ROTHAMSTED RESEARCH

Report for 1982 - Part 1

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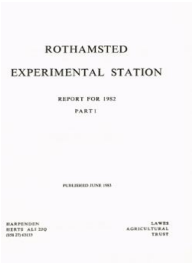

Field Experiments Section

J. McEwen

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FIELD EXPERIMENTS SECTION

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Introduction

The Section continued both service and research roles as hitherto. The service role was available to all sponsors of field experiments who were able to obtain advice and assistance at the committee stage of proposals, followed by the provision of detailed documentation for the conduct of experiments by the Farm; many sponsors also benefited from the specialized field service offered by the Small-plot staff of the Section. Service to visitors ranged from the organization of detailed programmes involving scientists in many departments to brief tours of the Classical experiments. A little individual field research was initiated by members of the Section but the major effort was on the organization and conduct of multidisciplinary experiments.

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, D. C. Griffiths, A. E. Johnston, A. H. Joicey, B. J. Legg, R. Moffitt, A. W. Neill, W. Powell, R. K. Scott, A. G. Whitehead and F. V. Widdowson, with J. McEwen and R. D. Prew as joint secretaries. The Working Party and its associated Commodity Groups and subcommittees held 26 indoor meetings and made 16 tours of experiments in the field.

The number of full-scale plots remained at nearly 6000 (Table 1); there were substantially fewer microplots at Rothamsted and especially at Woburn and hence the total number of plots was less than 8000, the smallest number since 1967.

Small-plot experiments

The Small-plot staff did all operations on 44 experiments with a total of 1304 plots and some operations on 26 other experiments with a total of 994 plots. The provision of electrified fencing was again increased and it is now possible to protect not only all the

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TABLE 1

Number of plots in 1982

	Grain	Roots	Hay and green crops	Total
Full-scale plots (yields taken)				
Classical experiments				
Rothamsted	570	19	237	826
Saxmundham	300	—	80	380
Long-period rotation experiments				
Rothamsted	432	104	78	614
Woburn	160	—	17	177
Crop sequence experiments				
Rothamsted	646	31	166	843
Woburn	501	260	26	787
Saxmundham	80	—	—	80
Annual experiments				
Rothamsted	1500	48	36	1584
Woburn	337	60	32	429
Saxmundham	—	—	—	—
Totals				
Rothamsted	3148	202	517	3867
Woburn	998	320	75	1393
Saxmundham	380	—	80	460
Totals	4526	522	672	5720
Full-scale plots (no yields taken)				
Rothamsted				669
Woburn				161
Microplots				
Rothamsted				1227
Woburn				52
All plots total				7829

multidisciplinary cereal experiments but also many other experiments at risk from rabbit damage. (Jones, Turnell, Stephens and Drake)

Seasonal effects on wheat, barley and potatoes

The Classical experiments Broadbalk and Hoos Barley remained unchanged and therefore continued to provide good material to assess the effects of season over a range of treatments (Table 2).

On Broadbalk the best yields of winter wheat with fertilizers or with FYM alone were less than in 1980 and 1981 but the yield with the combination of FYM and nitrogen fertilizer in spring was 8·7 t ha^{-1} after the two-year break, greater than yields in previous years with this treatment and greater than all other yields in 1982.

Potatoes were planted on Broadbalk three weeks sooner than in 1981 and perhaps as a result yields from the best plots were about 20 t ha^{-1} greater, although not as large as those of 1980. The best yield with fertilizers alone exceeded that with FYM alone but, in common with most recent years, the largest yield came from the combination of FYM with nitrogen fertilizer.

Spring barley on Hoos Barley gave very good yields, approaching the outstanding ones of 1980. Unusually however the best yield, of 6·5 t ha^{-1}, came from FYM alone.

Field experiments

Members of the Section continued their involvement with the multidisciplinary experiments. The winter wheat experiment was re-designed primarily to include the effects of

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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	1982 F	1981 F	1980 F	1982 G	1981 G	1980 G	1982 PC	1981 PC	1980 PC
None	(a)	3·5	3·8	2·2	1·0	1·0	1·1	9·2	5·4	10·8
	(b)	1·3	1·7	1·9						
N3PKMg(Na)	(a)	7·9	8·6	8·5	6·0	4·9	6·2	43·8	22·6	55·3
	(b)	6·0	6·1	6·6						
N4PKMg(Na)	(a)	7·9	8·4	8·8	—	—	—	43·3	25·4	50·7
	(b)	6·3	6·6	7·1						
FYM	(a)	7·2	8·7	6·4	6·5	4·4	6·8	39·9	21·9	52·5
	(b)	5·2	7·3	6·4						
FYM+N2	(a)	8·7	8·5	8·5	6·0	5·5	7·0	49·4	29·9	59·7
	(b)	7·8	8·5	8·4						
FYM+N2PK	(a)	8·6	8·0	8·4	—	—	—	41·0	27·7	52·9
(since 1968)	(b)	—	—	—						
					Date of planting			20/4	13/5	18/4

* Potatoes, potatoes for 1980 wheat; fallow, potatoes for 1981 and 1982 wheat

Symbols: F = Flanders, G = Georgie, 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}

differing pre-cropping (pp. 19–24). The spring and winter bean experiments were continued (pp. 33–36) and those on leafless peas were concluded (pp. 36–39). Work continued on several experiments studying the effects of subsoiling and deep PK. (McEwen, Prew and Yeoman)

In addition to multidisciplinary experiments some work was initiated jointly with single departments; with the Nematology Department on stem nematode in beans (pp. 157–158), with the Plant Pathology Department on rust in beans (p. 202) and with the Farm on the interactions of early N with seed rate and late N in winter wheat. (McEwen and Yeoman)

As hitherto some field experiments were done solely by members of the Section of which two examples are given below.

Field bean varieties. For several years a series of small-plot experiments has been done to compare the yield of our standard spring tick variety Minden with a range of alternative varieties. A very good standard of plant health has been maintained in these experiments by using sprays of permethrin to control *Sitona*, pirimicarb to control aphids and viruses, benomyl for foliar diseases other than rust, propiconazole (this year only) for rust. As a result yields have been consistently good, commonly at least 50% greater than in other experiments with lesser standards of plant health. This year was typical, the variety Blaze gave 5·7 t ha^{-1} of grain, Minden 5·6 t, Tiger and Exelle 5·5 t and Alfred 5·4 t. In the multidisciplinary experiment (p. 34) unprotected Minden gave only 3·5 t ha^{-1}. Although strict comparisons cannot be made between experiments these results support our view that at present improving plant health is much more important than choice of variety. (McEwen and Yeoman)

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Fenugreek (*Trigonella foenum-graecum*). The experiment testing *Rhizobium* inoculation and nitrogen fertilizer either applied to the seedbed or at flowering (*Rothamsted Report for 1979*, Part 1, 106) was repeated on fresh sites in each of the last three years with an additional test of permethrin in 1981 and 1982. Two problems have made the conduct of these experiments difficult; weed growth has been hard to control, it lessened yields in 1980 (to a mean of 1·4 t ha^{-1} of grain) and so dominated the crop in 1981 that yields were not taken, this year trifluralin weedkiller gave reasonable control but the other common problem, grain sprouting in the pod, was so severe that a grain yield could not be obtained —treatment effects were assessed from total above-ground dry matter taken by hand on 28 October.

In general, yields from fenugreek have been poor. They have been aided by inoculation with *Rhizobium meliloti*, but only when conditions have favoured infection, and rather more by nitrogen fertilizer ,in the seedbed or at flowering. (Yeoman)

Visitors

About 500 visitors attended the three Subject Days on the Rothamsted Field Experiments and were guided round the farm by members of the Section some of whom were also involved in demonstrating multidisciplinary experiments. During the rest of the year the Section received about 1750 visitors in 220 separate parties. About two-thirds of these required programmes which included the scientific departments, the remainder received tours of the field experiments only. As last year we received about 130 farmers and 600 overseas visitors but the majority came from research institutes, universities, colleges and schools. (Parker, aided by other members of the Section)

Staff

J. C. Wilson retired in March after 15 years at Rothamsted. He joined the Section in 1967 to lead the newly-formed team appointed to work on small plots. H. L. Jones was appointed to this post.

R. D. Prew joined the Section in April on transfer from the Plant Pathology Department. J. J. Stephens joined in March and Melanie G. Drake in July.

J. McEwen gave five outside talks to farmers on the Rothamsted approach to growing field beans.

Publications

General Paper

1 Dyke, G. V. (1982) Field beans in cropping and cropping/livestock systems in the U.K. *Fabis* **4**, 15-16.

Paper in Rothamsted Report, Part 2

2 Dyke, G. V., George, B. J., Johnston, A. E., Poulton, P. R. & Todd, A. D. (1983) The Broadbalk wheat experiment 1968–78. Yields and plant nutrients in crops grown continuously and in rotation. *Rothamsted Experimental Station. Report for 1982*, Part 2, pp. 5–44.

Research Paper

3 Dyke, G. V. (1982) Residuals of equal magnitude in fractional replicate 2^n designs. *The Journal of the Royal Statistical Society* (*Series C*) **31**, No. 1, 64–65.

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