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ROTHAMSTED RESEARCH

Report for 1972 - Part 1

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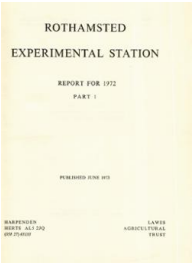
ROTHAMSTED
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PART 1

The Farms : Rothamsted

J. R. Moffatt

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THE FARMS

J. R. MOFFATT

ROTHAMSTED

Despite the absence of any real wintry weather, satisfactory seedbeds were obtained for all spring crops. The summer was cold and dull, and though there were many wet days in each month the rainfall was less than normal. Most of the hay was cut late but made quickly in one of the few sunny spells. The cereal harvest was made easy by fine weather and little lodging; yields and grain quality were good. Beans yielded well.

September, October and early November were remarkably dry which made easy the lifting of potatoes, sugar beet and swedes. Wheat was drilled early and though germination was rather slow good plants were established. Ploughing was finished by the end of the year.

The effect of weather on crops

January and February were mainly mild and wet with above average rain falling on 21 and 17 days respectively. The mild wet spell continued for the first ten days of March by which time the land was very wet. A short spell of gale force winds with driving snow was followed by drying winds and two weeks of fine weather. Land work and drilling started in mid-March and by the end of the month all spring corn and beans were sown.

Rain and strong winds early in April delayed field work; however in the dry but dull, cold and windy weather in the latter half of the month kale and sugar beet were sown, potatoes were planted and winter corn was sprayed.

The summer was cool and dull; rain, hours of sunshine and mean temperature were less than average in each of the months May–September. In May rain fell on 22 days; this and strong winds delayed the spraying of spring corn and beans. In June rain fell on 17 days and the mean temperature was 2·4°C less than average; hay crops were battered by wind and heavy rain, and became over-mature. In July the weather improved slightly; there was a ten-day hot spell in the middle of the month during which much hay was made. Cereals and beans grew well and showed signs of ripening, but potato crops showed the need for water; the deficit at the end of the month was about 100 mm. August and September each had five rain days; cereal harvest started on 14 August and with no interruption from the weather finished on 7 September. Beans were slow to ripen but most were cut by the end of September.

The dry weather continued into the autumn, rain falling on six days in October. Many stubbles and land after potatoes were broken up by a deep-tined cultivator instead of a conventional plough. A rotary harrow made good seedbeds for wheat, most of which was sown by the end of October. Potato lifting was done under excellent conditions which persisted into early November. Thereafter heavy storms gave almost average rain which fell on 17 days. In December rain was 26 mm above average, most of it falling early in the month; the latter part was mild and dry.

Cropping

Of the 264 ha farmed, 177 were under arable crops or fallow, 41·3 under short-term leys or lucerne and 45·4 under permanent grass. The main crops were wheat (59·5 ha),

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barley (77·7 ha), beans (15·0 ha), potatoes (10·9 ha) and fallow (10·9 ha). Small areas of kale, sugar beet, swedes and oats were grown.

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 potassium to provide sites for fertiliser experiments; most of these are under long-term leys or fallow.

The fallows, mainly to control couch (*Agropyron repens*), were worked by rotary and tined cultivators. The dry weather after harvest retarded the growth of perennial grass weeds and many areas were worked once or twice with a ridged-tine cultivator, while some areas were sprayed with paraquat to control annual weeds and volunteer corn until they were ploughed. Some areas tine cultivated twice since harvest were sprayed with paraquat in November and will not be ploughed.

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

On several fields where there have been experiments involving large amounts of potassium, phosphorus and magnesium, balancing applications of fertilisers supplying these nutrients were made.

Field experiments and crops

There were more than 5000 full-scale plots, and yields were taken from nearly 4000. Autumn-sown experiments had a good start as good seedbeds were easy to prepare after rain in mid-October; all winter wheat was drilled early.

On Broadbalk the 1971 wheat and bean stubbles (except Section 8) were sprayed with aminotriazole to control couch grass and 'Prebane' was used to control blackgrass (*Alopecurus myosuroides*) on all except Section 8 which was fallowed. The crop grew well and there was no lodging except on the plot receiving FYM and added nitrogen. Yields were about normal. Wild oats were few but were counted as they were hand-pulled on four occasions. Horsetails (*Equisetum*) were prevalent on all sections but were less vigorous than in 1971. Beans grew well and yields were good, many plots yielding over 3·77 tonnes/ha. Potato yields were about average

The Wheat and Fallow experiment had a satisfactory plant and yielded more than usual.

On Great Hoos the barley and bean stubbles were sprayed with paraquat to keep weeds and volunteer corn in check until after the potatoes were lifted. The Julia barley grew well and there was some lodging on the plot receiving FYM which yielded more than 6·28 tonnes/ha. Barley yields were better than average, the highest yield being 7·14 tonnes/ha. The few wild oats were counted as they were pulled. Bean yields which were low in 1970 and 1971 returned to normal; potato yields were normal.

The 1971 Exhaustion Land stubble was sprayed with aminotriazole to control couch grass; yields of grain and straw were above average.

Barnfield grew Kolibri spring wheat and Julia barley. They germinated and grew well and plants showed big responses to nitrogen. Birds damaged the wheat just before harvest but the mean yield was 3·71 tonnes/ha with the best plot yielding 6·53 tonnes/ha. The mean yield of barley was 5·31 tonnes/ha and some plots gave over 6·90 tonnes/ha. Beans were grown for the sixth successive year on Series 0. The plots were again split into four to test the immediate and residual effects of simazine; the 1972 application lessened the mean yield by 0·40 tonne/ha and that given in 1971 by 0·45 tonne. On the plot receiving FYM only, simazine applied in 1972 lessened the yield by 1·00 tonne/ha and applied in 1970 by 1·18 tonnes. By contrast, simazine applied in 1971 when bean yields were small,

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increased the yield that year on the FYM plot by 0·41 tonne and applied in 1970 by 0·15 tonne.

In the Cultivation/Weedkiller experiment the ploughed plots yielded most wheat, and both hormone and paraquat treatments improved yields. There were no treatment differences in the barley. The ploughed plots also gave the best yield of beans; simazine lessened the yield on the ploughed and tined plots but dinoseb acetate had no effect on yield. Tilths for potatoes were better on the ploughed plots than those tined or rotovated and this was reflected in the yield. Spraying paraquat on the previous wheat stubble increased the yield, on the ploughed plots by 4·5 tonnes/ha. Two rows on each plot were lifted in the normal way with an elevator digger and picked up by hand, and two adjoining rows were lifted satisfactorily by the Faun potato harvester.

Each Series of the Cultivation/Weedkiller experiment has grown three rotations of crops over the last 12 years. Differences in crop yields between primary cultivation treatments are small and there is no apparent accumulation of harmful residues from herbicides. However there is some indication that primary cultivation treatments affect soil organic matter (expressed as %C). As there seems no justification for continuing the whole experiment only one of the four Series will be retained with existing treatments.

Wheat. Cappelle-Desprez (26 ha) and Joss Cambier (16 ha) were the main varieties though some Cama was grown on experiments. There was much yellow rust (*Puccinia striiformis*) and take-all (*Gaeumannomyces graminis*) on the two latter varieties but all three were badly affected by mildew (*Erysiphe graminis*). Joss Cambier, unaffected by take-all, yielded 6·00 tonnes/ha, but an affected field yielded 3·39 tonnes/ha.

Maris Huntsman 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. As in 1971 it seems they did not because the mean of all varieties was 6·65 tonnes from the first site and 6·17 tonnes from the second. Corresponding yields of four varieties grown on two such sites in each of the past four years were 6·19 tonnes and 5·84 tonnes in 1972, 6·90 tonnes and 6·49 tonnes in 1971, 5·74 tonnes and 3·44 tonnes in 1970, and 7·50 tonnes and 5·92 tonnes in 1969. Nitrogen in excess of 126 kg/ha did not increase the yield. Despite the dry summer, in an experiment on winter wheat comparing two row spacings, two seed rates and two sowing dates, irrigation consistently lessened the yield.

Kolibri and Kleiber spring wheat were grown on 14 ha; they were relatively free from disease and stood well. Yields were poor; Kleiber with 98 kg/ha of nitrogen yielding 3·84 tonnes/ha and Kolibri with 94 kg 3·01 tonnes.

Barley. Julia (69 ha) remained the standard variety with Zephyr in some experiments. All the seed used on experiments was treated with ethirimol to control mildew, and where untreated seed was used there was much. There was little lodging. In an experiment comparing varieties, Julia with 6·93 tonnes/ha yielded most; Mazurka, the reported high yielding variety yielded poorly. Increasing rates of nitrogen adversely affected the mean yield which dropped from 6·80 tonnes at 38 kg/ha to 5·82 tonnes at 113 kg/ha.

Beans. Maris Bead (13 ha) was the main variety. The homegrown seed used proved to be infected with stem eelworms (*Ditylenchus dipsaci*) and sites of all experiments were found to have some, but in most cases not enough to affect yield. A small area (2 ha) of Minor seed, free from broad bean stain virus (BBSV) was grown and much will be used as seed in 1973. Wind and rain delayed simazine spraying and prevented it on one area where dinoseb acetate was used. The crop grew better than expected in the dry, cold weather, which induced lethargy of insect vectors of virus diseases, and lessened the

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severity of the early attack of bean aphids (*Aphis fabae*) which was controlled by applying phorate granules or 'Metasystox'. An attack in July was too late to do much damage and it was partially controlled by spraying the outsides of fields. The crop was harvested at the end of September; yields, which for the past two years have been small, returned to the average of about 3·77 tonnes/ha. In an experiment comparing varieties the mean yield was 3·25 tonnes/ha; in another on the control of bean aphids the best yield, as in 1971, was from phorate granules applied early but differences between treatments were small and may be masked by damage by stem eelworm.

Potatoes. King Edward was the main variety with small areas of Pentland Crown, Desiree and Majestic. Rothamsted-grown seed was used on most experiments but Stock Seed of King Edward and Pentland Crown from Northern Ireland was grown to provide seed for 1973; it was given an 'H' certificate. All seed was chitted but in the mild weather it was not possible to control the length of the shoots, many of which became long and etiolated. They were planted early and grew well at first but showed the need for water during July and August. The crop was sprayed against blight (*Phytophthora infestans*) twice in July and again in early August; 'Metasystox' was included at the second spraying. In the dry weather of August and September there was little blight (*Phytophthora infestans*). The seed crop was lifted in September followed by the maincrop. In an experiment comparing varieties Majestic gave a mean yield of 50·5 tonnes/ha, Pentland Crown 50·7 tonnes, King Edward 45·4 tonnes and Record 36·4 tonnes. Corresponding figures in 1971 were Majestic 58·5 tonnes/ha, Pentland Crown 53·2 tonnes, King Edward 56·7 tonnes and Record 42·2 tonnes. In an experiment on King Edward comparing row widths, rows 71 cm apart yielded more total produce than rows 91 cm apart, but the yield over a 4·45 cm riddle was almost identical; at both row widths seed spaced at 61 cm yielded most.

Grass. Most fields were given a high-nitrogen compound fertiliser in March; a mid-season dressing of an NK mixture was given to silage and hay aftermaths and 'Nitro-Chalk 25' to grazed fields. Many grass fields were irrigated as there was an increasing water deficit throughout the summer. Grass was plentiful throughout the summer but became scarce in autumn and forage from some hay aftermaths was cut and carted to cattle. Two fields were sprayed with asulam to control docks (*Rumex* spp.) and MCPA was used on some fields to control creeping thistles (*Cirsium arvense*).

Silage was made at the end of May but because of bad weather most of the hay was made in July. Much was battered but was cut by flail mower. Yields averaged about 6·3 tonnes/ha.

Cattle

Each autumn young Hereford-cross cattle are bought, most being outwintered on hay, silage and brock potatoes. They are sold fat from the grass during the summer and autumn and those not ready are finished in covered yards during the winter using the same ration but with the addition of home-grown concentrates. In 1972, 183 cattle were sold fat from the Rothamsted and Woburn farms.

In autumn 1972, 90 young cattle were bought. All bought cattle are dosed against liver fluke and with an organo-phosphorus insecticide against warble fly.

Equipment

In one experiment a Faun single-row potato harvester fitted with a bagging attachment was compared with hand picking. The harvester performed satisfactorily but because of the position of the soil chute can only be used on experiments where movement of soil is

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unimportant. There was an average loss of 3·3% tubers left on the ground. A minimum path width of 1·5 m is needed to ensure sufficient separation of plot produce if the harvester is not stopped.

New items of equipment include a rotary harrow and a spiked rotary cultivator.

Woodlands

Some of the young trees underplanted on 1 ha woodland late in 1971 have been damaged by barking deer (*Muntiacus*). Patching will be done in autumn 1973.

The 30-year-old plantations of beech, ash and an oak/beech mixture have been thinned to remove mis-shapen and defective trees.

Fifteen elm trees, mainly small ones, which were affected with Dutch elm disease have been felled and burnt.

WOBURN

All winter-sown crops were drilled early and those spring-sown in good time; all grew rapidly in April and May. In the dull, cold and dry summer the potato crops showed the need for water by July. Much of the grass for hay was battered by rain and winds, and was cut late. The corn harvest was easy and cereal yields were about average; beans yielded more than in the past two years. In a mild, dry autumn root crops were lifted and winter cereals sown by the end of November. At the end of the year some ploughing remained to be done.

The effect of weather on crops

The winter at Woburn was very mild with few severe frosts and little snow. Rain falling in January on 20 days and in February on 16 days made the land very wet. The first ten days of March were mainly mild and wet culminating in a blizzard on 11 March. In subsequent drying winds and warm weather the ground dried rapidly; drilling started on 14 March and 11 days later all cereals and beans were sown. Sugar beet was sown and potato planting started by the end of the month. In April planting was delayed by rain, and herbicide spraying by winds but they were finished by early May. In this month rain fell on 20 days but gave 14 mm less rain than average. June was mainly dull and cold, and though it seemed wet there were only 27 mm of rain on 12 rain days; the mean temperature was 2·4°C below average and there was one ground frost. Haymaking was delayed and the grass became over-mature but cereals and potatoes grew satisfactorily. Corn crops changed colour rapidly in a hot, dry spell in mid-July and by the end of the month some potato crops on light land were dying.

August, September and October were dry, but dull and cool; cereal harvest was uninterrupted and finished on 1 September. Potato lifting followed immediately; this and sugar-beet lifting finished at the end of November.

The lack of rain made the ground in autumn very hard; little ploughing was done, most of the stubbles being deep-tine cultivated. A rotavator was needed to produce satisfactory tilths on heavy ground for winter wheat; most was drilled by the end of October and that following potatoes by the end of November.

Much rain in early December prevented field work until the middle of the month. In the mild, dry spell which followed good progress was made with ploughing which was not finished by the end of the year.

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