit from dividing the dressing equally between the two methods. (Barnard)

Electrified fences. The resurgence of the rabbit population and the importance of avoiding any damage on many of the frequently sampled experiments, where even small parts of plots are of major importance, has led us to protect many experiments using battery-operated electrified fences. We use the product which has a mesh of 8×8 cm in which the horizontal strands, other than that in contact with the soil are made of inter-twined stainless steel and polythene and the vertical strands polythene alone. With care in use they have been very effective.

Theft of batteries in isolated areas has been overcome by construction of heavy steel box containers bolted to concrete blocks. The combined weight of about 90 kg is too great for the average person to remove but the two units can be positioned on site by an individual. The box $60 \times 30 \times 30$ cm, is made of 6 mm thick steel and has a padlocked lid with a guard to prevent the lock being cut or levered off. The concrete block is $60 \times 30 \times 15$ cm with sunken bolts which are attached to the box from the inside via holes in the base. (Finch)

Visitors

The number of visitors with programmes arranged for them by the Section was about 2000, comprising 260 separate parties. Of these 600 people, in 150 parties, came from overseas. As usual most of our visitors came from research institutes, universities, colleges and schools. We were pleased that the number of farmers visiting has almost doubled since last year to 132. (Parker, with help from other members of the Section)

Staff

G. V. Dyke retired in December after 34 years at Rothamsted. He joined the Statistics Department on appointment in 1947 and transferred to the Field Experiments Section in 1952 becoming Head in 1959. J. McEwen was appointed Head of the Section from 1 January. D. J. Ponsonby joined the Section in March but resigned in September. S. J. Parker gave four general lectures to outside societies. J. McEwen gave a lecture on 'Achieving Consistent Bean Yields' to the ADAS Arable Group (South Bedfordshire).

Publications

Research

1 Barnard, A. J. & Hornby, D. (1982) The effects of dazomet and nitrogen fertilizer on successive crops of maize (*Zea mays* L.) grown for either grain or forage. *Journal of Agricultural Science, Cambridge* **98**, 7–15.

2 Dyke, G. V., Smith, G. L. & Yeoman, D. P. (1982) Fourier series and response curves. *Journal of Agricultural Science, Cambridge* **98**, 119–122.

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