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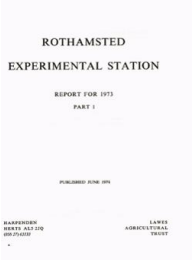
Report for 1973 - Part1

Full Table of Content


ROTHAMSTED
EXPERIMENTAL STATION
REPORT FOR 1973
PART 1

The Farms : Rothamsted

J. R. Moffatt

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THE FARMS

J. R. MOFFATT

ROTHAMSTED

The year was generally favourable for farm work. Despite the lack of winter frosts the ground was easily worked and it was the best spring for field work and sowing for many years; however, early growth was retarded by cold and rather dry weather. Hay was made in June under ideal conditions. Heavy rain in summer lodged cereal crops but in a hot and dry August they were harvested successfully. For the seventh consecutive year a warm and dry autumn enabled winter wheat to be sown early and made easy the lifting of potatoes and sugar beet. Ploughing was almost finished by the end of the year. Nine months in the year had less than average rainfall, the deficit for the year being 182 mm.

The effect of weather on crops

January and February were exceptionally mild with no frosts of any severity or longevity. Rainfall was less than normal in both months and there was only one light fall of snow in February. March was unusually dry and sunny; land work started on 8 March and continued without interruption until the end of the month. By then all beans, cereals, sugar beet, grass and clover seeds were sown, and potato planting started. By the end of the month rain was needed badly, the three months January–March had a total of 60 mm rain compared with the average of 161 mm.

The first part of April was cold, wet and windy with several quite sharp frosts which delayed plant growth. As the weather improved in the latter half of the month the top dressings of nitrogen were given to winter wheat which was also sprayed with herbicide. Potato planting started earlier and finished on 20 April, about two weeks earlier than usual. Rain and strong winds in the early part of May delayed the spraying of spring cereals and potatoes. There was much rain in the last two weeks and all crops grew rapidly.

June was dry, warm and sunny until the 19th after which there was heavy rain with thundery spells which lasted until the end of the month. Although rain fell on only six days in the month the 86 mm of rain was 29 mm above average; some wheat and barley was lodged. Excellent hay was made early in the month. Early July was hot and dry but the rest of the month was dull and cool with frequent spells of heavy rain. Many cereal crops lodged badly and a lot of secondary tillers appeared in the barley. Further rain early in August increased the lodging but the rest of the month was mainly dry, hot and sunny, and only on about three days was harvesting not possible. The fine hot spell continued well into September and the harvesting of all cereals and pulses finished about a week earlier than usual.

In the latter half of the month the weather became unsettled and cool; in October there was only 33 mm of rain and the dry weather continued well into November. This greatly facilitated the lifting of potatoes and swedes which finished on 16 November. A period of frosts followed which at first suited sugar-beet lifting, but as they became more severe lifting stopped as the roots were frozen in the ground; ploughing was also stopped. In a mild spell early in December the beet were all lifted; ploughing continued but was not quite finished by the end of the year.

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Cropping

Of the 264 ha farmed, 186 were under arable crops or fallow, 32·4 under short-term leys or lucerne and 45·3 under permanent grass. The main crops were wheat (34·8 ha), barley (100·4 ha), oats (4·5 ha), beans (10·5 ha), potatoes (14·2 ha) and fallow (19·8 ha). Small areas of sugar beet and swedes 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 and 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 made the stubbles too hard to plough but also retarded the growth of perennial grass weeds. A deep-tine cultivator was able to penetrate the ground so many fields were cultivated instead of being ploughed. Aminotriazole or TCA was sprayed where there was couch grass, and paraquat where weeds or volunteer corn were many and ploughing was delayed.

All cereals were rogued for wild oats; on two small areas where the infestation was bad a herbicide glove impregnated with dalapon was used.

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

Field experiments and crops

There were nearly 5000 full-scale plots and yields were taken from about 3640. In the dry autumn 1972 wheat was drilled early, and was completed by 9 November.

On Broadbalk 'Prebane' (terbutryne) was used to control blackgrass (*Alopecurus myosuroides*) except for Section 8; wild oats were hand pulled twice and they were almost twice as numerous as in 1972. Section 8 (the unsprayed section), though fallowed in 1972, became very weedy. Heavy rain and strong winds in June flattened the crop on a number of plots, mainly of this section. Horsetails (*Equisetum*) seemed less vigorous than in 1972. Bent grasses (*Agrostis* spp.) were very prevalent on some plots of Sections 8 and 9, and to a less extent on Section 0, so Sections 0 and 9 were sprayed with aminotriazole some weeks after harvest. Wheat yields were well below those of 1972. Beans grew reasonably well; weeds between rows were controlled mechanically but those in the rows spread rapidly and covered the surface. Yields were slightly better than average. The mean potato yield was 7·5 t/ha better than in 1972 and several plots receiving complete minerals and high nitrogen yielded 10–15 t/ha more. This may be due to less competition from horsetails (*Equisetum*) which were prevalent in 1972.

The Julia barley on Gt. Hoos plots was rather patchy, probably the result of uneven application of nitrogen. There was some lodging on plots receiving full minerals and much nitrogen, while the FYM plot lodged badly. There were more wild oats than in 1972. Yields were much below those of 1972, the FYM plot yielding 0·78 t/ha less; straw yields were also lower. The bean and barley stubble was sprayed with paraquat to keep weeds and volunteer corn under control until ploughing could be done.

On the Exhaustion land the Julia barley was less vigorous than usual; grain yields were far less than in 1972 but straw yields were much greater. As there was no lodging this cannot be the cause of the small yields. The stubble was sprayed with aminotriazole to control couch grass.

The wheat on the Half Acre wheat and fallow yielded 0·59 t/ha more than in 1972.

On Barnfield the King Edward potatoes and sugar beet, planted early in good seed-

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beds, grew well. Because of the risk of spray drift on to the beet seedlings, weeds in the potatoes were controlled mechanically, as were those in the sugar beet. Nitrogen effects were very marked in the colour of the tops of both crops; sugar beet yields varying from 11·8 t/ha with no nitrogen to 38·6 t/ha with 216 kg/ha, and potatoes from 16·4 t/ha with no nitrogen to 33·4 t/ha with 216 kg/ha. On some manurial strips many potato tubers were affected with pink rot (*Phytophthora erythroseptica*), some so badly that they were not picked up. Beans were grown for the seventh successive year on Series 1 (old Series 0), but the crop was very poor. The plots were again split into four to test the immediate and residual effects of simazine; the 1973 application lessened the mean yield by 0·94 t/ha; in 1972 the yield was lessened by 0·40 t/ha and in 1971 by 0·45 t/ha. The two plots receiving FYM were foul with creeping thistle (*Cirsium arvense*) despite several hand hoeings.

The Cultivation/Weedkiller experiment completed its full term in 1972 and the results showed little effect of different cultivation treatments or herbicide residues. However, as there was some indication that the cultivation treatments had affected soil organic matter (expressed as % C) one of the four Series is being retained. The same treatments are given except that the plots which received minimum cultivations are now shallow ploughed for all crops except potatoes, for which ploughing is done to the normal depth, and all rotavations used on treatment 'A' are now done with a spiked rotavator. Bouquet wheat which replaced Cappelle used in the past yielded 0·71 t/ha less than in 1972.

Wheat. Cappelle-Desprez (27 ha) and Bouquet (5 ha) were the main varieties though some Maris Huntsman (2 ha) was grown. All the seed sown on areas after fallow or potatoes was dusted with mercury/dieldrin, though tests made by the Insecticides Department showed that the amount of dust on the seed was far less than the optimum. In April the crop showed the need for nitrogen so 'Nitro-Chalk 25' was given earlier than usual. There was some mildew on winter wheat and much leaf spot (*Septoria nodorum*), especially on lodged crops. Eyespot (*Ophiobolus graminis*) was more prevalent than usual where wheat followed another cereal, but the incidence of take-all (*Gaeumannomyces graminis*) was about average.

Yields were similar to those of 1972, the mean yield of the variety experiment being 7·06 t/ha compared with 6·65 in 1972. As in 1972 the best yield was obtained from Maris Huntsman (8·39 t) closely followed by Maris Templar (8·29 t) and Maris Nimrod (7·80 t). Cappelle (5·76 t) gave the smallest yield of the eight varieties grown. The two 'quality' wheats gave poor yields, Bouquet 6·23 t and Maris Widgeon 5·84 t. Although there is a price differential of about £3/ton in favour of these wheats this is not nearly enough to compensate for the lower yield. Except for Maris Freeman and Maris Huntsman, nitrogen in excess of 63 kg/ha lessened the yield. In a similar experiment on a site affected by cereal diseases the mean yield was 5·11 t but the same three varieties and Champlein topped the list. Cappelle, Maris Widgeon and Bouquet again gave poor yields; nitrogen in excess of 63 kg/ha occasionally slightly improved yield.

Barley. Julia (86 ha) remained the main variety with Zephyr and Mazurka in some experiments. Most of the Rothamsted-grown Julia seed was cleaned and dusted against mildew (*Erysiphe graminis*) with ethirimol by a mobile machine. Sown early, the crop grew rapidly in April and May but was badly lodged by heavy rain, and because of the many secondary tillers producing green grain most had to be dried at harvest. There was much mildew (*Erysiphe graminis*) where untreated seed was used but little where the seed was dusted with ethirimol or the crop was treated with tridemorph.

Yields were generally rather less than in 1972. In an experiment comparing varieties the mean yield was 6·21 t/ha compared with 6·35 in 1972. The best yield was from Maris

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Mink (7·39 t), closely followed by Universe (7·35 t). Mazurka, the reported high yielding variety, gave a poor yield (5·81 t). Julia with no mildew control yielded 5·29 t/ha; with seed treated with ethirimol the yield increased by 0·8 t, and spraying with tridemorph increased it by 0·94 t. Nitrogen in excess of 38 kg/ha lessened the yield in nearly all cases.

Oats. For the first time for many years a small area (4 ha) of Peniarth winter oats were grown. They grew satisfactorily and promised a good yield. The crop was standing well early in August when cutting started but a spell of stormy weather caused much lodging with consequent loss and discoloration of grain.

Beans. Minor (9 ha) and Maris Bead (1 ha) were the main varieties. Rothamsted-grown Minor seed, free from broad bean stain virus (BBSV) was used, but virus-free Maris Bead seed was purchased. Simazine was used as a pre-emergence spray. The crop grew well in May and early June and was sprayed with 'Metasystox' or dusted with phorate granules just before flowering to control black aphids (*Aphis fabae*). A second invasion started in the hot weather in June but the crop was then too tall to spray; however, heavy rain and cool weather restricted their spread. The crop was damaged by the storms, many of the stems 'kneeing' over at a height of about 1 ft from the ground. This complicated harvesting, especially of experimental plots, and though the crop was cut at a rather earlier stage than usual, cutter-bar losses were serious. Yields averaged about 4 t/ha. In an experiment on the control of bean aphids the mean yield was 4·02 t/ha, but the best yield, as in 1971 and 1972, was from phorate granules applied early.

Potatoes. King Edward was the main variety with small areas of Pentland Crown, Majestic and Record. Rothamsted-grown seed, produced from Northern Ireland Stock Seed, was grown on most experiments, but Scottish VTSC seed of King Edward and Pentland Crown was planted with phorate granules and in isolation to provide seed for 1974. All seed was chitted and although the winter was mild, heat was used in the chitting house to accelerate the growth of sprouts as planting started early. A linuron/paraquat mixture was sprayed to control weeds. All varieties grew well in June and July; an aphicide was incorporated in the first spray against blight (*Phytophthora infestans*) and two further sprayings were done. There was little blight except on unsprayed experimental areas. The seed crops were very vigorous when their haulm was destroyed in August. The destruction of the haulm of maincrops started in mid-September and lifting started about ten days later. This was hampered by the shortage of pickers but experiments were all cleared before the end of October; the lifting of discard and non-experimental areas finished on 16 November. The tubers were of good size and shape with little disease or scab except in Barnfield where many tubers were affected by pink rot (*Phytophthora erythroseptica*). On one area slug damage was widespread. In an experiment comparing varieties, Pentland Crown gave a mean yield of 51·6 t/ha, Majestic 49·6 t, King Edward 48·6 t and Record 35·9 t. These results are very similar to those of 1972.

Grass. All grass fields were given either a high-nitrogen compound fertiliser or 'Nitro-Chalk 25' in late February; fields cut for silage or hay were given a mid-season dressing of an NK mixture while grazed fields received 'Nitro-Chalk 25'. By mid-June the water deficit under grass was about 4 in., so many fields were irrigated to wash in the fertiliser. Grass grew ahead of stock in the wet weather in late June and July, and some good second-cut hay was made in late July/August. One field was sprayed with azulam and mecoprop to control docks (*Rumex* spp.) and chickweed (*Stellaria media*), and others with 2,4-D to control creeping thistles (*Cirsium arvense*).

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Silage was made at the end of May; a formic/propionic acid additive was used at cutting to improve fermentation. Cutting for hay started early in June and all was made and baled, and most was carted, before a spell of heavy rain in the middle of the month.

Cattle

Each autumn young Hereford-cross cattle are bought, and all are dosed against liver fluke and with an organophosphorus insecticide against warble fly. Most are out-wintered on hay, silage and brock potatoes, and are sold fat from the grass during the summer and autumn. Those not ready are finished in covered yards during the winter using the same ration but with the addition of home-grown concentrates. In 1973, 165 cattle were sold fat from the Rothamsted and Woburn farms. In autumn 1973, 139 young cattle were bought.

Equipment

In one experiment a German-made 'Sprint' single-row bagger potato harvester was compared with hand picking. The harvester performed satisfactorily and left very few tubers in the ground provided there was no haulm. It was more satisfactory than the 'Faun' for plot work as the soil is returned to the plot from which it came. The rate of work was slow but should improve as techniques are developed.

Staff

Of the Recorder Staff, F. V. Cooper retired and A. M. Percival left. Susan Quan and K. Sykes were appointed.

WOBURN

Although the land in autumn 1972 was hard, and much had to be deep-tine cultivated instead of being ploughed, the winter wheat, sown reasonably early and after a mild, dry winter, produced some excellent crops. Spring sowings started in February 1973 and during a long dry spell most were finished earlier than usual. Excellent hay was made, though a few bales got wet before carting. Very heavy storms in May and June caused severe lodging of much wheat and barley, and severe erosion on sloping land. A dry August enabled even this lodged corn to be harvested without much difficulty, and in a warm and dry autumn, potatoes and sugar beet were lifted in good conditions, despite serious shortage of labour, and winter wheat was sown in good time. Ploughing was finished before the end of the year. Nine months in the year had less than average rainfall, the deficit for the year being 146 mm.

The effect of weather on crops

In early January the ground was dry and ploughing finished by 10 January. The weather during the whole of January and February remained generally mild and dry, and the one slight fall of snow soon melted. The land dried well, and field bean drilling was almost completed by the end of February. In March rain fell on only five days, and before the end of the month all spring cereals, sugar beet and most of the small seeds were sown; the barley land and much of the winter wheat was rolled and potato planting started. The rainfall for the first three months of the year was 50 mm (average 136 mm).

April was mainly cold, wet and windy which delayed germination and early growth. However, potato planting was finished by the end of the month, nitrogen applied to winter

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