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ROTHAMSTED RESEARCH

Report for 1971

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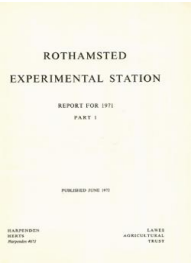

The Farms : Woburn

J. R. Moffatt

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WOBURN

All winter and spring-sown crops were sown or planted early and with fine weather in May grew rapidly. In June heavy rain and strong winds caused severe lodging of cereals and grass for hay; the hay cut early was spoilt. The promise of an early harvest did not materialise but in a mild, dry autumn root crops were lifted, winter cereals were sown, and autumn cultivations done by the end of November.

The effect of weather on crops

Early January was cold but the rest of the month was mild and wet. February was mild and dry with seven rainy days. Drilling started on 25 February but was interrupted by a wet spell in March, during which fertilisers were applied to grassland. However, all beans and barley were drilled by the end of the month. April was cold and dry, rain falling on seven days. Good progress was made with land work; potatoes were planted, sugar beet and grass and clovers were sown, wheat and barley was sprayed with herbicide and wheat given its nitrogen. Rain fell just as this work was finished. May was mainly fine with useful rain towards the end of the month; sugar beet were singled.

June was cool and dull with long periods of rain, heavy storms and strong winds; sunshine hours were 76 fewer than average and mean temperature 2·3°C less than average. Rainfall was more than double average; on several areas the soil slaked and the surface 'capped' as it dried; wheat lodged badly and barley less. Potatoes and beans grew rapidly but hay cut early was spoilt.

July was mainly hot and dry, only 37 mm of rain falling on six days. Cereals ripened fast and promised an early harvest; sugar beet wilted on hot days, carrots grew slowly and towards the end of the month the haulm of some potatoes began to die. Haymaking was finished and FYM was ploughed in after a one-year ley.

A dull, wet August, with rain on 19 days, delayed the start of harvest which finished by the end of the month; all corn needed drying. Some potatoes recovered after the rain but those that did not were lifted.

Fine, warm weather started in September and lasted until the middle of November, except for a short but very wet spell in mid-October. Rain on five days in September measured 16 mm but in October on eight days measured 79 mm. Much of the ground became waterlogged and there was severe erosion. Beans were harvested early in September, potato lifting finished on 8 October, sugar-beet lifting and wheat drilling by the end of the month. The latter half of November was wet with some snow, but field work was finished by the end of the month.

December was dry and mild until almost the end of the month.

Field experiments

There were 1568 field plots, 232 fewer than in 1970. All experiments were sown early in good tilths and were harvested without difficulty.

Cappelle winter wheat grown on experiments promised well but there was much mildew (*Erysiphe graminis*) and some brown rust (*Puccinia recondita*). In the variety experiment the mean yield of six varieties was 44·21 cwt/acre, with Maris Nimrod yielding most (50·5 cwt): in 1970 the mean yield of the same varieties was 54·31 cwt.

Julia barley was grown in all experiments except one. Two long-term experiments drilled in March were damaged by pheasants and were re-drilled; many plots in the variety experiment were damaged by birds and after spraying with paraquat the experiment was re-drilled. Despite these set-backs the average yield from four long-term experi-

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ments was 33·4 cwt/acre (in 1970 23·0 cwt). There was more mildew than in the preceding two years, but less brown rust (*Puccinia hordei*). In a variety trial the mean yield of six varieties was 37·0 cwt/acre (in 1970 36 cwt). Treating the seed with ethirimol to control mildew increased yield by 4·5 cwt. As at Rothamsted, Vada gave the best yield both with fungicide (47·8 cwt) and without (44·5 cwt). Ethirimol increased the yield of the variety Sultan from 26·9 to 35·9 cwt.

The two bean experiments, variety Maris Bead, each had a mean yield of only 16 cwt/acre; the small yield resulted from many factors.

Potatoes were grown in 21 experiments of which seven were micro-plot experiments. All were sprayed with linuron to control weeds; on three experiments on heavy land this failed to kill cleavers (*Galium aparine*), which were controlled between rows by hand-spraying with paraquat and in the rows by hand-pulling. In the Market Garden experiment the haulm remained green longer than elsewhere and the mean total yield of Pentland Crown was almost 24 tons/acre. On one block in the Ley–Arable experiment the haulm of Maris Piper, adequately manured, died early. The mean yield was 13·04 tons/acre. On another block, the same variety similarly manured and not on fumigated soil, where the haulm remained green until 20 September, the mean yield was 22·86 tons/acre after arable crops and 25·80 tons after grass and sainfoin. On plots fumigated in 1968 and 1971 yields increased to 28·28 and 30·89 tons.

In an experiment comparing varieties, Majestic (22·0 tons/acre) out-yielded Pentland Crown (18·9 tons); Record yielded 14·1 tons. In a similar experiment in 1970 yields were Majestic 20·2 tons/acre, Pentland Crown 21·4 tons and Record 17·5 tons.

Sugar beet, variety Klein E, was grown on one experiment. Sown early and sprayed with 'Solubor' (66·2% diboron trioxide), it grew well until July when it wilted on hot days. Lifted in October the mean yield was 19·6 tons/acre. Three rates of nitrogen had little effect on yield of roots or total sugar.

There were two small experiments on grain maize. One comparing varieties was destroyed by pheasants; the other, to observe the build up of pathogens common to maize and other crops, was halved, gaps in one half being filled with transplants from the abandoned half.

Cropping

Of the 72·8 ha farmed 6·1 carried wheat, 18·2 barley, 7·7 potatoes and 5·3 beans. There were small areas of sugar beet, sainfoin, carrots, rye and maize. Temporary grass occupied 16·2 and permanent pasture 6·9 ha. There were 10·9 ha of fallow.

The light land is worked on a six-course rotation and the heavy land on a four-course, to provide different intensities of soil-borne pathogens of cereals and to prevent those of potato and sugar beet reaching dangerous populations. 'Break' crops are potatoes, beans, ley or fallow.

During autumn magnesian limestone was applied on the stubble of light land and ground carbonate on the heavy land. The few areas with couch grass were sprayed with paraquat before a deep-tine cultivation; other stubbles were sprayed to control annual grass weeds and volunteer corn until ploughed. Areas after potatoes were deep-tine cultivated for winter wheat.

The few wild oats in cereal crops were hand-pulled. Horsetails are becoming prevalent on two fields.

Crops

Wheat. Cappelle was the only variety, except in the variety experiment. After potatoes on light land, seedbeds produced by a deep-tined cultivator were fine and loose; on heavy

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land seedbeds were good though dry. Germination was slow and irregular, but the crops became uniform after rain in November. All areas looked promising until mid-June when the crop on the heavy land, given 94 units of nitrogen in spring, lodged badly. It partially recovered but was damaged by birds; the yield was small. Mildew was prevalent and there was some brown rust.

Barley. Julia was the standard variety; sown early the crops grew rapidly. Early mildew lessened yields, which ranged between 2·8 and 4·6 tonnes/ha, averaging 4·0; some was over-ripe when harvested and grain was lost at the cutter bar.

Beans. Maris Bead was the standard variety. Sown early, they grew well especially during June but pods filled slowly in July. Yields from light land were about 2 tonnes/ha and from heavy land about 2·5. On heavy land simazine failed to control common orache (*Atriplex patula*) which covered the ground even after hoeing. Aphids were few but the crops were sprayed. On most areas there was a slight infestation of stem eelworm (*Ditylenchus dipsaci*).

Potatoes. Pentland Crown was the main variety but Maris Piper was grown on land infested with potato-root eelworm; most of the Pentland Crown seed was grown at Rothamsted. Early planting, with weeds controlled by linuron, gave the crop a good start. Growth was rapid during June and early July but at the end of July the haulm began to die; some crops recovered after rain in August. The first spraying against blight was done in June and the second, when blight appeared in early August, to areas where haulm was green; these were burnt off towards the end of September. The soil was dry and with little soil on the tubers or the lifter web, the skin of the tubers was damaged at lifting. The yield of Pentland Crown ranged between 32·6 and 47·7 tonnes/ha, less than in 1970. The tubers of Pentland Crown were almost free from scab but many had growth cracks, probably the result of the spurt of growth in August; the proportion of saleable ware is small. The Maris Piper were badly affected by scab; there was some tuber blight and more soft rots than usual.

Grassland. A high-nitrogen compound fertiliser was given in March and again later. Growth in April was slow but became rapid with rain at the end of the month. Some hay, cut early, was spoilt and had to be burnt. The best hay was made in July though the grass was over-mature. Aftermaths grew rapidly and the grass was plentiful throughout the summer and autumn.

Cattle

Twenty-five cattle bought in October 1970 were brought into yards for the winter. Some were moved to Rothamsted at the end of February for finishing and others were fattened on grass during the summer.

Twenty-four beasts were bought in March and 16 in July. All were yarded at the end of December and were fed on hay and potatoes.

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A Comparison of Broadcast and Drilled Seed

Moffatt and Widdowson (*Rothamsted Report for 1966*, 236–240) found that winter wheat yielded similarly whether the seed was broadcast or drilled in rows at 7 or 4 in. spacing. Also, yields were as large with broadcast or with combine drilled fertiliser. Their experiments were made with small plots and 'broadcast' seed was sown from a drill from which the spouts had been removed. Rate of working can be much faster with a spinning disc distributor than with a drill, so further experiments were made in 1966, 1967 and 1968 with winter wheat and spring barley broadcast in this way and with the large plots needed with this type of sowing. The fertiliser was broadcast on all plots.

Each plot was divided into four sub-plots cultivated differently. The seed was sown at various stages during the preparation of the seedbed, and treatments ranged from one in which all cultivations were done before sowing to one with the seed sown on the furrow back and all cultivations done after. All crops were sprayed with a hormone weed-killer and were combine-harvested. The drilled plots were cut across the direction of drilling.

Winter wheat. The variety Cappelle was used in all years and in 1966 followed potatoes in ground that was chisel ploughed. A compound fertiliser supplying 0·16 cwt N, 0·4 cwt P_2O_5 and 0·4 cwt K_2O was applied before sowing, and a top dressing of 'Nitro-Chalk' (0·8 cwt N/acre) in the spring. The drilled seed was sown at 190 lb/acre and the broadcast seed at 190 lb and 250 lb.

The sequence of cultivations was:

- C_1 Spring-tine cultivate. Harrow. Sow. Harrow
- C_2 Disc. Sow. Harrow
- C_3 Spring-tine cultivate. Sow. Harrow
- C_4 Spring-tine cultivate. Sow. Spring-tine cultivate. Harrow

In 1967 and 1968 the wheat followed beans in ground that was ploughed. A compound fertiliser supplying 0·4 cwt P_2O_5 and 0·4 cwt K_2O/acre was applied after ploughing, and 'Nitro-Chalk' (0·8 cwt N/acre) in spring.

Seed rates were 150 lb and 190 lb/acre where drilled and 170 lb and 235 lb/acre where broadcast.

The sequence of cultivations was:

- C_1 Spring-tine cultivate twice. Sow. Harrow.
- C_2 Spring-tine cultivate. Sow. Spring-tine cultivate. Harrow
- C_3 Spring-tine cultivate twice. Harrow. Sow. Harrow
- C_4 Sow. Spring-tine cultivate. Harrow.

TABLE 1

Yields of wheat—1966 (cwt/acre)

	Broadcast seed				
	C_1	C_2	C_3	C_4	Mean
		(± 1·06)			
190 lb	48·4	47·2	46·6	45·0	46·8
250 lb	44·1	43·0	43·1	45·9	44·0
Mean (± 0·75)	46·2	45·1	44·9	45·5	45·4

	Drilled seed		
	C_1	C_3	Mean
	(± 0·75)		
190 lb	45·0	44·9	45·0

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TABLE 2

Yields of wheat—mean of 1967 and 1968 (cwt/acre)

	Broadcast seed				
	C_1	C_2	C_3	C_4	Mean
		(± 0·61)			
170 lb	39·2	39·2	39·4	40·0	39·4
235 lb	38·0	37·6	37·3	38·8	38·0
Mean (± 0·46)	38·6	38·4	38·4	39·4	38·7

	Drilled seed		
	C_1	C_3	Mean
	(± 0·61)		
150 lb	39·7	39·4	39·6
190 lb	39·6	40·0	39·8
Mean (± 0·32)	39·6	39·7	39·6

Treatments C_1 and C_3 only were used for the drilled seed.

Tables 1 and 2 show that neither the method of sowing the seed, nor the change in cultivations, affected yields.

Barley. In all years the variety was Maris Badger, and it followed winter wheat. The wheat stubble was ploughed during autumn and a basal fertiliser was applied before cultivating the land in the spring. In 1966 the compound fertiliser used supplied 0·8 cwt N, 0·4 cwt P_2O_5 and 0·4 cwt K_2O/acre and in 1967 and 1968 0·75 cwt N, 0·3 cwt P_2O_5 and 0·3 cwt K_2O. The site of the 1968 experiment was sprayed with paraquat before ploughing to kill grassy weeds.

The sequence of cultivations was:

C_1 Spring-tine cultivate. Harrow. Sow. Harrow
C_2 Spring-tine cultivate. Sow. Spring-tine cultivate. Harrow
C_3 Spring-tine cultivate twice. Sow. Harrow
C_4 Sow. Spring-tine cultivate. Harrow.

Treatments C_1 and C_3 only were used for the drilled seed and in 1967 treatment C_4 was omitted.

The drilled seed was sown at only 140 lb/acre in 1966 but in 1967 and 1968 at 140 lb and 112 lb. The broadcast seed was sown at 140 lb and 200 lb/acre in all three years.

TABLE 3

Yields of barley—mean of 1967 and 1968 (cwt/acre)

	Broadcast seed			
	C_1	C_2	C_3	Mean
		(± 0·49)		
140 lb	35·0	38·6	37·0	36·9
200 lb	35·1	38·2	36·8	36·7
Mean (± 0·54)	35·0	38·4	36·9	36·8

	Drilled seed		
	C_1	C_3	Mean
	(± 0·49)		
112 lb	38·0	37·5	37·7
140 lb	37·9	38·4	38·1
Mean (± 0·38)	37·9	37·9	37·9

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TABLE 4

Yields of barley—mean of 1966 and 1968 (cwt/acre)

	Broadcast seed				
	C_1	C_2	C_3	C_4	Mean
		(± 1·39)			
140 lb	35·0	37·4	34·8	36·0	35·8
200 lb	34·1	36·8	35·6	34·9	35·4
Mean (± 0·98)	34·6	37·1	35·2	35·5	35·6

As not all treatments were included in each year mean results for drilled and broadcast seed are given in Table 3 for 1967 and 1968 only omitting treatment C_4.

Mean yields for all the cultivation treatments are given in Table 4 for the broadcast seed only omitting 1967.

Conclusions

(1) The seed rates used had no effect on yields of wheat or barley. The smaller used was enough to give a full crop.

(2) Differences in cultivation did not affect wheat yields. Barley yields were slightly bigger from treatment C_2 (spring-tine cultivation following sowing on a spring-tine cultivated surface) than from the other treatments. Where a cultivator was used after sowing, the seed tended to be drawn into wide bands spaced at about 10 in. centres, which made the young crop appear uneven but did not lessen yields.

(3) Wheat yields were as big from broadcast as from drilled seed. Drilled barley yielded slightly more than broadcast on average, but the best yield from broadcast seed equalled the best with drilled barley.

With a spinner-type distributor properly set and carefully operated, the yields can be as big as with a conventional drill. More land can be sown during a day so sowing can be more timely, or winter wheat might be sown when it is too wet for a drill to operate. (R. Moffitt)

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