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ROTHAMSTED RESEARCH

Report for 1964

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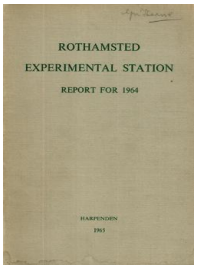

The Farms : Rothamsted

J. R. Moffatt

J. R. Moffatt (1965) *The Farms : Rothamsted ;* Report For 1964, pp 233 - 240 **- DOI: https://doi.org/10.23637/ERADOC-1-57**

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THE FARMS

J. R. MOFFATT

ROTHAMSTED

The wet autumn 1963 delayed drilling of winter wheat and prevented the sowing of winter beans, but after a fairly mild winter the land dried in January and early February, and barley drilling started much earlier than usual. Despite this, changeable weather later delayed work, which at the end of April was several weeks behind schedule. In the very wet June most of the early cut hay was spoilt, but a fine spell at the end of this month and early July allowed the rest to be made into hay of excellent quality.

The corn crops grew well and ripened more quickly than usual; harvest started early, and with almost no interruption was finished in 4 weeks. Wheat yielded well and barley exceptionally so.

The chitted potato seed grew rapidly at first, but drought later caused the plants to die early, and yields suffered. The ground was hard and dry when the root crops were lifted.

Autumn ploughing was delayed, and it was difficult to get seedbeds for winter corn, but by December all ploughing was finished and winter wheat and beans were drilled.

By the end of the year field work was, for the first time for many years, as far forward as it could be.

The total rain for the year was 7·29 in. below average, with each of the last 6 months being less than usual. Except for June and October, the summer and autumn were warmer than average, though the hours of sunshine were 108 fewer.

The Effect of Weather on Crops

The winter started with a very wet and stormy November 1963, when 4·64 in. of rain delayed all field work. There was an improvement in December, and dry weather lasted until about mid-March, and rain for December, January and February was 4·37 in. less than average. Although the winter seemed mild, there were 23 ground frosts in December, 26 in January, 19 in February and 17 in March; the only spell of severe weather was in mid-February, when there was snow, sleet and some hard frosts, with temperatures falling to 14° F.

Winter-wheat drilling finished in mid-December, but a few acres were sown by spinner-broadcaster early in February. In the dry weather dung was spread for potatoes and ploughing finished. The land dried in early February, spring cultivations started on 10 February, and sowing the next day; good progress was made until work was stopped a few days later by snow and rain.

During the last week in February fertilisers were put on grassland, and a grass field was ploughed for spring wheat, but the arable ground was still wet. Heavy rain on 29 February postponed further work until

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6 March, when in a fine week excellent progress was made with spring cultivations and sowings. The ground broke down easily and seedbeds were excellent. In mid-March rain and snow for 30 hours gave precipitation in 2 days of 1·82 in., and the wet spell continued until the end of the month. The total rain in March was 3·30 in., of which 3·24 in. fell in the second half. Despite the early start, spring sowings were behind schedule at the end of March.

In early April there was little rain and a cold east wind dried the ground. Corn, bean and sugar-beet drilling was finished by 10 April, and nitrogenous top dressings were given to winter wheat. Potato planting started on 10 April, but was stopped after 5 days by rain. In the first 2 weeks of April there was 0·55 in. of rain, but in the last 2 weeks there were 2·78 in., almost twice the average for the whole month, which seriously delayed field work.

May was mainly fine though cold and blustery, which delayed cereal spraying. However, sowings were finished, as was spraying with herbicides during a calmer spell in the last week. Most of the herbage for silage was cut in this spell, and a little hay.

The first 3 weeks of June were dull, cold and wet, and produced 4·01 in. of rain and several heavy thunderstorms, which ruined the early cut hay and caused some barley to lodge. The end of the month was dry and warm, and as this weather continued into July, haymaking was quickly finished.

July was drier and warmer than usual. By the end of the month cereal crops were turning colour fast, and the beans looked healthy and vigorous, but potatoes were beginning to turn yellow.

The warm, dry weather lasted through August and September; cereal harvest started early and finished on 5 September, the date the 1963 harvest began. Very little grain needed drying. Potato lifting started 3 weeks earlier than usual, but the ground was almost too dry and hard. In a dry and sunny October mangold, swede and sugar beet were lifted under ideal conditions, but with ground so hard that two tractors were needed to pull the beet lifter.

Several areas of stubble were too hard to plough early, and those ploughed turned up rough and dry, so that seedbeds for wheat and beans had to be forced by disc harrows. On these areas germination was rather slow and uneven. The long dry spell ended in the middle of November, though both November and December had less rain than average, and by the end of November the crops looked reasonably uniform. In November dung was carted and ploughed in, and all other ploughing was completed by about mid-December. Seldom, if ever, had land work been as far forward as it was at the end of 1964.

The dry weather led to a shortage of grass in late summer and there was no autumn flush, so no late silage was made.

The rain during the last 6 months of 1964 was almost 9 in. less than average. Weather in December was mainly mild and damp, but there was a wintry spell around Christmas, with 3 in. of snow on 26 December, and several severe frosts, the coldest 9° F.

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Field Experiments

There were 3,626 full-scale field plots and several hundred microplots, many more than in any previous year. This large programme was completed only because the spring work started so early and the dry summer allowed all crops to be harvested easily and quickly.

Most of the wheat experiments were sown in October, and all spring crops were sown in good time and under good conditions. Barley lodged on many plots, but wheat lodged only on Broadbalk, which was drilled on 30 October 1963, much earlier than usual, and the seed germinated rapidly. The few wild oats were pulled on two occasions and took a total of 13 hours. Horsetails (*Equisetum arvense*) were numerous on strips 3 and 5 of Sections 1a and 1b, and were hand pulled early in June. Lodging was more severe than for several years, with many of the plots almost completely flat. In 1963 the weeds were so numerous, except on the two half sections sprayed, that the recorded yields were of little value; to prevent this recurring the whole field was sprayed with herbicides except Section Va. The results were dramatic, and weeds were few, except on Section Va, where they were prolific. Plot 18 (minerals only in 1964) of this Section was almost completely smothered by vetches.

Lodging was also worse on Section Va than where herbicides were used, but in the fine weather the laid plots were harvested without difficulty. The field was too hard to plough until mid-October, and as the ground seemed too dry for blackgrass to germinate quickly, it was worked and drilled under excellent conditions on 26 October 1964. A few patches of couch grass (*Agropyron repens*) are developing, and rhizomes were forked off four plots on Section 1a.

On Hoosfield Wheat and Fallow the new variety Rothwell Perdix was grown alongside Squareheads Master 13/4 to compare their behaviour in infertile soil. The plant of Perdix looked thin and backward early in the season, but improved later, and on all sub-plots yielded about twice as much as Squareheads Master. Straw yields of the two varieties were similar.

Hoosfield permanent barley plots were sprayed in the autumn with dalapon against couch grass. The plots were split to compare Plumage Archer with the new mildew-resistant variety Maris Badger. As this stiff-straw variety will withstand and respond to more nitrogen, the standard dressing of 43 lb/acre N was doubled for the Maris Badger. Drilling was delayed until 10 April to get an early germination of wild oats, but few appeared then or in the subsequent barley crop. These were pulled in 8½ man-hours. There was very little lodging. On plots without nitrogen the two varieties yielded equally, but the doubled quantity of N given to Maris Badger about doubled its yield.

The Exhaustion Land was sprayed with dalapon against couch. Maris Badger replaced the Proctor grown in 1963. The crop grew well and there were few wild oats.

Bad weather delayed the cutting of the Park Grass plots until 29 June, but the hay was made and carted in excellent condition. Yields were about average. The grass made a very poor recovery and there was very little by

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5 November, when the second cut was made. Some plots were cut and yields taken, but many were topped over with a mower and left.

The plots of Barnfield, the classical mangold experiment, were split for 4 rows each of mangolds and potatoes. In the past powdered fertilisers have been mixed and applied to each plot separately, but this year granular fertilisers were applied to whole strips. The type of fertiliser and amount were chosen to give the same amount of potash as in the past, which meant extra phosphate was given to most plots. The mangold seed was dusted with BHC, but this caused severe stunting and yellowing of many plants, especially on plots 4AC and 4C. Mangold fly (*Pegomyia betae*) also did damage, but no spray was applied to control it. Singling was made difficult by the uneven plant, and at the end of July the field still looked peculiar; some plants were growing fast, but their neighbours were yellow and stunted, some only an inch or two high. The undamaged plants grew well considering the dry period, and the weeds were easily controlled. A black aphis infestation was controlled by a menazon spray. Conditions at lifting were perfect.

The oat plots of Highfield Ley–Arable experiment were severely damaged by birds after planting, and were resown as late as 28 April. The early drilled sugar beet failed in both Highfield and Fosters, and was re-drilled on 7 May. The crop was sprayed against *Pegomyia betae* and black aphis. On both fields the grasses and grass–clover mixtures grew slowly and there were fewer cuts and less yield per cut than usual. The lucerne was cut as often as usual.

All potato experiments, except those requiring special lots of seed, were planted for the first time with Rothamsted-grown seed, all seed was chitted and planted by machine from chitting trays.

Cropping

Of the 451 acres farmed, 290 were under arable crops or fallow, 102 under short-term leys or lucerne–grass mixtures and 62 under permanent grass. The main crops were wheat (85 acres), barley (108 acres), beans (30 acres), oats (4 acres), potatoes (35 acres), and kale, mangolds, swedes and sugar beet (6 acres). Twenty-one acres were fallowed.

The basic three-course rotation of wheat, barley and either roots or beans was varied to provide sites for current and future field experiments. Potatoes were the main root crop, as only a little kale was needed and sugar beet is unsuited to our heavy land. The balance of the root break was sown to beans, which make little demand on labour and are harvested by combine. Several fields are kept acid or deficient in phosphorus or potash to provide sites for fertiliser experiments. Some of these do not give worth-while arable crops and are kept under long-term leys or fallow. Experiments needing fertile ground were sited in fields normally in the three-course rotation.

Crops

Wheat. Winter wheat was drilled at 7-in. spacing except on two areas where the soil was wet and the seed was sown by spinner-broadcaster.

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Spring wheat was sown reasonably early in good seedbeds. All wheat grew and looked well throughout the season, but take-all, eyespot and mildew were all widespread, and in some crops severe. The crops ripened early and evenly; Cappelle winter wheat averaged more than 40 cwt/acre and spring wheat about 30 cwt/acre, Opal yielding more than Jufy.

In an experiment comparing winter- and spring-sown varieties the largest yield of winter wheat (Rothwell Perdix) was 58·5 cwt/acre, whereas the largest of spring wheat (Opal) was 44·0 cwt/acre. Prestige sown in winter gave 10 cwt/acre more than when spring sown, but sown in winter yielded less than true winter varieties, and sown in spring less than true spring varieties.

Comparisons of methods of sowing seed and of different seed rates showed no difference in yield of winter wheat with the same fertiliser between seed broadcast, drilled at 4-in. or 7-in. spacing, or combine-drilled at 7-in. spacing.

Barley. Because it resists mildew, Maris Badger barley replaced Proctor in most of the experiments and on some non-experimental areas, but Cambrinus occupied the biggest acreage. Some Proctor was grown, but in future only mildew-resistant varieties will be grown.

Seedbed preparations started early, and on 11 February a field of Cambrinus was sown by spinner-broadcaster, sowing the seed and fertiliser separately; this yielded 44 cwt/acre. Other fields were combine-drilled at 7-in. spacing. In an experiment on methods of sowing and seed rates, similar to the one with wheat, broadcast seed of Maris Badger yielded more than the 7-in. row spacing. Eyespot was severe on many areas and caused extensive lodging, but in the fine weather this caused no difficulty at harvest Mildew was widespread and severe on Proctor. Yields were exceptional, and averaged over 40 cwt/acre; quality was good. In a variety trial Impala gave the biggest yield of 47 cwt/acre, and was least lodged.

Oats. Only a very small area of Condor spring oats was grown.

All corn except that undersown to ley was sprayed with CMPP/2,4-D or MCPA/2,4-DP to control polygonum spp.

Some areas of stubble, mainly headlands, were sprayed in autumn with aminotriazole against couch grass.

Beans. The wet autumn prevented winter beans being sown. Spring varieties were drilled at 10½-in. spacing in March and April and were sprayed with simazine soon after drilling. This controlled weeds well, and no inter-row cultivations were given. Patches were infested with black aphids in July, but they caused little damage. The crop grew well and ripened earlier than usual, and the stems, though tall, were not unwieldy. Yields were larger than usual; an experiment testing row spacing and seed rate indicated that neither of these factors was important in 1964, and the mean yield exceeded 33 cwt/acre.

Sugar beet, kale and swedes. Only a small area of each of these crops was grown. They grew well early in the season, but only slowly after mid-

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July. All yields were smaller than usual, but the bigger sugar content of the beet gave a total sugar yield not much less than average. There were no bolters. Sugar beet was sprayed with menazon early in July against green aphis, and in late July against black aphis. Weeds in sugar beet and swedes were controlled by few mechanical and hand operations; those between the rows of kale were controlled, but the fat hen (*Chenopodium album*) in the rows grew more rapidly than the kale and overtopped it most of the season. In future kale will be sprayed to kill weeds in the rows.

Potatoes. Excellent seedbeds were produced by a single rotary cultivation after applying fertilisers. A granular systemic insecticide was applied at time of planting, which was delayed by bad weather. However, the chitted seed soon came through, on several areas too soon to use a contact pre-emergent weedkiller because the plants emerged before many weeds had germinated, so mechanical weeding was substituted. The crop grew rapidly in the wet June and July; the yield of King Edwards from samples lifted on 9 July was 5 tons/acre and on 12 August was 10½ tons/acre, but there was little increase after that. A similar experiment in 1963 gave 5·2 tons/acre on 6 August, but the plants grew later into the autumn.

Because of a blight warning in late June, the crops were sprayed with mancozeb, but the hot dry weather later prevented the attack from developing. King Edward was sprayed twice more and Majestic once more.

By the end of July a few areas were dying back; the seed crop was burnt off on 25 August and lifting started on 8 September, but some areas were so hard and dry that the lifter did not penetrate to the proper working depth and many tubers were damaged. There was too little soil on the tubers to cushion them on the lifter and there was more bruising than usual. Scab was widespread, and on a few areas severe.

New certified stocks of Majestic and King Edward from Northern Ireland were grown in isolation to produce seed for 1965, and both varieties were given an H certificate. They were burnt off at the end of August to give a large proportion of seed-sized tubers.

Although chitted seed seemed so much more vigorous in the early part of the season, yields from two experiments showed an increase of only ½ ton and 1 ton/acre over unchitted, possibly because the growing season was short. There was no difference in yield between Irish and home-grown seed of Majestic or King Edward. King Edward averaged about 10 tons and Majestic about 12 tons/acre total yield.

Grassland. Most of the grass fields were harrowed and given their first dressing of a high-nitrogen compound fertiliser in late February or early March. Growth was slow until mid-April and to avoid poaching, cattle were not turned out until early May. The wet April, followed by a warm May, made the grass grow rapidly, and silage cutting started on 21 May. A smaller proportion than usual of grass was conserved as silage, and more was made into hay. A little grass cut towards the end of May and about mid-June suffered from the June rain, but it was baled at the end of the month and the hay looked in surprisingly good condition. Cutting started again on 24 June, and by 1 July the other hay fields were cut and crimped, and by

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6 July it was all made and carted in, in excellent condition. One field was so badly laid by storms that it could be cut by a flail forage harvester only, at slow rotor speed. A first cut of a hay mixture in its first year gave 66 cwt/acre of hay. The hay fields were all top dressed with 40 units of nitrogen to encourage the aftermath, but the little rain prevented a quick recovery. By the end of July grass was scarce, as the pastures had been grazed tightly and there was little aftermath. There was no growth in late summer or autumn, and the grassland became very bare and brown except where irrigated.

The sprinkler irrigation equipment was used in the autumn on about 70 acres of grass; about 40 units of nitrogen were given before applying 1½–2 in. of water per acre. This produced valuable grazing on fields that would otherwise have been bare.

Livestock

Cattle. Forty-six forward cattle were brought into covered yards early in December. They were fed on silage, brock potatoes and kale, with a little hay and home-grown concentrates; some were sold fat each week, the last early in May. Fifty-three yearling Hereford bullocks were bought in November 1963 and were outwintered until mid-February 1964, getting the same ration except for the concentrates. However, as they were losing weight and puddling the grassland, 28 of the smallest were then bought into a covered yard and given concentrates; those remaining out were given more coarse food. Both lots then increased at 1 lb/head per day. The yarded cattle were turned out to grass on 6 May. Both lots made liveweight gains of over 2¾ lb/day during May, and 2 lb/day during June, July and August. There was enough grass until the end of July, but by late September there was so little that home-grown concentrates and brock potatoes were fed. Hay was fed to all cattle from early October. The cattle were sold as they became fit; the last 8 were yarded in early November, and all were sold by the end of the year. Altogether 103 cattle were sold fat during the year.

Fifty-two cattle were bought in autumn 1964; they were yarded in December and are being fed to give a liveweight gain of 2 lb/head. All were treated with an organophosphorus insecticidal wash against warbles in November.

Sheep. In October 1963, 167 ewes, mainly Scotch Half-breds, were mated to Suffolk rams after flushing on fresh grass. Feeding with hay started early in January, and concentrates were fed in increasing amounts over the 6 weeks before lambing. The final lambing percentage was 134, and all but 2 of the lambs were sold by the end of the year. Twelve ewes died during the year and 13 were culled, but 29 home-bred Suffolk Cross Half-bred gimmers were added to the flock. They were flushed on grass, brought on by irrigation, before being mated to Suffolk rams in 1964. Because of the scarcity of grass, hay feeding started in late October.

The ewes were injected in autumn and spring with a combined vaccine, and lambs were injected at weaning. Ewes and lambs were drenched with a nematicide during the summer.

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Equipment

The tanker-combine adapted by the suppliers in 1963 for quick conversion to a bagger for harvesting plots was so successful that a second machine was similarly adapted in 1964.

A two-row potato planter able to carry and plant chitted "seed" was fitted with a machine to apply granular systemic insecticides at time of planting.

A double-knifed mower with a p.t.o. extension for a crimper is now used on grass for hay. A 4-in.-row general-purpose seed drill is used for sowing grass seeds and some cereal experiments.

A light, high-clearance, narrow-wheeled tractor was fitted with a sprayer specially designed for use on plots. The boom has stop cocks that alter the effective width to suit plots of different widths. Five polythene containers mounted on the front of the tractor permit small amounts of different materials to be sprayed with little waste, and the minimum loss of time in filling.

Irrigation plant. An irrigation plant has been installed to supply water over a large part of the farm; it will be used for both experimental and non-experimental crops.

Water is pumped from a 300-ft borehole at 5,000 gal/h into a 150,000-gal reservoir, from where it is pumped into a 5-in. underground main, of which there is about 1⅓ miles with several take-off points. Four-inch portable aluminium mains carry the water to most parts of the farm. Two acres can be irrigated at any one time using sprinklers which can apply 1 in. of water in 4 hours.

Oscillating spray-line equipment is used for experiments involving irrigation.

WOBURN

Spring work started early, and most crops were sown in good time under satisfactory conditions. A very wet June delayed haymaking, but later, in good weather, excellent hay was made; there was then a long dry period until mid-November. Each of the last 6 months had less rain than usual, and the yearly total of 17·9 in. was 6·8 in. less than usual. Hours of sunshine were slightly fewer than average. Winter wheat did exceptionally well, but barley was rather disappointing. The weather at harvest was good, and very little corn needed drying. Potatoes and sugar beet suffered from the drought and yielded less than usual; the dry and warm weather during lifting made the work easy, but the soil was very hard and dry. Autumn ploughing and drilling was delayed by the hard ground, but all field work was completed by the end of the year.

The autumn of 1963 was very wet, but winter wheat was drilled early. December, January and February each had less than 1 in. of rain; in a spell of frosty weather in January dung was spread and ploughed in for sugar beet, and all ploughing was finished. In early February most of the heavy land was worked for spring corn, but little drilling was done. The early

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