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ROTHAMSTED RESEARCH

Report for 1971

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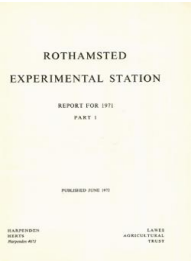

The Farms : Rothamsted

J. R. Moffatt

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THE FARMS

J. R. MOFFATT

ROTHAMSTED

The year was an easy one for field work, and spring crops were planted early. Silage was good, but early-cut hay was spoilt by rain in June and late-cut, though well made was over-mature. The prospect of early cereal harvest was denied by a dull August, and most corn needed drying. Cereal yields were average and beans again yielded poorly.

September, October and early November were remarkably mild and dry which made easy the harvesting of potatoes and sugar beet, and drilling of wheat, which germinated and grew rapidly. Ploughing was finished by mid-December.

The effect of weather on crops

After a cold start January was mainly mild and damp. February was dry and mild, rain falling on only nine days, and despite 21 ground frosts the mean air temperature was 0·7°C above average. Spring land work started on 24 February and much barley and beans were sown during the month. During a wet spell early in March, fertiliser was applied to grassland, and most of the spring wheat and barley was drilled by the end of the month.

In April winds were strong and cold, but with little rain excellent tilths for potatoes were obtained with one stroke with a rotavator; planting started early and was finished by the end of the month. Sugar beet and kale were drilled. Winter wheat began to turn yellow and was top-dressed with nitrogen early in the month, when it was also sprayed with herbicides.

May was mainly fine with some useful rain towards the end of the month; the mean temperature and hours of sunshine were more than average. Potatoes and spring corn were sprayed with herbicide, and silage was made during the second half of the month.

June was dull, wet and cold; hours of sunshine and mean temperature were below average; rain on 14 days was 49 mm above average. Crops grew well but leaf diseases of cereals spread rapidly. Rain spoilt hay already cut, and delayed the cutting of the rest which became badly laid; it also prevented the final ridging of some potatoes, as the haulm became too tall before the land dried. July was hot, sunny and dry; hours of sunshine and mean temperature were more than average and rain, falling on only seven days, was 49 mm less. Corn began to ripen and promised an early harvest, and at the end of the month potatoes began to die back. In August the weather deteriorated; rain fell on 19 days and hours of sunshine were 50 fewer than normal. Harvest did not start until mid-August but was finished on 4 September.

September was fine and warm, with more sunshine than average and only 14 mm of rain on four rainy days. Some excellent hay was made and a silage cut was taken from the grass experiments. Beans were harvested and some maincrop potatoes lifted. The dry weather continued into October and the hard ground made ploughing slow and difficult. Some seedbeds for winter corn were forced by disc harrows and rollers but other areas were too hard and could not be worked until rain softened the land; winter wheat drilling started on 5 October and finished by the end of October. The mean temperature of October was 1·5°C above average and hours of sunshine 40 more. November had average rainfall, 17 ground frosts and a little snow; potato and sugar-beet lifting finished.

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December was dry and mild until the end of the month; the mean temperature was 2·1°C above average, and there were only 20 mm of rain in seven wet days. Winter land work was finished by mid-December.

Field experiments

There were more than 5000 full-scale plots, 346 more than in 1970, and yields were taken from 4309. Autumn-sown experiments were drilled early in dry seed-beds and germination was uneven. On Broadbalk the stubble of the continuous wheat (section 0) was sprayed with paraquat to control weeds until it could be ploughed. The sections for beans and potatoes became weedy during the winter and to avoid reploughing were sprayed with paraquat. Bean seed was Field Approved; mechanical hoeing did not control weeds in the rows, where they spread rapidly. A linuron/paraquat mixture sprayed to potato ridges controlled weeds except thistles and horsetails (*Equisitum*) which were hand-pulled. On the plots not given potash or nitrogen the haulm died early; the haulm was destroyed mechanically early in September. Weeds in the wheat were controlled by a hormone weed-killer; many plots on the unsprayed section were badly infested with vetches and plot 19 was cut green and carted off. Lodging was confined to the vetch-infested plots and the strip receiving FYM and nitrogen. Most plots had some wild oats and were hand-pulled on two occasions; horsetails were prevalent on all sections. After harvest the wheat and bean stubbles (except section 8) were sprayed with aminotriazole to control horsetails and couch grass.

Great Hoos was sprayed with paraquat in autumn 1970. All crops were sown early. Weeds in potatoes were controlled by linuron, and between bean rows by mechanical hoeing. The barley was sprayed with a hormone weedkiller and the few wild oats were hand-pulled. After harvest the barley and bean stubbles were sprayed with paraquat.

On the Exhaustion Land one cultivation in spring produced a good seedbed; wild oats were few.

Barnfield, in the fourth year of its revised cropping, grew potatoes and sugar beet; growth at first was slow. Weeds in potatoes were controlled by a linuron spray but mechanically in sugar beet. The potato haulm on the plots not given potassium died early. The series not given nitrogen under the old Classical manuring (section 0) grew beans for the fifth consecutive year. The residual effect of the simazine sprayed on quarter-plots in 1970 was measured against simazine applied in 1971. The crop was poor and the yields very small, particularly on plots given simazine in 1971 or 1970. The mean yield from those plots sprayed in 1971 was 9·2 cwt/acre less than from unsprayed. By contrast, simazine applied in 1971 increased the yield on the FYM plot by 3·3 cwt, and applied in 1970 by 1·2 cwt.

In the Cultivation-weedkiller experiment, spring wheat replaced winter wheat to allow weeds in the bean stubble to be controlled by spraying with paraquat followed by several disc harrowings. The average yield was 32·8 cwt/acre and there were no treatment differences. Pentland Crown potatoes replaced Pentland Dell; the mean yield was 14·9 tons/acre, the best since 1968. The ploughed plots yielded significantly more (16·43 tons) than the tined or rotaved plots. Spraying paraquat on the previous wheat stubble increased yields with all the primary cultivation treatments on the ploughed plots by 2·17 tons/acre. Sodium trichloracetate (TCA) was used after potatoes to control couch grass. Dinoseb acetate was less effective than simazine as a weedkiller in the beans; yield with either was less than with mechanical weed control, with which weeds increased greatly in the rows. Yields were small, but more on the ploughed than on the tined or rotavated plots. Barley grew well and plots looked uniform; the mean yield was 46·7 cwt/acre (1970 38·0 cwt, 1969 43·8), with only small differences between treatments.

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Champlein and Maris Nimrod yielded more than other varieties of winter wheat grown on two sites, one where cereals have not been grown for some years, and one where they have been and soil-borne pathogens were expected to develop. However it seems they did not because the mean yield of all varieties was 55·0 cwt from the first site and 53·5 cwt from the second. Corresponding yields of five varieties grown on two such sites in each of the past three years were 53·8 and 52·5 cwt in 1971, 47·2 and 28·1 in 1970, and 62·2 and 45·8 in 1969.

Julia remained the standard barley variety for experiments, with Zephyr in some; all were sown early. In an experiment comparing varieties with and without systemic fungicide the old variety Vada, which did badly in 1970, yielded most with both treatments (52·3 and 47·6 cwt/acre), closely followed by Julia. All varieties benefited from the fungicide, which increased the mean of all varieties from 42·5 to 47·0 cwt/acre. Corresponding figures for 1970 were 32·4 and 31·8 cwt. Midas yielded poorly in 1970 and 1971.

The Ley–Arable experiments in Highfield and Fosters, now being phased out, grew only wheat, barley and grass. All crops grew well and there was lodging only where barley was given much nitrogen. On Highfield the mean yield of wheat after potatoes was 52·4 cwt/acre, and 14 plots yielded 60 cwt or more. The yield of wheat as the third cereal crop was 48 cwt, the fourth 40·0 and the fifth 46·3. On Fosters the corresponding figures were, after potatoes 51·9 cwt with six plots giving 60 cwt or more, 50·5 cwt, 49·5 and 46·6. The mean barley yield on Highfield was 47·5 cwt and on Fosters 49·1.

Spring beans yielded only between 15 and 24 cwt/acre. This was more than in 1970 when late sowing followed by drought was held mainly responsible for yields of 11–15 cwt. In 1971 they were sown early and grew well in the wet June, and in July. Aphids were few and a precautionary spray was probably unnecessary but there was much mild chocolate spot (*Botrytis* spp.), some virus disease and damage by stem eelworm. An experiment on the control of aphids showed only slight benefit from insecticidal spray or granules, with the best result from granules applied early. An experiment comparing 13 varieties or strains had a mean yield of 15·8 cwt/acre with little difference between varieties. An experiment comparing different sowing depths also compared the weed-killers dinoseb acetate and simazine. At all sowing depths, the yield with simazine was less than with dinoseb acetate, the mean difference being 0·9 cwt/acre. Used elsewhere as a basal weedkiller dinoseb acetate caused the plants to darken and the leaves to wilt, an effect attributed to the material being absorbed through the layer of wax on the skin made thin by damage caused by wind; irrigation helped the plants to recover.

Potatoes in experiments were planted early and grew vigorously at first but on some plots, mainly those with little potassium, the haulm died early; all were lifted by 6 October. In an experiment comparing varieties, Majestic gave a mean total yield of 23·3 tons/acre, King Edward 22·6 tons, Pentland Crown 21·2 tons and Record 16·8 tons. An experiment comparing row widths gave 21·0 tons/acre total yield from 28-in. rows and 19·0 tons from 36-in. rows.

Two kale experiments occupied 6 acres. They were sown early in April and grew well during the summer. Spraying with desmetryne against fat hen (*Chenopodium album*) had little effect and tractor hoeing was needed while the plants were small. The yield was nearly 30 tons/acre.

Cropping

Of the 264 ha farmed, 178 were under arable crops or fallow, 40·5 under short-term leys or lucerne and 45·7 under permanent grass. The main crops were wheat (40·1 ha), barley (85 ha), beans (15·9 ha), potatoes (13·4 ha), kale (2·43 ha) and sugar beet (1·21 ha); 19·8 ha were fallowed.

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Much of the farm is worked on a seven-year rotation of two cereals, a 'break' crop, two cereals and two 'break' crops, so as to give a choice of sites with different probabilities of attack by soil-borne pathogens. Several fields are outside the rotation. Some are growing cereals continuously and others are kept acid or deficient in phosphorus or potash to provide sites for fertiliser experiments; most of these are under long-term leys or fallow.

The fallows, mainly to control couch, were worked by rotary and tined cultivators. The dry weather after harvest retarded the growth of perennial grass weeds but some areas were sprayed with aminotriazole; many others were sprayed with paraquat to control annual weeds and volunteer corn until they were ploughed.

Wild oats were few, but all cereals were inspected and rogued where necessary.

Diseases and pests. Mildew (*Erysiphe graminis*) appeared early on barley, increased rapidly and lessened yield. There was also much brown rust (*Puccinia hordei*). Both diseases were more prevalent than in the preceding two years. Loose smut (*Ustilago nuda*) was uncommon.

Wheat also was infected with mildew. Septoria appeared after the wet weather in June and attacked the ears; the severity differed between varieties, but yield was probably affected appreciably. Yellow and brown rust were common but severe only in patches.

Take-all (*Ophiobolus graminis*) was severe and damaging on land where few successive wheat or barley crops have been grown, but was much less so after many. Eyespot (*Cercosporella herpotrichoides*) was more prevalent than usual on winter wheat but seems not to have affected yields greatly, possibly because there was little lodging in the dry July.

Stem eelworm (*Ditylenchus dipsaci*) was widespread in beans and occurred even where seed certified under the Field Bean Seed Scheme was grown on soil free from the pest, suggesting it was brought in by the seed. It is unlikely to have caused much loss except where damaged patches were obvious.

In autumn 1970 eggs of the Wheat Bulb fly (*Leptohylemyia coarctata*) were numerous after fallow and unexpectedly many after irrigated potatoes where the haulm had covered the ground. The wheat seed sown on these areas was given a protective dressing of insecticide. There was also a severe infestation on Broadbalk Section 3, despite the use of a protective seed dressing. In autumn 1971 eggs were numerous after fallow and maincrop potatoes.

Crops

Wheat. Joss Cambier (20·2 ha) and Cappelle (10·5 ha) were the main varieties. The crop responded well to early top dressings and gave average yields. There was little lodging. The 8·9 ha of Kolibri spring wheat averaged 3·51 tonnes/ha, more than in 1970.

Barley. Julia (76·9 ha) was the main variety with small acreages of Zephyr and Midas. Midas gave only 4·77 tonnes/ha and will not be grown again. Some non-experimental crops were over-ripe when cut and grain was lost at the cutter bar. Yields ranged between 4·02 and 5·65 tonnes/ha.

Beans. Maris Bead was the main variety. A wet June favoured growth but yields were affected by virus disease, mild chocolate spot and stem eelworm. Cold, wet weather in June prevented the forecasted infestation by aphis. Yields of 2·13 tonnes/ha were disappointing, for the third successive year.

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Potatoes. King Edward was the main variety with small areas of Majestic, Pentland Crown and Desiree. Rothamsted-grown seed was used for most ware crops and all were chitted. Stock Seed of King Edward and Pentland Crown from Northern Ireland was grown to provide seed for 1972; both varieties were given an 'H' certificate.

Potatoes were sprayed against blight in June and again in early August when blight appeared. The seed crop was lifted in August, maincrop lifting starting in mid-September. More tubers than usual were affected by soft rots, and there was some tuber blight. The mean total yield of about 50 tonnes/ha was average.

Grass. A high-nitrogen compound fertiliser was given in March, and most fields received 'Nitro-Chalk 21' during the summer. Growth, retarded by dry weather and cold nights in April, became rapid with rain at the end of the month. Silage cuts in late May were heavy; the grass was either wilted or treated with an additive before being ensiled. Much of the hay was battered by wind and rain but was cut by flail mower. About 30·5 tonnes were stacked before fully dry, and drying was finished by cold air blown through the stack. The average yield was about 5 tonnes/ha.

Grass was plentiful throughout the summer, helped by irrigation and nitrogen. Several areas grew ahead of stock requirements and in September about 16 ha were made into excellent hay; three fields were sprayed with asulam to control docks, and one field with 2,4-D to kill dandelions.

Cattle

In November 1970, 30 cattle were brought into covered yards and fed on hay, silage, brock potatoes and home-grown concentrates. In early autumn 1970, 109 young Hereford-cross cattle were bought and most were outwintered on a similar ration without concentrates; most were sold fat from the grass during the summer and autumn. Altogether 136 cattle were fattened during the year.

One-hundred and thirty yearling Hereford-cross bullocks were bought in autumn 1971. The most forward were yarded in November, the remainder outwintering on hay, silage and kale; potatoes will be fed when the kale is eaten.

All bought cattle were dosed against liver fluke, and young stock was treated in autumn with an organo-phosphorus insecticide against warble fly.

Equipment

A single-row potato harvester was used on non-experimental areas and will be fitted with a bagging attachment for use on experimental plots.

Woodlands

About 1 ha of woodland near Rothamsted Manor was cleared of scrub and useless trees, and enough timber felled to allow underplanting. Three main sections were planted with Douglas fir (*Pseudotsuga taxifolia*), beech (*Fagus sylvatica*) and European larch (*Larix decidua*) in alternate rows, and Western hemlock (*Tsuga heterophylla*). Groups of Grand fir (*Abies grandis*), beech, Douglas fir and Western hemlock were planted in smaller clearings. Wild cherries (*Prunus avium*) and a few copper beech were planted around the perimeter.

Staff

Three recorders, J. Kelsey, A. Martin and J. Archer left, and M. Rogers, J. Hayles and A. Percival were appointed.

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