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Report for 1968 - Part 1

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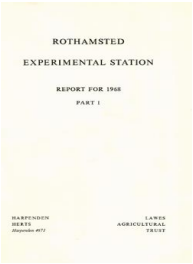

The Farms : Rothamsted

J. R. Moffatt

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THE FARMS

J. R. MOFFATT

ROTHAMSTED

This was a very disappointing year. The summer was wet and dull, and each of the months May–August had more than 50 hours less sunshine than average. Only March and April had average sunshine, and the deficit for the year was 366 hours. This was probably the main reason for the small yield of all cereals and pulses, as straw yields were more than usual. Most of the barley lodged early but little wheat was lodged; the quality of all grain is poor. The root crops grew well and gave average yields. The 30·5 in. of rain was 2 in. more than average and it rained on 189 days.

The wet autumn of 1967 delayed the drilling of winter wheat, which was not finished until late February. The winter was mainly mild, and in a dry, cold spring, crops were drilled early. Some excellent hay was made early.

Most of the winter wheat was drilled early, but heavy rain in September delayed potato lifting. The ground remained wet and ploughing was not finished at the end of the year.

In November a fire of unknown origin destroyed one barn and damaged another. About 230 tons of hay and 150 tons of straw were burnt, and water damaged about 240 tons of potatoes in an indoor clamp.

The effect of weather on crops

The first week of January brought rain, sleet, frost and snow; 8 in. of snow fell in one night. It remained cold until mid-January when there was a mild, damp spell. Very little land work was done. February was dull and damp, with little rain but 24 ground frosts. Ploughing was finished and grassland was harrowed and fertilised.

During the last few days of February and the first three weeks of March, strong winds dried the ground, which worked down easily. Beans were drilled by 9 March, cereals and rape by 12 March and sugar beet by the end of the month; potato planting started at the end of March.

The weather remained dry but cold until mid-April when heavy rain and a rapid rise in temperature caused all crops to grow rapidly. During a fine spell towards the end of the month, potato planting was finished and winter wheat was top-dressed.

May was cold, dull and showery; rain fell on 17 days, sunshine was 50 hours fewer than average and there were 4 ground frosts. Spraying to control weeds in cereals was affected; some areas had to be done twice because of rain, and on 55 acres the crop became too tall to be sprayed. Grass grew vigorously and silage-cutting started on 22 May.

In early June dull spells alternated with fine spells, during one of which most of the hay was cut and quickly made. Heavy rain towards the end of June caused barley to lodge; total rain was about average but it fell on 17 days. Sunshine was 50 hours less than average.

The first few days of July were fine, sunny and hot, and some late hay

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was made. The rest of the month was dull, cold and wet; rain was more than average and the mean temperature and hours of sunshine much less than average. Grass and potatoes grew rapidly, and some potatoes developed blight.

The dull, wet weather during the first three weeks of August prevented potato spraying and haulm destruction, and delayed the start of cereal harvest. However, progress was made in the last ten days. Rain fell on 18 days and there were 70 fewer hours of sunshine than average. In early September weather was very mixed but cereal harvest was finished on 11 September, and beans, which ripened earlier than usual, on 13 September, just before the two days when 2·93 in. of rain fell. There were 5·46 in. of rain in 21 wet days, and 38 fewer hours of sunshine than average. A few potatoes were lifted towards the end of the month. The shed corn and grass weeds grew vigorously and about 150 acres of stubble were sprayed with paraquat.

In early October weather was variable but little rain fell during the second half of the month. The surface of the ground dried and good progress was made with potato lifting and drilling winter wheat. After ploughing, seedbeds had to be forced by reciprocating harrows, disc harrows or a rotavator, but land deep-tine cultivated after potatoes worked down easily; all wheat was drilled under satisfactory conditions.

A wet spell, which started towards the end of October and continued well into November, delayed potato picking. The weather remained mild and damp and, though rain was less than average, it fell on 18 days and kept the ground very wet. During a fine spell in mid-December, FYM and mineral fertilisers were applied to the Classical fields, sugar beet were lifted and much land was ploughed, but the ground was too wet to lift potatoes and some were still in the ground at the end of the year. The weather remained mild until 24 December when there was a fall of snow; frosts kept this on the surface until the end of the year. December was the eighth consecutive month with less sunshine than average.

Field experiments

There were 4071 full-scale plots from which yields were taken and more than 2000 others, some large plots from which yields were not taken and some microplots. This was an increase of 677 full-scale plots, and the execution of the full programme was made possible by the dry early spring, and the utilisation of a third combine harvester. Winter-wheat plots in 1967 were drilled over a wide interval, but spring crops over a very short one; hand applications of N to the experiments were done after drilling was finished.

Broadbalk and Hoos Barley were in their first year of the revised experiment (*Rothamsted Report for 1966*, pp. 229–231). For the first time mineral fertilisers were applied before ploughing, minerals and FYM were applied to the areas to be fallowed, and 'Nitro-Chalk' 21 replaced sulphate of ammonia and nitrate of soda.

Cappelle replaced Squarehead's Master on the parts of Broadbalk retained in wheat. The mean yield of the 3 sections under continuous wheat

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(25·1 cwt/acre) was more than in 1966 (21·9 cwt/acre) or in 1967 (14·6 cwt/acre). This, in a year when most yields were less than average, was probably because of the greater yield potential of Cappelle. Weed control by the hormone weedkiller was poor as rain fell soon after spraying. There were fewer wild oats than in 1967 and they were hand pulled. There was little lodging.

Plant size and yield of beans and potatoes differed greatly on different plots. The beans were sprayed with simazine which damaged plants on all plots except the FYM plots; simazine will not be used in future. The plot receiving FYM alone gave 42 cwt/acre, and all plots given potash over a period of years gave more than 27 cwt/acre. The yields exceeded those on annual or rotation experiments. Herbicides were not used for the potatoes and the ground on most plots became foul with horsetail (*Equisetum arvense*). More acid than usual was used when burning off the haulm, to give some control of this weed. The poor Majestic seed gave an uneven plant; in 1969 King Edward will be grown and herbicides will be used.

In autumn all the plots (except section 8) coming into wheat for 1969 were sprayed with paraquat. In past years drilling was delayed to kill the initial germination of black grass (*Alopecurus myosuroides*), but this year the field was drilled in mid-October, and all except section 8 was sprayed the next day with a soil-acting herbicide to control this weed.

On Hoosfield, Maris Badger was the only barley variety grown. The few wild oats were hand pulled. There was little lodging. The Majestic potatoes were very uneven; herbicide was not used. In future King Edward will be grown and a herbicide used. Beans were sprayed with simazine but in future weeds will be controlled by cultivations. The mean yield of the plots without potash exceeded 23 cwt/acre and those with potash more than 30 cwt/acre.

On the Exhaustion Land there was some couch grass despite the fallow in 1967. To control this the stubble was rotavated after harvest and sprayed with paraquat two weeks later. Barley yields were 14% less than in 1966.

Barnfield was in the first year of its revised cropping (*Rothamsted Report for 1967*, p. 232). Mineral fertilisers were applied before ploughing, and minerals and FYM were both applied to the valley strip. Spring wheat (Kolibri) and spring barley (Maris Badger) were grown for the first time since 1856. Both crops grew and stood well; the best mean yield of wheat was 41·6 cwt/acre, with 130 lb/acre N. Straw yields were big, some plots giving more than 3 tons/acre. The mean grain/straw ratio was 1 : 1·6. The best mean yield of barley was 38 cwt, with 86 lb/acre N. There was a lot of straw and the mean grain/straw ratio was 1 : 1·3. On all barley plots and four of the seven wheat plots, grain yields were less with most N (130 lb/acre), but with one exception straw yields were biggest.

Beans were grown on series O, and all plots were split for simazine v. mechanical cultivations for weed control. On the plots receiving FYM there was no evidence of damage by simazine but on other plots the sprayed plants were less vigorous, shorter and yielded 45–70% less than the unsprayed ones. The mean yield of the unsprayed plots was almost 30 cwt/acre. Quite a lot of seed shed before and during harvest germinated, and the seedlings were killed by diquat in the late autumn.

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On the wheat after fallow on Hoosfield the wheat yielded less grain than in 1967 but more straw.

In the Ley–Arable experiments King Edward potatoes replaced wheat as the first test crop, and a fourth test crop of wheat replaced the usual first-year crops. The wheat in Highfield suffered from take-all and gave a small yield; the wheat after newly ploughed pasture was damaged by various pests, and produced a thin plant and a small yield.

On the Cultivation–Weedkiller experiment, cereal crops gave disappointing yields. The winter wheat averaged 37 cwt/acre; the barley 35 cwt, 10 cwt fewer than in 1967, and the spring beans 20 cwt/acre, also 10 cwt fewer than in 1967. Simazine had no significant effect on yield. Potatoes yielded 2 tons/acre more than in 1967. An innovation in this experiment is the burning of wheat and barley straw on the minimal cultivation plots.

The yield of the Cappelle wheat in annual and rotation experiments varied widely. The variety stood well, as did the spring varieties Kolibri and Kloka. One experiment with Champlein was badly lodged, but gave the most yield. In many winter wheat experiments the best yield was obtained with small quantities of N (0·6–0·8 cwt N/acre); more gave less yield without appreciably increasing lodging. In fewer spring wheat experiments, the same seemed to be true. In a variety trial, Kolibri yielded far more than any other variety and will become the standard spring variety.

Maris Badger was grown in most barley experiments; much was badly lodged and yields were small. In several experiments the largest yield was given by the smallest amount of N. In a variety trial Sultan, which remained almost free from mildew, yielded almost as much as Zephyr, despite the fact that it lodged very early. The small grain yields cannot be ascribed to poor straw growth. In two barley experiments, each with similar treatments as in 1967, and where there was no lodging, the grain/straw ratio was halved in 1968.

In the last of a series of experiments comparing drilling and broadcasting cereals, the yield of wheat differed little whatever the method of drilling or sequence of cultivations. With barley, where two cultivations were done between ploughing and sowing, the drill did better than broadcasting, but, unexpectedly, the best yield was given by broadcasting seed on the ploughed land, and then cultivating it in.

Spring beans on the Irrigation experiment were very disappointing. The simazine was less effective than usual in controlling weeds, which had to be killed mechanically, and although there was no aphid attack, the mean yield (18·3 cwt/acre) was only half as much as in 1967. Increasing intensities of irrigation progressively lessened the yield.

Because a few plants in the potato crop being grown in 1967 for seed had leaf drop streak, it was decided not to plant them in experiments. Seed for experiments was bought from Northern Ireland; the Majestic 'A' stock proved very poor and plant counts on plots in June showed that up to 23% of the tubers failed to emerge. The rejected Rothamsted-grown seed gave a very satisfactory mean total yield exceeding 18 tons/acre. The crop grew well despite the lack of sun and yields were good but variable; some experiments yielded more than in 1967, some less. King Edward outyielded the Majestic in several experiments.

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Cropping

Of the 652 acres farmed, 448 were under arable crops or fallow, 92 under short-term leys or a lucerne-grass mixture, and 113 under permanent grass. The main crops were wheat (104 acres), barley (191 acres), beans (46 acres), potatoes (37 acres), and a small acreage of kale, sugar beet, swedes and oats. Fifty-three acres were fallowed and ten acres of winter and spring oil-seed rape were grown. The acreage of barley increased at the expense of the wheat and the area of permanent grass was decreased by ploughing a field on Scout Farm.

The fallows to control twitch grasses were worked many times during the summer, mainly by a rotary cultivator, with occasional deep-tine cultivations. Grass weeds grew freely through the laid barley crops, and volunteer corn soon made the stubbles green. About 150 acres were sprayed with paraquat to kill the corn and annual weeds, and control the twitch grasses until the land could be ploughed. This form of stubble hygiene is now standard practice because, in addition to controlling weeds, it restricts the spread of infection.

Wild oats were hand pulled from most of the cereals but on two areas where they were numerous the straw was burnt, and barban will be sprayed before the next crop.

Most 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 the scientific staff a choice of sites. Several fields are outside the rotation, as they 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, but some grow cereals.

Cereal diseases. There was an early and severe attack of mildew on winter and spring wheat, and barley, but the infection on the flag leaves was less than in 1967. There was little Yellow Rust, and Rhyncosporium attacked only the winter barley. Eyespot on wheat was fairly prevalent but only seriously affected the susceptible variety Champlein. Take-all was severe in second and third year wheats after a long 'break'.

On winter wheat there was an infestation of aphids (mainly *Sitobium avenae*), and numbers reached 50–60 per ear. Heavy rain greatly decreased the numbers.

Wheat Bulb fly (*Leptohylemyia coarctata*) damaged one area of late-sown wheat. The remaining plant was killed by paraquat and barley was drilled.

The beans suffered early from chocolate spot (*Botrytis* spp.) and leaf spot (*Ascochyta fabae*). Stem eelworm (*Ditylenchus dipsaci*) was present on most areas but the infestation differed greatly both between and within fields.

Crops

Wheat. Cappelle was the only winter variety grown except for a few experimental areas. Sowing was spread over a period of four months; some seedbeds were poor and germination was slow. Spring top dressings

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of N were given before the end of April, and the crops looked promising in early summer; although battered by heavy rain most of the Cappelle stood reasonably well, but the late storms caused some patchy lodging. One second wheat crop was badly lodged and yielded only 23 cwt/acre. Yields generally were about 25% less than in 1967.

Of the two spring wheats grown, Kolibri outyielded Kloka. Kloka yielded about 30% less than previously.

Barley. Maris Badger remained the main variety in experiments, but Zephyr was grown on non-experimental areas. Many of the crops looked rather yellow in early summer but became uniform later. Storms in June caused several areas to lodge, and further heavy rain in July and August made this severe on all areas. The grain is of poor quality, and yields were about 20% less than those of 1967. The best yield on non-experimental areas (36 cwt/acre) was given by the variety Sultan grown on ploughed-out grassland; it remained free from mildew but was the first to lodge.

Oats. The small area of Manod, spring sown on Fosters and Highfield Ley–Arable experiments, was lodged and yielded about 37 cwt/acre compared with 42 cwt/acre in 1967.

Beans. Tarvin and Maris Bead spring tics were sown early and most areas were sprayed with simazine soon after drilling. Germination and early growth was good but despite the use of simazine most areas had to be tractor hoed. There were no aphids, but as a precaution phorate granular insecticide was applied to some experimental areas. The plants were shorter than usual, but the persistent rain caused them to lean. Leaf-fall occurred suddenly and much earlier than usual, probably from leaf diseases; cutting started immediately after the cereals were finished and was completed on 13 September. Yields were 30–50% smaller than in 1967.

Oil-seed rape. Both winter and spring rapes were grown, winter for the first time at Rothamsted. Although severely damaged by pigeons during the winter, it recovered well when given nitrogen early. Inter-row cultivations were not done and the ground became weedy. Storms caused the plants to lean badly and delayed cutting. Much of the seed became overripe and shed before or during the direct combining; the mean yield was 16·3 cwt/acre with a mean oil content of 43·4%.

The Nilla spring variety grew without a check and was sprayed with malathion against pollen beetle early in June. There was no lodging and less shedding; the mean yield was 17·4 cwt/acre with a mean oil content of 36·4%.

Though useful as a 'break' crop, rape is not easy to grow.

Sugar beet, kale, swedes. These crops were grown only in experiments. They were drilled under good conditions and all grew well; swedes and sugar beet yielded slightly more than in 1967 but sugar percentage was smaller and sugar per acre less.

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Potatoes. King Edward and Majestic were the main varieties but a few Pentland Dell were grown. Some Irish and some Rothamsted-grown seed was used; all were chitted. Stock Seed of each of the three varieties was grown to provide seed for 1969 and 'H' certificates obtained. Good seed beds were made by the rotavator and planting was done in an unbroken period of four weeks. On most areas weeds were controlled by a linuron/paraquat spray, and a late ridging with a rotoridger. In two experiments yields were slightly increased by this ridging. The Northern Irish 'A' Majestic gave a very irregular plant, possibly because diquat was used improperly on the crop that produced them.

The crop grew well during the summer; spraying against blight (*Phytophthora infestans*) started in early July. Because of an attack by aphids (mainly *Macrosiphum euphorbiae*) about mid-July, 'Metasystox' was incorporated at the second spraying on most areas. Rain and strong winds interfered with the last spraying and delayed the burning-off of the haulm, which was badly affected by blight by the time it was finished. Lifting was delayed and interrupted by bad weather, and was still unfinished at the end of the year. Some of the Majestic went rotten in the ground, probably from waterlogging. The tubers were of good size and shape and there was less scab than usual. Yields were good; Majestic gave about 16 tons/acre total produce and King Edward more. Many of the tubers were very muddy when lifted and riddling is slow and tedious. A single weighing showed that about 5 cwt of soil was removed per ton of bagged ware.

Grass. A high-nitrogen compound fertiliser or 'Nitro-Chalk' was given to most of the leys in late February or early March. Growth in March was slow and the stock were given their winter rations until the end of April. Grass grew rapidly in May and for the rest of the summer and there was more than sufficient for the stock. Crops of silage were big and hay yields exceeded 3 tons/acre, most of excellent quality. On some fields the grass was too badly laid for conventional mowing and crimping, but a flail mower worked satisfactorily. Most of the grassland was top-dressed with 'Nitro-Chalk' during the summer, and irrigation continued until 9 July after when none was needed. All the grazed land was topped by a rotary mower.

Livestock

Cattle. In November 1967 62 cattle were brought into covered yards and 82 were out-wintered at Scout Farm. All were fed on hay, silage and brock potatoes, and the most forward ones were given home-grown concentrates to gain 2 lb/day. The smaller cattle were fed on less. The yarded beasts were sold as they became fat, the last in May.

The out-wintering cattle poached the grassland so badly that it was ploughed in late spring. They just maintained their weight over winter but thrived on the ample grass during the summer and gained about $2\frac{1}{4}$ lb/day. They were sold by the end of the year. Altogether 150 cattle were sold fat during the year, 13 were from Woburn and finished at Rothamsted.

Because of foot and mouth disease no cattle were bought between

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October 1967 and August 1968; 72 young Hereford bullocks were bought in autumn 1968. In December 31 of the most forward cattle were yarded for fattening, and 46 were left out to eat the potatoes damaged by water when the barns were burnt.

All the young cattle were treated in November with an organophosphorus insecticide against warble fly.

Sheep. In October 1967, 218 ewes, mainly Scotch Half-breds, and 20 home-bred ewe lambs, were mated after flushing on new seeds, to Suffolk rams. Very little hay was needed until early in January 1968, and concentrates were fed in gradually increasing quantities from 9 January. Lambing started about mid-March and was favoured by cold, dry weather, but there was little early grass. There were 351 lambs alive on 1 May, giving a lambing percentage of 147. There were some deaths from pulpy kidney and nematodirus but most lambs did well and the first were sold before the end of May. There were 53 unsold at the end of the year.

The ewes were injected before lambing with a combined vaccine to protect them and their lambs against clostridial diseases. Ewes and lambs were sprayed against sheep maggot fly, and lambs were dosed regularly against worms.

In autumn 1968, 50 young Half-bred ewes were added to the flock to replace culls, as were 2 Suffolk rams. The ewes were flushed on fresh grass before mating in mid-October. Hay was not fed until snow fell at Christmas, and as the ewes were in rather poor condition concentrates and brock potatoes were fed before the end of the year.

Buildings

A new timber-framed barn with a lean-to cattle shelter each side was built on Scout Farm.

WOBURN

At Woburn the year was almost as disappointing as at Rothamsted. At first work was up to schedule and in a dry spring all crops were drilled early under good conditions. The summer was dull and damp; each of the 8 months from May had less sunshine than usual, and the total for the year was 303 hours fewer than average. Each of the 7 months from April had more than average rain; the total for the year, 27·52 in., was 2·8 in. more than average and rain fell on 172 days. Grain yields were small partly through lodging and disease, but mainly because proportion of grain to straw was small. The haulm of the potatoes died very early but yields were reasonable. Shortage of pickers and bad weather meant some were still in the ground at the end of the year; also much land was still not ploughed.

The effect of weather on crops

In January the weather was variable, with rain, sleet, snow and hard frosts alternating with spells of mild weather. Little land work was done.

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