Report for 1975 - Part 1

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Field Experiments Section

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FIELD EXPERIMENTS SECTION

G. V. DYKE

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Field Plots Committee

The field experiments at Rothamsted, Woburn and Saxmundham are controlled by the Field Plots Committee: F. G. W. Jones (Chairman), G. V. Dyke (Secretary), J. McEwen (Deputy Secretary), J. P. Dickinson, L. Fowden, I. J. Graham-Bryce, A. E. Johnston, R. Moffitt, J. A. Nelder and C. P. Whittingham. During the year G. W. Cooke resigned after 18 years as a member; he had been Chairman since 1971. J. M. Hirst also resigned; he had served on the Committee for eight years; he was Chairman of the Working Party for Root Crops from its creation in 1967.

Table 1 shows the number of plots on the three farms; changes since 1974 are mostly small. Plots of root-crops (mainly potatoes) decreased by nearly half at Rothamsted but much less at Woburn; cereal plots increased at Rothamsted but decreased at Woburn.

Field Experiments Section

Members of the Section continued their work of service to the field experiments. Decisions of the Field Plots Committee were translated into detailed plans, schedules of quantities etc. Nearly 200 separate experiments were handled (though this total includes a few 'sampling areas' and equally simple projects); more than 100 fair-copy plans were circulated (mainly McEwen, Allen and Barnard).

We arranged 315 separate programmes for visitors to the station—a considerable increase over 1974. Nineteen groups (and many individuals) came from overseas. Four short cine films about Rothamsted are now available. (Pattison)

Small-plot experiments

The Small-plots staff, though short-handed throughout the growing season, did some or all of the agricultural operations on 71 experiments (68 in 1974) totalling 2332 plots. Every job was done at (or very nearly at) the right time but cutting grass paths, cleaning fallows etc were not done as often as we would wish.

The Classical Experiments

Many of the experiments included in past summaries of yields of crops grown in standard conditions (see for example, *Rothamsted Report for 1973*, Part 1, 239) have been modified so that yields in different seasons are not strictly comparable. Broadbalk and Hoos Barley, however, continue to provide yields each year obtained under conditions that are

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TABLE 1

Number of plots in 1975

	Grain	Roots	Hay	Total
Full scale plots (yields taken):				
Classical experiments:				
Rothamsted	373	35	208	616
Saxmundham	—	—	80	80
Long-period rotation experiments:				
Rothamsted	708	—	76	784
Woburn	338	292	88	718
Crop-sequence experiments:				
Rothamsted	728	64	380	1172
Woburn	252	452	—	704
Saxmundham	136	—	—	136
Annual experiments:				
Rothamsted	1132	365	32	1529
Woburn	236	162	24	422
Saxmundham	64	—	—	64
Totals:				
Rothamsted	2941	464	696	4101
Woburn	826	906	112	1844
Saxmundham	200	—	80	280
Total	3967	1370	888	6225
Full scale plots (no yields taken):				
Rothamsted				546
Woburn				134
Microplots:				
Rothamsted				2071
Woburn				535
Saxmundham				212
	All plots total			9723

as nearly equal as the weather of the seasons permits; these experiments usually have priority, and dates of sowing and other operations vary less from year to year than on short-term experiments. These yields therefore provide a good measure of the effect of season freed as far as possible from confusing factors.

Table 2 shows the yields achieved in the last three seasons by certain treatments: no manure, farmyard manure alone and supplemented by N fertiliser and those of the fertiliser-only treatments that seem most relevant to general farming conditions. The table deals with crops in the 3-course rotation and with barley grown after many crops of barley; the continuous wheat on Broadbalk is omitted since little land in England is in a like condition.

Yields of wheat with adequate fertiliser were about equal to those of 1974, nearly double those of 1973. With FYM 1975 yields were a little less than 1974; 1973 yields, though the least of the three seasons, were relatively better with FYM than with fertilisers only.

Barley (which in 1975 was sown early but checked by a spell of cold wet weather) yielded generally less than in 1974 or 1973, but FYM plus 96 kg N as 'Nitro-Chalk' yielded more in 1975 than in 1974. Barley in rotation and barley after barley showed similar seasonal effects.

Beans, which on both fields were affected by stem-nematode, yielded in 1975 half or less grain than in 1974 and 1973. Potatoes suffered severely from drought in 1975 and yields were one quarter (or less) than those of 1974 and 1973; in 1975 FYM plus 96 kg fertiliser N was scarcely better than fertiliser only, in contrast with 1974.

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TABLE 2

Broadbalk (BK) and Hoos Barley (HB); yields of crops from selected treatments

Grain, t ha^{-1} and total tubers, t ha^{-1}

Treatment		Wheat after potatoes, beans			Barley			Beans			Potatoes		
		1975	1974	1973	1975	1974	1973	1975	1974	1973	1975	1974	1973
None	BK	3·1	2·4	2·4	—	—	—	1·1	3·2	2·6	5·0	12·6	13·5
	HB*	—	—	—	2·8	4·3	3·5	0·9	2·9	3·8	4·8	14·7	17·1
	HB†	—	—	—	1·1	1·6	0·8	—	—	—	—	—	—
N3PKMg(Na)	BK	6·7	6·6	3·9	—	—	—	1·6	4·0	4·4	11·2	58·7	48·5
	HB*	—	—	—	4·7	6·0	5·3	1·1‡	4·0‡	4·5‡	—	—	—
	HB†	—	—	—	4·5	4·9	5·1	—	—	—	—	—	—
N4PKMg(Na)	BK	6·5	6·4	3·7	—	—	—	2·2	4·0	4·1	15·5	57·3	49·2
	HB*	—	—	—	—	—	—	—	—	—	12·4	44·2	41·6
FYM	BK	6·7	7·4	5·7	—	—	—	1·5	4·0	4·2	13·2	57·7	47·1
	HB†	—	—	—	2·8	5·8	6·1	—	—	—	—	—	—
FYM+N2	BK	7·1	7·3	4·3	—	—	—	2·0	3·9	4·0	16·0	67·3	48·8
	HB†	—	—	—	5·1	4·8	5·7	—	—	—	—	—	—

* with residues of castor meal, after potatoes, beans
† after barley, no castor meal
‡ PKMg(Na)

Symbols: 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 till 1973
FYM = Farmyard manure annually, at 35 t ha^{-1}

Lupins for grain

Lupins, which are grown in other EEC countries for oil and protein, were sown for the first time in Spring 1975. Two varieties, belonging to different species, were grown: *Lupinus albus* (Kievsky mutant) and *L. angustifolius* (Unicrop). Kievsky was less affected by *Sitona* (see p. 264), was easier to harvest by combine, ripened a little later and yielded nearly twice as much grain as Unicrop (Table 3) when cut on 18 September.

TABLE 3

Grain lupins

Yields of grain (at 85% DM) t ha^{-1}
Main effects, averaged over other treatments
(Harvested 18.9.75)

	L. albus (Kievsky)			*L. angustifolius* (Unicrop)		
Factor	Absent	Present	% increase	Absent	Present	% increase
Rh. lupini inoculum	1·62	1·92	+18·5	0·86	0·93	+ 8·1
Nitrogen (150 kg ha^{-1})	1·71	1·84	+ 7·6	0·86	0·93	+ 8·1
aldicarb (10 kg ha^{-1})	1·66	1·88	+13·2	0·83	0·96	+15·7
menazon (0·28 kg ha^{-1})	1·76	1·79	+ 1·7	0·87	0·92	+ 5·7
benomyl (1·12 kg ha^{-1})	1·79	1·76	− 1·7	0·80	0·99	+23·7
Mean	1·77			0·90		

Both varieties responded to inoculation with *Rhizobium lupini*. Without inoculum, N fertiliser increased yields, but with inoculum there was no increase from applied N. Aldicarb applied before sowing increased yields of both varieties (partly by controlling *Sitona* on *angustifolius*). Menazon and benomyl applied as sprays had irregular effects.

Kievsky, inoculated and given aldicarb, averaged 2·0 t ha^{-1}. If this yield can be equalled

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in other seasons (lacking the exceptional heat and drought of 1975) the crop will be worth much more experimentation. (Wilson, with members of Plant Pathology and Soil Microbiology Departments; see also p. 284)

The effects of incorporating P and K into the subsoil

The experiment started last year (*Rothamsted Report for 1974*, Part 1, 132) was continued, to determine residual effects of subsoiling and incorporation of P and K into the subsoil.

P and K applied to the subsoil in 1973 substantially increased yields of potatoes and barley but not those of winter wheat and sugar beet, which have deeper roots. Subsoiling done in 1973 increased the yields of all four crops in 1975. (McEwen)

Maize for forage or grain

Members of the Section participated (with members of departments) in two experiments on maize grown repeatedly on the same land.

Woburn

This experiment was started in 1971 (*Rothamsted Reports for 1972*, Part 1, 254 and *for 1973*, Part 1, 246) and tests dazomet applied to the soil at 450 kg ha^{-1} annually in combination with different N fertiliser treatments. In 1975 birds pecked grain from the unripe cobs and so the crop was cut for forage.

The crop was sown on 13 May, in a sheltered position, on a sandy soil and the experiment was netted against bird damage during early growth. Common Smut (*Ustilago maydis*) and *Fusarium* stalk rot were slight and had little effect on yield.

TABLE 4

Grain and forage maize, Woburn

Grain, t ha^{-1} (at 85% DM)
Forage, t ha^{-1} (DM)

	No dazomet					dazomet (450 kg ha^{-1})				
	Grain				Forage	Grain				Forage
N kg ha^{-1}	1971	1973	1974	Mean	1975	1971	1973	1974	Mean	1975
50	4·5	5·3	1·9	3·9	8·0	6·0	5·9	3·4	5·1	9·7
100	5·0	4·6	3·2	4·3	9·1	7·1	6·5	3·5	5·7	12·0
150	4·8	5·7	2·9	4·5	10·3	6·0	6·0	3·6	5·2	12·2
100+50 late	4·2	6·1	3·4	4·6	11·2	6·2	5·9	3·3	5·1	11·8
Mean	4·6	5·4	2·8	4·3	9·6	6·3	6·1	3·4	5·3	11·4

Yields were not taken in 1972 because birds damaged the crop

With dazomet 100 kg N ha^{-1} gave almost maximum yield (as with grain in previous seasons) but without dazomet additional N in the seedbed or later gave an appreciable increase of forage and on average a small increase in grain (Table 4). (Barnard, with Hornby, Plant Pathology Department)

Rothamsted

An experiment testing several chemicals for the control of pests and diseases in combination with rates of N fertiliser was started in 1974; the wet autumn of 1974 prevented the grain from ripening and yields were not taken. All the treatments except dazomet were applied cumulatively in 1975 and the crop grew well. Part of each sub-plot was cut for forage on 9 October and another part taken for grain on 10–11 November.

The crop was sown on 14 May, in a relatively exposed position. Germination was

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slower than at Woburn, the soil being slower in warming and drying; yields of forage were correspondingly less than at Woburn. Lodging was extensive because of the poor growth, in the dry summer, of adventitious roots at or just above ground level.

TABLE 5

Maize, control of pathogens experiment, Rothamsted 1975

Mean yields of forage maize (DM) and grain (at 85% DM), t ha^{-1}

	N (kg ha^{-1}) 50		100		150		Mean	
Pesticide	Forage	Grain	Forage	Grain	Forage	Grain	Forage	Grain
none (1)	6·7	3·5	6·6	3·6	7·1	3·8	6·8	3·6
aldicarb (2)	6·5	3·6	6·0	3·9	10·0	4·3	7·5	3·9
benomyl (2)	6·2	4·0	6·4	3·5	8·6	4·1	7·1	3·9
dazomet* (2)	6·7	4·0	7·2	3·7	6·9	4·0	6·9	3·9
phorate (2)	7·7	3·7	7·7	4·2	8·8	4·6	8·1	4·2
benomyl + dazomet* + phorate (2)	7·3	4·4	7·1	4·1	9·0	4·8	7·8	4·4
Mean (3)	6·8	3·9	6·8	3·8	8·4	4·3	7·4	4·0

Standard errors (based on pooled mean squares for whole- and sub-plot residuals)

	For each rate of N Forage	Grain	Mean over N rates Forage	Grain
(1)	0·39	0·23	0·22	0·13
(2)	0·78	0·46	0·45	0·27
(3)	0·26	0·15	—	—

* 1974 only; other treatments applied cumulatively 1974 and 1975

50 and 100 kg N ha^{-1} gave small but about equal yields of forage while 150 kg N ha^{-1} gave 2 t ha^{-1} more except where dazomet alone was applied in 1974 (Table 5). Yield of grain was about half the yield of forage dry matter and effects of treatments were in proportion, with the greatest yield being from a combination of benomyl, phorate and dazomet. (Barnard and Wilson, with Fletcher, Entomology Department, Hooper and Williams, Nematology Department, and Hornby and Plumb, Plant Pathology Department)

Staff

M. J. Allen was appointed M.B.E. in the New Year's Honours List. G. F. Jarvis retired in April because of ill health. A. P. Harmer and S. P. Kerr joined the staff of the Section. A. R. S. Kassim (Yemen) and S. H. Moon (Korea) were temporarily attached.

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